



ISC2026



**International
Sedimentological
Congress**

WELLINGTON, NEW ZEALAND
25-30 JANUARY 2026



Abstract Book

**22nd International
Sedimentological Congress**

**25 – 30 January 2026
Wellington, New Zealand**

**Congress Theme: *“Sedimentation on active
plate margins through time and space”***

Fore Arc Sedimentation and Contemporary Basin Tectonics: Insights from Miocene Successions of Miura Peninsula, Japan, and Cretaceous Pedawan Formation, Borneo

Mrs Aisha Al Siyabi¹

¹German University of Technology in Oman, Muscat, Oman

1D: Controls on sedimentation at submarine active margins (1), Rongomātāne A (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

Sedimentary successions developed at the destructive plate margin settings bear a valuable record of contemporary basin tectonics and consequent sedimentation. Intense deformation and metamorphism often obliterate the primary sedimentary texture and structures of the sedimentary successions formed at destructive plate margins. However, sedimentological analysis of young unmetamorphosed forearc successions provides a rare opportunity to infer the interplay between tectonics and sedimentation. This presentation will summarize sedimentological analysis of Miocene fore arc succession of Miura Group, Miura Peninsula, Japan and Cretaceous fore arc succession of Borneo island. Both successions bear penecontemporaneous deformation structures that formed far below the storm wave base. These penecontemporaneous deformed horizons sandwiched between laterally persistent undeformed beds. Deformation structures include folds with reclined to recumbent geometry and layer-confined normal and reverse faults. These deformation structures are interpreted as seismites. The sedimentary facies characteristics of the Miura Group and the Pedawan Formation in combination with numerous penecontemporaneous deformation features at selected stratigraphic levels indicate that the turbidites formed in a seismically active deepwater depositional setting.

Controls on Stromatolite and Thrombolite Development in a Mixed Siliciclastic-Carbonate System

Hasan Algheryafi^{1,2}, Dr Mohammed Fallatah¹, Mr Misbahu Abdullahi², Dr Ardiansyah Koeshidayatullah², Dr Khalid Al-Ramadan^{2,3}

¹Saudi Aramco, Dhahran, Saudi Arabia, ²Geosciences Department, College of Petroleum Engineering and Geosciences, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia, ³Center for Integrative Petroleum Research, College of Petroleum Engineering and Geosciences, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia

10D: Marine Carbonate-Siliciclastic sedimentary systems, Rongomātāne A (Level 1), January 30, 2026, 11:00 AM - 12:30 PM

Mixed siliciclastic-carbonate settings are known to display detrimental effects of the carbonate production that is triggered by continuous siliciclastic influxes. Such mixed-lithology sequences may represent a lower carbonate – upper fine-to-coarse-clastic sequence or a lower fine-grained-to-mudrock – upper sequence. This study integrated sedimentology, ichnology, palynology and cyclostratigraphy to determine whether the siliciclastic and carbonate are regressive or transgressive based on multiple lines of evidence.

This study discusses a total of 340 feet of core taken from a mixed siliciclastic-carbonate system outcrop. Detailed description of the core including lithology, sedimentary structures, ichnology was integrated with 20 thin sections that were acquired mainly from the carbonate lithology intervals. Furthermore, palynological data was used in this study to understand variations in the depositional environment from fresh to brackish and saline water. Furthermore, spectral analysis is performed using gamma ray data from the core. Correlation coefficient was used to determine sedimentation rate during the Emsian and to test any astronomical forcing on the dataset. The identified orbital cycles were correlated with the alternating siliciclastic-carbonate beds and palynological data.

The siliciclastic successions were dominated by shoreface facies associations in most cycles, except for one cycle that was dominated by tidal flats facies association. On the other hand, the carbonate-dominated parts of the cycles were mostly topped by microbial buildups. These displayed variates of thrombolites and stromatolite mounds. Several siliciclastic intervals were showing development of syneresis cracks suggesting freshwater input. These episodic influxes of siliciclastics were the main factor that increased the turbidity of the water.

This study illustrates the effect of Milankovitch cycles, especially eccentricity, on ancient mixed siliciclastic-carbonate systems. The complex interplay between sedimentary processes, microbial activity, and environmental conditions governed the formation of shoreface sand bodies in regressive pulses that interrupted the development of microbial buildups.

Source to Sink Sedimentation at the Dawn of Land Plants: Ordovician Fluvial, Braid Delta, and Marine Deposits of the South Mayo Trough, County Mayo, Ireland

Mr Hamilton Allport¹, Dr. Neil Davies¹, Dr. William McMahon¹

¹University of Cambridge, Cambridge, United Kingdom

6D: The complexity of braided rivers that reach the base level, Rongomātāne A (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

The Middle to Late Ordovician formations of the South Mayo Trough record fore-arc deposition in diverse fluvial, alluvial, and marine environments. This study augments sedimentological work on the shallow marine and non-marine facies of this succession with architectural element analysis to create detailed paleoenvironment reconstructions of the original alluvial fan, braided river, braid delta, and shallow marine settings. Sediment source and basin paleogeography are determined through the use of paleocurrent indicators, clast composition, pebble concentration data, and ignimbrite marker horizons. Petrological studies of clay mineralogy constrain the extent of chemical weathering through the succession. This holistic investigation is used to lend partial support to a revised stratigraphic framework of the basin previously based on ignimbrite band dating and limited contact mapping. In particular, several shale and conglomeratic units are shown to be spatially restricted and transitional with the dominantly fluvial Dapingian to (?)Sandbian Mweelrea Formation, suggesting contemporaneous and laterally transitional deposition. However, portions of the (?)Darriwilian to (?)Katian Rosroe Formation, previously interpreted as having been deposited in submarine fans forming part of a separate terrane to the rest of the South Mayo Trough, are shown to be transitional with that formation and deposited in subaerial alluvial fans. These results are combined to provide context for proximal fluvial environments deposited contemporaneously with the earliest fossil evidence of land plants, better constraining the potential impacts of primitive vegetation on alluvial systems.

Fine-gravel Petrography as a Key to Lithostratigraphic Correlations in Quaternary Deposits of South-Western Funen, Denmark

Dr Theis Raaschou Andersen, Ms Jette Sørensen

¹Via University College, Horsens, Denmark

6D: The complexity of braided rivers that reach the base level, Rongomātāne A (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

The demand to distinguish between Quaternary stratigraphic units in Denmark is high, as suitable aquifers for drinking water abstraction are scarce in many regions. In this study, we employed 114 fine-gravel petrography analyses from 12 boreholes in the south-western part of Funen to establish lithostratigraphic correlations both between and within individual boreholes, with the aim of refining the regional stratigraphic framework and enhancing hydrogeological modelling.

Statistical tests reveal that many Quaternary layers exhibit significant differences in their fine-gravel composition, which depends on the origin and pathway of ice-sheet flows from the Scandinavian mountains to south-western Funen. Consequently, the layers can be subdivided into distinct geological units based on their characteristic fine-gravel composition. Notably, one unit serves as a clear geological marker, with a unique fine-gravel composition comprising over 39% quartz grains compared to the surrounding units, which contain no more than 15%.

Detailed analysis of grain morphology indicates that the majority of quartz grains most likely originate from Miocene alluvial fan systems deposited to the west and north of the study area, and that these grains have been eroded and transported by the ice sheet to south-western Funen. This observation supports the interpretation of a quartz-rich sand layer as a glacial meltwater deposit, formed by an ice sheet advancing from the north. Although the precise timing remains uncertain, the deposit is hypothesised to date from either the Saalian or the Elsterian glaciation, covering an estimated area of approximately 1500 km².

Our findings demonstrate that fine-gravel petrography is a promising tool, and often neglected in present day investigations, for correlating lithostratigraphic units on former glaciated areas. The clear petrographic distinctions not only facilitate the identification of unique stratigraphic markers but also provide new insights into sediment transport dynamics during glaciation, ultimately contributing to more accurate hydrogeological models and improved water resource management.

Interplay of Late Quaternary Sea Level and Tectonic Along the Southern Coast of Sardinia Island, Mediterranean Sea

Professor Stefano Andreucci¹, Dr Giovanni Fantini¹, Dr Daniele Sechi¹, Dr.ssa Giulia Cossu², Dr.ssa Marta Lai³, Professor Vincenzo Pascucci³, Dr Toru Tamura⁴

¹Department of Chemical and Geological Sciences, University of Cagliari, Cagliari, Italy, ²Department of Chemical, Physical, Mathematical and Natural Sciences, University of Sassari, Sassari, Italy,

³Department of Architecture, Design and Urban Planning, University of Sassari, Sassari, Italy,

⁴Geological Survey of Japan, AIST, Tsukuba, Japan

6A: Sedimentology and Luminescence keys to tune late Quaternary tectonic, climate and eustatic events, Tāwhirimātea A (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

The Sardinia Island (West Mediterranean Sea) is mantled along the coasts by relatively thick Pleistocene shallow marine deposits. Despite being considered almost tectonically stable over the last 1 million years, recent studies have shown clear evidence of a moderate late Quaternary tectonic activity.

To investigate the interplay between tectonic activity and sea-level fluctuations three areas, located on distinct crustal blocks of the Southern coast of the island were studied: Torre Foxi, Nora and Piscinnì. Stratigraphical analysis along with U/Th and luminescence ages led to subdivide the studied succession into three Unconformity-Bounded Units (UBSU): U1, U3a and U3b.

Unit U1, cropping out only at the Piscinnì site, unconformably lies on the bedrock and is characterised from the base upward by cobbly pebbly transgressive lag grading into a mixed trough cross-stratified sandy-gravelly beach system. Unit 3a deeply erodes U1 and is dominated by moderately to well-sorted low-angle cross-laminated foreshore sandstones.

At the Nora site, a well-developed trough cross-stratified to low-angle cross-laminated sandy-gravelly beach ridge system referred to unit U3a crops out.

At the Torre Foxi site, instead, U3a consists of a thick *Cladocora caespitosa* coral framestone. U3b deeply erodes U3a and consists of cobbly to coarse-grained, moderately to well-sorted low-angle cross-laminated sandstones interpreted as foreshore to backshore systems. Unit 4 rests unconformably on U3b and consists of high-angle cross-bedded aeolian sandstone.

The geochronological framework indicates that U1, U3a and U3b are referred to MIS7 (ca.200ka), MIS 5e (ca.125ka) and MIS 5c (ca.100ka), respectively. According to the widely accepted eustatic sea curves, MIS7 and MIS 5c sea level should lie significantly lower than MIS 5e. Therefore, the presence of three distinct highstand phases of beach progradation, above the present sea position level, can be interpreted as a consequence of late Quaternary eustatic fluctuations tuned by a regional tectonic activity characterised by a differential uplift of the different crustal blocks.

Deep, Steep, Small or Tall? Size, Shape and Resolvability of Clinoforms from Continental Margins, Seismic and Outcrop

Dr Ingrid Anell¹, Professor Ivar Midtkandal¹, Leticia Rodrigues-Blanco Irusta¹

¹University of Oslo, Oslo, Norway

3C: Coastal to shelf environments across time and space (3), Tāwhirimātea E (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

Clinoforms are fundamental building blocks in sedimentary geology forming sloping depositional profiles. The quintessential s-shape is recognized from cm-high ripples to kilometre-scale continental margins. They owe their formation, morphology and size to a complex interplay of factors. Although the sloping s-shape is considered synonymous with the clinoform, over the scales, cm to km, a variety of shapes develop; concave, linear, convex, sigmoidal. Shape forms in response to variations in sedimentation along profile, resulting from erosion / bypass / limited deposition / accumulation / sediment supply. Equally important is slope, which varies considerably from angle of repose to <1 degree, visible only in vertically exaggerated seismic datasets.

In outcrops, steeply dipping clinoforms are over-represented in the literature, because their dip makes them resolvable. In seismic, subaqueous deltaic (barely within) and shoreline clinoforms (below) are under-represented due to limitations in resolving them. There is a clear knowledge-gap between analogue outcrop and seismic-scale clinoforms. Photogrammetric models coupled with logging can bridge this gap by extracting seismic-scale clinoform geometries from long low-angle prograding systems in outcrops.

The calciclastic Eocene clinoforms, Ainsa Basin, visible to the naked eye, and the recently resolved Triassic compound clinoforms on Edgeøya, Svalbard, combined with a wealth of published literature, are herein examined. The compound nature with complex stacking pattern, tidal amplification and sediment redistribution, means the low-angle Edgeøya clinoforms are resolved in seismic, not in outcrop. Ainsa, based on photo-panels, allows for extraction of four distinct clinoform surfaces, which can be mathematically defined and together with logs and sediment distribution the processes leading to varying geometries can be explained.

Bridging the seismic to outcrop gap for clinoforms will provide a better understanding of seismic resolution, clinoform reflector formation, impact of stacking patterns, temporo-spatial variability, relative sea-level change, sediment partitioning, and erosional and depositional processes.

Sink to Source: Alluvial Fan Study of Basement Composition

Aurora Kvamsdal¹, **Dr Ingrid Anell**¹, Dr. Ivar Midtkandal¹, Dr Lars Riber²

¹University of Oslo, Oslo, Norway, ²Moreld Ross Offshore, Oslo, Norway

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

A sedimentological and petrographic study of alluvial fans and their protolith investigates how data from the strata can constrain the composition and characteristics of the upstream catchment. Alluvial fan deposition in extensional continental settings in arid to semi-arid climates is the classic and most extensively studied setting in alluvial fan research. However, there is still more to be understood in terms of facies distribution in ancient conglomerates and how the alluvial fan (sink) reflects the catchment (source). A challenge when studying ancient alluvial fan deposits is the timing of the alteration observed in the clasts, which may be of hypogene, supergene, or diagenetic origin.

The present study utilizes a multi-method approach combining traditional core-logging of ancient alluvial fan deposits from Utsira High, North Sea, and quadrat logging of two modern-day alluvial fans in the Northern Basin and Range, USA, with weathering proxies from petrographical, mineralogical and geochemical datasets, to study the connection between alluvial fan deposits and the associated catchment in catchment-fan systems with plutonic protoliths. The study shows that modern-day fan surface expressions offer valuable information on the protolith and how it is weathered in the catchment. Our results suggest that the present mica mineral suite dictates the type of weathering observed in terms of texture and grain size, which controls the fan facies distribution. However, the degree of weathering alone is insufficient to determine fan facies.

Assessing Conformance and Integrating Sedimentological Data in Geological CO₂ Storage: Insights from the RAMONCO Project

Dr Sorin Anghel¹, Dr. Constantin Stefan SAVA¹

¹National Institute for Research and Development on Marine Geology and Geo-ecology – GeoEcoMar, BUCHAREST, Romania

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

In the context of the energy transition and the European climate goals, geological storage of carbon dioxide (CO₂) is emerging as a key technology to reduce industrial emissions. The international RAMONCO project ("Risk-based framework for assessing CO₂ storage monitoring") proposes an integrated approach for assessing risk and conformance in storage projects, focusing on a multi-physics inversion framework for monitoring data. A fundamental component of this methodology is the incorporation of sedimentological data for detailed characterization of reservoir and seal formations.

Sedimentology provides essential parameters for understanding porosity, permeability, facies distribution, and stratigraphic discontinuities—critical factors in evaluating the dynamic behavior of CO₂ underground. Within RAMONCO, sedimentological data are integrated with geophysical (3D seismic, gravity, deformation) and operational (injection, pressure) data to calibrate simulation models and support the field-scale multi-physics inversion process.

This paper highlights the particular relevance of the Oltenia region (Romania), previously investigated in the GETICA CCS project. This area features a complex sedimentary setting dominated by Mio-Pliocene clastic successions and clay-rich sealing units. Borehole data and well logs provide valuable support for geological modeling and site-specific risk assessment.

By correlating sedimentological insights with data from other disciplines (geophysics, engineering, risk evaluation), the RAMONCO project advances a scalable and replicable framework for site selection and storage safety assessment. The study underscores the critical role of sedimentology in supporting decisions on conformance and long-term monitoring strategies for CO₂ geological storage.

Subsurface Contamination Mapping in a Black Sea Coastal Environment

Dr Sorin Anghel¹, PhD Student Andrei Gabriel Dragos¹, Master Student Bogdan Baraitareanu¹, Dr Gabriel Iordache¹

¹National Institute for Research and Development on Marine Geology and Geo-ecology – GeoEcoMar, BUCHAREST, Romania

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tăkina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Hydrocarbon contamination in coastal environments poses a significant environmental and public health threat, particularly in areas with long-standing industrial activity. Along the Black Sea coast of Romania, the Petromidia refinery near Năvodari represents one such critical site, where historical and ongoing industrial processes have led to the accumulation of hydrocarbons in soil and groundwater. This study presents an integrated geophysical and photogrammetric approach for mapping and characterizing subsurface contamination in this coastal setting.

Advanced non-invasive geophysical techniques, including Ground Penetrating Radar (GPR), electrical resistivity and magnetometry, were employed to delineate contamination plumes and detect structural features that may influence contaminant migration. GPR surveys were conducted using a Noggin system equipped with 100 and 500 MHz antennas, enabling multi-depth imaging of shallow subsurface stratigraphy and detection of buried anomalies and fracture zones. Electrical resistivity measurements, acquired with an AGI Ministing system, provided critical data on changes in soil conductivity associated with hydrocarbon presence. Magnetometry, performed using a Geometrics 864 cesium vapor magnetometer in a gradient configuration, revealed magnetic anomalies potentially linked to buried metallic infrastructure or hydrocarbon-induced alterations.

All geophysical data were georeferenced using a Trimble R980 RTK GPS system, ensuring high spatial accuracy and compatibility with geospatial analysis. Aerial photogrammetry was also integrated into the investigation using a DJI Phantom 4 Pro drone. These datasets enabled detailed surface monitoring and contextual interpretation of subsurface features.

Although the current study was conducted at the Petromidia site, the methodologies and expertise developed will be directly applied in future investigations at the Oil Terminal site in Constanța. Given the large number of historical boreholes in the area, there is a strong potential to develop a high-resolution, integrated hydrogeophysical model.

This multidisciplinary approach provides a robust framework for environmental monitoring, risk assessment, and remediation planning in sensitive coastal environments affected by industrial pollution.

Sedimentological Features with Related Geochemical and Biotical Fluctuations During Mid Cretaceous Oceanic Anoxic Events in the Tethyan Realm

Mr Vlad Apotrosoaei^{1,2}, Mr Relu-Dumitru Roban³, Mrs Mihaela Melinte-Dobrinescu^{1,2}

¹National Institute for Research and Development on Marine Geology and Geo-ecology – GeoEcoMar, Bucharest, Romania, ²Doctoral School of Geology, University of Bucharest, Bucharest, Romania,

³Faculty of Geology and Geophysics, University of Bucharest, Bucharest, Romania

7C: Sedimentology of Black Shales through Phanerozoic (2), Tāwhirimātea E (Level 2), January 29, 2026, 10:15 AM - 11:45 AM

Most of the Oceanic Anoxic Events (OAE) occurred during mid-Cretaceous times as a consequence of palaeoenvironmental and tectonic activities. The sedimentological feature of OAE2 is characterized by rich-organic black shales, which contain isotope $\delta^{13}C$ excursions. This study focuses on the upper Albian - lower Turonian interval of the Romanian Carpathian belt (eastern part). In this region, several black shale occurrences are known to crop out. Previous studies have linked these deposits to the palaeogeography and tectonics of this region, where a trough, i.e., the Moldavian Trough, existed during the Early Cretaceous, implying the setting of small marine basins with restricted circulation regime and anoxic deposition. Our findings pointed out several mid-Cretaceous OAEs in the area, proving that some of the rich-organic black shale occurrences are linked not only to regional settings, but also to global events. Based on sedimentological and geochemical changes we identified in the Eastern Carpathians, the Albian-Cenomanian Boundary Event (ACBE), the Middle Cenomanian Event (MCE), and the Cenomanian-Turonian Boundary Event (OAE2). According to the biostratigraphy based on calcareous nannofossils, the ACBE is placed in the UC0 nannofossil zone, while the MCE is situated in the UC3a nannofossil subzone. OAE2 is the most extended OAE of the studied section, encompassing the late Cenomanian-early Turonian interval. This oceanic event shows three successive peaks in the late Cenomanian, covering the UC3e-UC5c biozones, and the youngest early Turonian peak, in the UC6 biozone. The investigated successions are mainly composed of black and dark-grey shales, grey marls, and rare cm-thick radiolarites, which contain significant fluctuations of TOC (Total Organic Carbon) and OM (Organic Matter) values, with peaks corresponding to the associated OAEs. The characteristics of OAEs discovered in the Romanian Carpathians were also correlated with depositional intervals from Tethys, showing many similarities, and also a few differences, probably mirroring the regional setting.

Clay Mineral Indexes Vs Carbonate Stable Isotopes as Paleoclimatic Proxies in an Onland Record of the Oligocene-Miocene Transition

Mrs Concepción Arenas-Abad^{1,2}, Mr Joaquín Bastida³, Mrs María Cinta Osácar^{1,2}, Mr Lluís Cabrera^{4,5}, Mr Francisco Javier Pérez-Rivarés¹, Mr Luis Valero^{4,5}, Mr Miguel Garcés^{4,5}

¹Department of Earth Sciences. University of Zaragoza, Zaragoza, Spain, ²Institute for Research on Environmental Sciences of Aragón (IUCA), and GeoTransfer Group, University of Zaragoza, Zaragoza, Spain, ³Unit of Geology. University of Valencia, Valencia, Spain, ⁴Department of Earth and Ocean Dynamics. Universitat de Barcelona, Barcelona, Spain, ⁵Geomodels Research Institute and Research Group of Geodynamics and Basin Analysis, Universitat de Barcelona, Barcelona, Spain

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Oligocene-Miocene Transition (OMT) includes a cooling period related to global Antarctic ice-extension (Mi-1). Clay-mineral indexes obtained through a well dated (23.56-22.1 Ma) distal alluvial, lacustrine and palustrine carbonate record in the Ebro Basin, northeastern Iberian Peninsula, encompassing the Mi-1 event, are used to infer catchment climate conditions. The indexes used are: FWHM (illite crystallinity index), ICKS [(Illite + Chlorite) content/(Smectite + Kaolinite) content], SK (Smectite/Kaolinite content). Combination with previous findings from sedimentological and C-O stable isotope analyses, helps discerning the palaeoclimatic evolution across the OMT [1]. A closed-lake environment is envisaged throughout, with important evaporation during the latest Oligocene, then changing to freshwater conditions through the earliest Aquitanian. A first interval (23.56-23.15 Ma), corresponding to alluvial and saline mud flats with little lacustrine or palustrine carbonates, encompassed both temperature and humidity decreases. Coherently, the FWHM decrease, and prevailing increase of ICKS suggested a gradual decline of chemical alteration in the source areas. From 23.15 to 22.85 Ma, lacustrine conditions prevailed, with reduced detrital supply to the lake and relatively high Precipitation/Evaporation balance (P/E). A sharp decrease of ICKS reveals a relative rise of chemical alteration, which drops at the end, with a parallel SK evolution. Average FWHM values in this interval support a dominant chemical alteration, consistent with general increasing humidity. A third interval (22.85-22.1 Ma) represents dominant palustrine followed by shallow lacustrine conditions, recording oscillating humidity, P/E and warming [1]. There is a significant decrease of FWHM. An initial minimum, then gradual rise of ICKS point to a sudden increase of the chemical alteration, followed by a gradual decline, matching the highest SK values of the record. Altogether, the results from clay mineral indexes fit the paleoclimatic findings derived from the carbonate stable isotopes.

Research funded by grants AEI 10.13039/501100011033 and PID2023-149220NB-I00. [1] Arenas et al., 2025. <https://doi.org/10.1016/j.palaeo.2025.112880>.

Geoheritage Significance of the Stromatolite Natural Park at Laguna De Los Cisnes, Tierra Del Fuego, Chilean Patagonia: Implications for Microbialite Formation and Conservation

Dr. Daniel Ariztegui¹, Dr. Alejandro Nuñez Guerrero²

¹University of Geneva, Geneva, Switzerland, ²Corporación Laguna de los Cisnes, Porvenir, Chile

3E: Geoheritage and geodiversity of the sedimentary record & Open Science in Sedimentology, Rongomātāne B (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

A major challenge of the 21st century is fostering awareness, especially among younger generations, of the importance of understanding natural systems. This awareness is essential for their effective and sustainable protection. Making complex Earth processes accessible and engaging plays a crucial role in this effort.

Laguna de los Cisnes, located in southern Tierra del Fuego (Chile), just below the Strait of Magellan, provides a unique opportunity to explore early life on Earth. In this remote and windswept setting, where low temperatures dominate much of the year, both living and fossil stromatolites coexist (Pollier et al., 2024). Formed after the last glaciation, the lake has undergone water-level changes driven by climatic and human-induced factors, recorded in successive generations of stromatolites that reflect long-term environmental change.

A collaborative initiative among local residents, scientists, and authorities has resulted in the Stromatolite Natural Park, where visitors can explore these living and fossil microbial structures using an actualistic approach (Nuñez Guerrero, 2023). A wooden boardwalk and QR-coded panels along the lake shore explain modern stromatolite formation and link it to fossil analogues. A new government-backed project will enhance the park with visitor facilities, an information desk, and monitoring staff to protect the structures, promoting environmental education and sustainable scientific and eco-tourism.

Future plans include establishing an on-site research station to study microbialite formation through microbiological, geochemical, and sedimentological methods. With a strong educational and citizen science component, the station will deepen public engagement and strengthen geoheritage conservation.

References:

Nuñez Guerrero, 2023, Estromatolitos en Tierra del Fuego-Chile: Protagonistas de la vida en el planeta. *La Lupa* 22, 34-38.

Pollier GCL, Nuñez Guerrero AN, Rabassa J, Ariztegui D, 2024, The hidden biotic face of microbialite morphogenesis - a case study from Laguna de Los Cisnes, southernmost Patagonia (Chile). *Sedimentology* (doi: 10.1111/sed.13189).

Differentiating Hyperpycnal, Hypopycnal, and Turbidity Current Deposits in Late Pleistocene-Early Holocene Glaciogenic Mud

Dr Bill Arnott¹, Dr Omar Al-Mufti

¹University of Ottawa, Ottawa, Canada

1B: Transport of Mud and Deposition of Mudstones, Tāwhirimātea C (Level 2), January 26, 2026,
10:15 AM - 11:45 AM

The fate of sediment-laden density flows is strongly controlled by the density contrast between the flow and the basin fluid, which fundamentally influences the character of the sedimentary deposit. However, differentiating the deposits of hyperpycnal and hypopycnal flows, in addition to slope-failure-related turbidity currents, remains a source of debate. In part this can be attributed to the difficulty in determining the density of the fluid in an ancient depositional basin. In this study of a nearly modern succession of fine-grained (silt-clay) glaciogenic deposits, basin fluid conditions are well constrained and the sedimentological make-up of these sediments was determined using X-ray computed tomography and microscopy. Deposits of bottom-hugging hyperpycnal flows consist of a distinctive alternating pattern of silt-rich and clay-rich laminae attributed to the rhythmic alternation of shear thinning and shear thickening processes in the mm- to sub-mm-thick, non-Newtonian very-near-bed region. A similar pattern is observed in fine-grained turbidites suggesting similarity in depositional mechanism, and therein the difficulty in differentiating fine-grained hyperpycnites from turbidites based solely on physical stratal attributes. Alternatively, hypopycnal flows form buoyant plumes from which sediment settles by gravity, potentially augmented by flocculation and convective instabilities, spawning bottom-hugging secondary turbidity currents. In these flows insufficient sediment concentration and shear stress prevents shear thinning and shear thickening processes from operating and instead entropic Brownian fluid motion results in an unstratified deposit with a disorganized particle fabric. Additionally, these strata contain irregularly spaced, well-sorted silt lenses that range from one to a few silt grains thick and record outer flow disturbances that reworked the previously deposited silt and clay. Whereas differentiating fine-grained hypopycnal flow deposits from hyperpycnal flows or turbidity currents may be straightforward, differentiating them from pure suspension fallout would appear to rely on the recognition of the thin, well-sorted silt lenses indicating advection rather than pure particle settling.

Applications of Forward Stratigraphic Modelling in Modern Settings

Dr. Korhan Ayranci¹

¹King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia

5A: Can Forward Stratigraphic Modeling enhance geological understanding of the subsurface and predict sedimentation through time and space? (2), Tāwhirimātea A (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

Forward stratigraphic modelling (FSM) emerges as a recent methodological advancement aimed at assessing the significance of parameters governing stratigraphic stacking configurations, notably sea level fluctuations and sediment supply dynamics. It serves as a robust analytical instrument for reconstructing stratigraphic frameworks and elucidating uncertainties related to sedimentation rate and accommodation space, applicable across diverse geological contexts encompassing both siliciclastic and carbonate environments. While FSM finds widespread utilization in the examination of ancient geological systems, its application within modern settings remains relatively infrequent.

The Fraser River Delta in Canada offers an ideal venue for investigating the applicability of FSM to recently deposited sediments within an active sedimentary basin. This suitability arises from several favorable conditions: Firstly, the undammed nature of the Fraser River facilitates direct comparisons between modern and ancient depositional systems. Secondly, sedimentation processes within the delta are governed by well-understood transport dynamics. Thirdly, the Fraser River Delta represents a well-documented geological system with an ample dataset conducive to the construction of realistic predictive models.

In this study, the evolutionary trajectory of the delta over the past 10,000 years is simulated employing a synthesis of realistic geological data and contemporary observations. Various potential future scenarios are subsequently evaluated to anticipate forthcoming morphological alterations and stratigraphic configurations. The outcomes of this investigation hold promise for informing and refining numerical modelling approaches applicable to both modern and ancient deltaic environments. Such applications possess the potential to enhance hazard mitigation strategies by offering insights into the prevention and management of natural geohazards, including slope instabilities, erosion phenomena, and subsidence events. Moreover, the results can be used to analyze ancient reservoirs and their stratigraphic architectures.

Possibly the Oldest Fish-Made Resting Trace

Dr. Korhan Ayranci¹, Dr. Andreas Wetzel¹, Dr. Michael Kaminski¹, Dr. Bedri Kurtulus¹, Dr. Lotfi Rabaoui¹

¹King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Fish are among the most abundant vertebrates in modern marine environments, having inhabited oceans since the Cambrian Period. They occupy various water depths, with certain species residing near or on the seafloor. Notably, some modern bottom-dwelling fish, such as mudskippers, have adapted to terrestrial life due to their enhanced locomotion and respiratory capabilities. Despite the frequent interaction of bottom-feeding fish with the sediment-water interface, our understanding of their traces preserved in the rock record remains limited.

The sandstone slab examined in this study was obtained from an outcrop of the Sharawra Member, located in the Old Qusaiba Village within the Qasim Region of Saudi Arabia.

Seven small, wing-shaped traces occur on a sandstone slab showing well-defined hummocky cross-stratification having a few decimeters wavelength being covered by a thin mud layer. These traces are preserved as concave epirelief along with elongated internal striae and surrounded by slightly elevated levees. Preservation of these delicate, 10–20 mm long and ~10 mm wide traces suggests that they were formed after a storm event when mud had already settled to the sediment surface. The lack of wave-generated sedimentary structures implies deposition between fair-weather and storm-wave base, probably preventing further rapid reworking by waves. Based on their geometry, internal pattern, and spatial distribution, these wing-shaped traces are interpreted to have been produced by relatively stationary bottom-feeding fish, morphologically similar to ancestors of Gobiidae, probably in the Actinopterygii class. The majority of fish-made trace fossils record feeding and locomotion behaviour, whereas the wing-shaped traces are interpreted to represent resting structures made by fish that pressed their fins downward on the muddy sediment surface and hence, represent undertracks.

These traces are possibly the oldest fish-made structure documented thus far. These wing-shaped traces are described as *Pisquiesichnus dashtgardi* igen. et isp. nov. in this study.

Architecture and Origin of a Slope-Perched Middle Eocene Carbonate Clinothem (Urbasa-Andia Plateau, Western Pyrenees, North Spain)

Dr Juan Ignacio Baceta¹, Dr Gillem Mateu-Vicens², Dr Xabier Murelaga¹

¹University of The Basque Country UPV-EHU, Leioa, Spain, ²University of the Balearic Islands UIB, Palma de Mallorca, Spain

7B: Carbonate depositional systems from platform, slope to basin (1), Tāwhirimātea C (Level 2),
January 29, 2026, 10:15 AM - 11:45 AM

In the Pyrenean basin (western Tethys), the middle Eocene was a time of compressive tectonism and the definition of two east-west trending marine forelands opening into the paleo-Bay of Biscay and the north Atlantic (the Jaca-Pamplona and Aquitaine sub-basins). On the Urbasa-Andia plateau (south-western margin of the Jaca-Pamplona foreland), local tectonic uplift caused a marked basinwards shift of shallow-water sedimentation, as evidenced by the deposition of a 400-500 m thick carbonate ramp clinothem prograding 5 km from the previous Paleocene-lower Eocene shelf edge. Several erosional discontinuities allow the differentiation of four internal sequences within the progradational clinothem, which consist of extensive packages of coarse cross-stratified bioclastic calcarenites (grainstone-rudstones) grading distally to clinoformal fine-grained limestones and marlstones with local slumping and numerous intercalations of calciclastic turbidites and grainflow deposits. Cross bedding in the shallower-proximal sequence represents medium-large scale dune bedforms developed with a general oblique to downramp migration trend. The cross-bedded calcarenites are mostly made of characteristic Eocene oligophotic and heterozoan biota (orthophragminids, red algae, bryozoans, echinoderms and small benthic foraminifera). In the distal base of slope, turbidite channeling and amalgamation are volumetrically important locally. The origin of the middle Eocene progradational carbonate geobody can be discussed in terms of current and resedimentation processes probably generated by the activity of internal waves. The studied example is comparable in size and general internal arrangement to Miocene Maldivian delta drifts and also to wedge-shaped calcarenite geobodies identified in the subsurface of other Paleogene basins. The studied example documents how in carbonate ramp systems thick and extensive coarse, mud-free bioclastic accumulations can develop at relative depth, detached from inner ramp settings and unrelated to surface waves and nearshore current activity.

This study is part of the ResearchProject PID2022137860NB-I00 funded by the MCIN/AEI/10.13039/501100011033 (Spanish Research Agency AEI) and the European Social Fund Plus (ESF+). It is also a contribution to the Research Group 1602-22 of the Basque University System.

Calibration of Sortable Silt Mean Size to Bottom Current Speeds in the East Sea (Japan Sea): Regional Challenges and Prospects

Professor Jangjun Bahk¹, Mr. Gyutae Sim¹, Mr. Haedo Baek¹, Professor Dong Eun Lee¹, Professor In-Kwon Um²

¹Chungnam National University, Daejeon, South Korea, ²Korea Institute of Geoscience and Mineral Resources, Daejeon, South Korea

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Sortable silt (SS), defined as the 10–63 μm grain-size fraction, responds sensitively to variations in deep-sea bottom current speeds. The mean size of sortable silt (SS_Mz) has been widely used as a proxy for reconstructing relative changes in past bottom-current strength. Although a quantitative relationship between SS_Mz and bottom current speed was recently proposed for the North Atlantic, its broader application is limited due to differences in sediment size composition and bottom circulation patterns in other oceanic regions. This study aims to develop a new regional calibration applicable to the East Sea (Japan Sea) by comparing SS_Mz values from surface sediments on the continental slope with bottom current speeds derived from GLORYS ocean reanalysis data. Preliminary results show that SS_Mz correlates strongly with modeled bottom current speeds, particularly at sites with pronounced changes in bottom velocity associated with steep seafloor morphology. The sensitivity of SS_Mz to current speed, derived from the resulting calibration, is $0.15 \text{ cm s}^{-1} \text{ per } \mu\text{m}$, which is significantly lower than the $1.33 \text{ cm s}^{-1} \text{ per } \mu\text{m}$ previously reported for the North Atlantic. This discrepancy is interpreted as a result of differences in sediment size characteristics and the generally weaker bottom-current regime of the East Sea. Further calibration efforts across diverse depositional settings within the East Sea are needed to enhance the applicability of SS_Mz as a quantitative current-speed proxy in this region.

Sedimentary Processes of Gas Hydrate-Bearing Layers and Its Implications for Hydrate Accumulation in the Shenhu Area, Northern South China Sea

Dr. Chenyang Bai¹, Ms. Wenlin Chen¹

¹China University of Geosciences (Beijing), Beijing, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Gas hydrates, as an environmentally friendly energy resource, are primarily distributed in marine sediments, with over 90% occurring in subseafloor fine-grained sediments. However, the formation mechanisms of gas hydrates within fine-grained sediments remain poorly constrained. In addition to the temperature and pressure conditions, variations in sedimentary layer properties resulting from distinct sedimentary processes critically control gas hydrate accumulation. Since the Quaternary, substantial environmental and sedimentary dynamic changes in the northern South China Sea have likely influenced gas hydrate enrichment. This paper investigates the variability of sedimentary processes and its implications for gas hydrate accumulation by integrating analyses of sediment grain-size parameters, clay mineral characteristics, biological data, and geochemical data. The results indicated that the gas hydrate reservoir in the study area was predominantly formed by fine-grained turbidite processes. In contrast, the overlying hydrate-free layer is primarily influenced by traction flow dynamics, specifically contour currents. The differences in the sedimentary processes are mainly governed by sea-level fluctuations and climate variations, which modulate the hydrodynamic intensity and sediment provenance. During periods of low sea level and colder climate conditions, gravity flows preferentially develop fine-grained turbidite deposits. Such sedimentological and environmental conditions promote gas hydrate accumulation. Conversely, during periods of high sea level and warmer climate conditions, the enhanced contour current intensity and velocity, along with higher illite/smectite mixed-layer contents, inhibit gas hydrate formation. These findings not only reveal the coupling between sedimentary processes and gas hydrate enrichment but also elucidate the underlying mechanisms driving this relationship. Moreover, they establish a link between paleoclimate conditions and gas hydrate enrichment by positioning sedimentary processes as an intermediary. This study contributes significantly to the understanding of gas hydrate accumulation theory and its environmental implications.

Insights on the Wedge-Top of the Ionian Margin from New Sparker Data Successfully Acquired at Deep Water (> 2000 m)

Dr Julien Bailleul¹, Dr Sébastien Rohais², Dr Pascal Barrier¹, Davide Oregioni³, Laure Schenini³, Dr Daniele Casalbore⁴, Nora Markežic⁵, Dr Danilo Morelli⁶, Dr Silvia Ceramicola⁵, Dr Nathalie Babonneau⁷, Dr Christian Gorini⁸, Dr Frank Chanier⁹

¹U2R 7511, Basins-Reservoirs-Resources (B2R), UniLaSalle - University of Picardie Jules Verne, 60026 Beauvais, France, ²IFP Energies Nouvelles (IFPEN), 92500 Rueil Malmaison, France, ³UMR 7329 CNRS - UR 082 IRD, GEOAZUR, University of Nice, 06905 SOPHIA ANTIPOLIS, France, ⁴Dipartimento di Scienze della Terra, SAPIENZA, University, Roma, Italy, ⁵Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (OGS), Trieste, Italy, ⁶Dipartimento di Scienze della Terra, dell'Ambiente e della Vita (DISTAV), University of GENOVA, Genova, Italy, ⁷UMR 6538, Geo-Ocean, University of Brest, 29280 PLOUZANE, France, ⁸UMR 7193, Institut des Sciences de la Terre de Paris (ISTeP), SORBONNE University, 75005 Paris, France, ⁹UMR 8187, Laboratoire d'Océanologie et de Géosciences (LOG), University of Lille, 59491 Villeneuve-d'Ascq, France

1D: Controls on sedimentation at submarine active margins (1), Rongomātāne A (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

The southern Calabrian margin could be considered as the wedge-top of the Ionian subduction wedge. Indeed, it constitutes the northernmost and highest portion of the fold and thrust belt and is located to the south-west of the Croton-Spartivento forearc basin (Minelli et Faccenna, 2010; Gallais et al., 2012).

In that context, the FIT (from Fiumare to Ionian Turbidites) oceanographic campaign succeeded to acquire new high-resolution geophysical data in a country where air-gun acquisitions are banned for environmental consideration. To do so, the acoustic source deployed in this study was a 2 kJ sparker source, coupled with a fish-bone planar multi-tip electrode optimized for a wide range of energies (160 to 3000 Joules). Acoustic waves were picked up by a 24 channels analog streamer with a group spacing of 12.5m and a hydro spacing of 0.5m. That unusual configuration of the acquisition chain gave exceptional results with 5-10 m of resolution obtained for 300-350 m of penetration down to around 2200 m of water depth, which is far beyond the classic bathymetric limits of the sparker.

The quality of the profiles outlines the complexity of this abrupt margin with two main different geological domains affected by 3 different structural directions. The style and timing of the deformation, as well as the respective kinematics along the structures, have strongly controlled the deep-water sediment routing-systems through time and are also responsible for the distribution in time and space of diverse depot-centers. The results help to decrypt the tectono-stratigraphic processes at a key location between the compressive structures of the Ionian prism to the south, normal faults and tilted blocks of the emerging Calabrian arc to the North (e.g. Rohais et al., 2021) and the transform faults of the Sicilian-Messina canyon sector to the west (Polonia et al., 2011; Gutscher et al., 2017).

Plastic Waste in Coastal Landfills, From Characterization and Quantification Methods to Transport and Fragmentation in the Environment

Victor Lieunard^{1,2,3}, **Dr Julien Bailleul**¹, Dr Sébastien Rohais², Hélène Roussel³, Benjamin Rabaud⁴

¹U2R 7511, Basins-Reservoirs-Resources (B2R), Geosciences Department, UniLaSalle - University of Picardie Jules Verne, 60026 Beauvais, France, ²IFP Energies Nouvelles, 92500 Rueil-Malmaison, France, ³ADEME, 49000 Angers, France, ⁴SUEZ, CIRSEE, 78230 Le Pecq, France

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Rising sea levels and more frequent storms are accelerating erosion in coastal areas, which are home to many historic landfill sites. One of the most concrete examples in France is the Dollemard landfill site in Le Havre. The cliffs there are highly exposed, favoring the remobilization of sedimentary series, particularly by gravity, as well as the release of waste from the landfill. Such landfills can be found all over the world, and many have been identified in Europe. Plastics and microplastics (MP) are some of the most common types of waste found in landfills and are not yet closely monitored in this environmental compartment. Indeed, while much research focuses on the transport of plastics and their presence in marine environments, few consider nearshore landfills as a source of plastics and MP. Moreover, the similarity of sediment and plastic transport processes has been little studied. The same applies to the erosion of coastal cliffs and the fragmentation of plastics into MP. To this end, plastic sampling and MP analysis protocols need to be developed to measure plastic impregnation in landfills and their diffusion. Thus, by linking the mapping of plastic pollution from coastal landfills to the mechanisms of erosion and sediment transport, the processes involved in the export and formation of MP could be better understood. In addition, this step could help to better determine the origin of some plastic waste found at beachfronts. Finally, an approach combining field surveys, laboratory analysis and the modeling of gravity and erosion processes is crucial for the understanding of the source of plastics and pathways from coastal landfills to the environment. The initial outcomes of this integrated approach are illustrated here through the case study of the Dollemard landfill (France).

Late Pliocene/Pleistocene Alluvial Dynamics in the Southern Pannonian Basin: Sedimentological and Provenance Insights

Dr. Adriano Banak¹, Dr. Danijel Ivanišević¹, Dr. Krešimir Petrinjak¹, Dr. Anita Grizelj¹, Dr. Jasmina Martinčević Lazar¹, Dr. Borna Lužar Oberiter², Dr. Vlatko Gulam¹

¹Croatian Geological Survey, Zagreb, Croatia, ²Faculty of Science, Department of Geology, Zagreb, Croatia

5D: The continental sedimentary successions and their ability in understanding the present and forecasting the future of the Earth's surface (2), Rongomātāne A (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

The southern margin of the Pannonian Basin in Croatia serves as an archive of past alluvial activity, preserving a detailed record of sedimentary processes and paleoenvironmental conditions during the Late Pliocene and Pleistocene. This region, shaped by complex interactions between tectonic uplift, climatic fluctuations, and fluvial dynamics, offers valuable insights into the evolution of alluvial systems in Central Europe.

Analysis of four profiles (Cabuna-1, 2, 3, and Bistrica) within sand and gravel quarries reveals a variable depositional environment. The lower horizons of profiles consist of poorly to very poorly sorted gravels and coarse grained sands – characteristic of alluvial fan deposition in a glaciofluvial to fluvial setting. Middle and upper horizons display fine to medium sized, moderately to poorly sorted sands with gravel lenses and channels. The strongly fine skewed sediment throughout the profiles suggests periods of relatively low-energy sedimentation, contrasting with the high-energy deposition of coarse gravel sheets. Fining upwards, which is clearly seen in the Cabuna-1 profile indicates a decrease in flow energy over time. A shift from alluvial fan deposition to braided river sedimentation reflects declining tectonic activity and a transition toward a more stable, moderately humid climate.

Provenance analysis indicates a tectonically active hinterland, with gravel and sands derived primarily from mechanical weathering. Garnet is dominant in heavy mineral assemblage (on average 50%), while epidote and zoisite/clinozoisite are less frequent. The ratio between epidote and zoisite/clinozoisite is constantly in favour of epidote. Amphiboles whose percentage increases upwards indicate proximal source for the sediment. The scarcity of granitic and gneissic material, along with the presence of well-rounded quartz clasts, points to multiple phases of sediment reworking. Heavy mineral assemblages—particularly the high garnet content in sandy facies—implicate the Alpine-derived Paleo-Drava River as a key contributor to the middle and upper outcrop sequences.

Potential Rare Earth Elements (REE) Deposits in Plio-Quaternary Sediments Located at the Southern Edge of Pannonian Basin

Dr Adriano Banak¹, Dr Danijel Ivanišević¹, Dr Anita Grizelj¹, Dr Jasmina Martinčević Lazar¹, Dr Krešimir Petrinjak¹, Dr Vlatko Gulam¹

¹Croatian Geological Survey, Zagreb, Croatia

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Täkina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The study of Pliocene and Quaternary sediments is important for reconstructing paleoenvironmental changes in the Northern Croatian Basin (NCB) which is the southern part of the Pannonian Basin System (PBS). Novigrad Podravski (NP) gravel pit is located along the Drava river at the foothills of the Bilogora Mountain. NP received sediment transported by the Drava from the Southern Alps. Due to the erosion of the Alps and Carpathians, Upper Miocene to Quaternary deposits accumulated in a brackish lake environment and, later, in a fluvial system. Local input of sediment from nearby mountains is also present. Profile is still not dated but facies within and regional stratigraphy suggest Plio-Quaternary age.

As part of this research, the rare earth element (REE) composition was analysed in the clay/silt fraction in 12 samples from NP. This locality displayed REE in high concentrations. REE are valuable geochemical markers due to their chemical stability and resistance to fractionation during sedimentary processes. The aim of this study is to identify individual REE's or groups of REE's that could aid in provenance interpretation of the sediment profile. Higher values of Niobium, Yttrium, Neodymium, Praseodymium, Dysprosium and Gadolinium are observed in NP. The values are particularly high in the lower part of the profile where gravelly sediment dominates. Given the PBS's geology, the REE-Nb-Y-rich sediments likely derive from Variscan/Alpine granitoids & metamorphics which were eroded and deposited in PBS. These clastic sediments rich with heavy minerals were then reworked and deposited by paleo Danube & Drava rivers. Geochemistry matches within-plate (rift-related) magmatism which is expected since the PBS was formed due to Miocene back-arc extension behind the Carpathian arc.

The cluster of samples from NP should be examined further in more detail to distinguish between local input from the Bilogora Mountain and distal input from the Alps.

Seasonal, Annual, and Decadal Changes in Morphology and Sedimentation of a Channelized, Open-Coast Macrotidal Flat

Ms Seolhui Bang¹, Dr. Joohee Jo², Dr. Dohyeong Kim³, Ms Seungyeon Sohn¹, Prof. Kyungsik Choi¹

¹Seoul National University, Seoul, South Korea, ²Research Institute of Oceanography, Seoul National University, Seoul, South Korea, ³Korea Environment Institute, Sejong, South Korea

5C: Coastal to shelf environments across time and space (5), Tāwhirimātea E (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

Unlike typical open-coast tidal flats, where morphology and sedimentology primarily respond to seasonal wave intensity, the channelized, open-coast tidal flats located in the southern part of Ganghwa Island, on the west coast of South Korea, display complex spatiotemporal variability. This study examines the factors that control such variability by analyzing seasonal, annual, and decadal changes in morphology and surface sediment distribution. Seasonally, surface sediments exhibit a distinct pattern, with coarser-grained sediments accumulating in response to prevailing wind directions: southerly to southwesterly in summer and northerly to northwesterly in winter. Interestingly, despite the intensified wave activity during winter, local mud flats expand, attributed to biofilm stabilization. Additionally, mud deposition occurs on the flanks of tidal channels in the lower intertidal zone, where supercritical ebb flows produce turbid plumes. In summer, frequent heavy rainfall enhances surface runoff, promoting ebb-dominant flow conditions that facilitate channel migration. On an annual scale, surface sediments tend to coarsen, likely reflecting increased storm activity potentially linked to sea-level rise. This coarsening trend is further supported by decadal observations, which also reveal increasing surface roughness of the tidal flats due to the expansion of oyster reefs, especially in the middle intertidal zone. The growing presence of oyster reefs not only alters bed roughness but also mud retention, thereby increasing the spatial heterogeneity of surface sediment distribution. Over the past decade, significant channel morphodynamics highlight the pivotal role of tidal currents and rainfall-driven runoff in shaping the morphology of these flats. Meanwhile, wave action and biological activity contribute to the complexity of sedimentary facies, particularly in the middle to lower intertidal zone, necessitating a revised facies model for the channelized, open-coast tidal flats.

Fault-Conduit Control on TSR-Derived H₂S Enrichment in Lacustrine Carbonates (Upper Es₄), Chezhen Sag, Bohai Bay Basin

Mr. Changjia Bao^{1,2}, Prof Chengyan Lin^{1,2}, Prof Chunmei Dong^{1,2}, Prof Pengjie Ma³, Mr Dai Han^{1,2}

¹School of Geosciences, China University of Petroleum (east China), Qingdao, China, ²National Key Laboratory of Deep Oil and Gas, China University of Petroleum (East China), Qingdao, China, ³Sanya Offshore Oil & Gas Research Institute, Northeast Petroleum University, Sanya, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Chezhen Sag, central Bohai Bay Basin, is a half-graben with a steep northern border fault and a gentle southern ramp. This study examines the upper sub-member of the fourth Member of the Shahejie Formation (Es₄U), the main petroleum interval, which consists of grain-rich dolomitic limestones interbedded with gypsum deposited in lacustrine shoal–evaporite settings. Northwest-striking step faults F8 and F501 exert first-order control on fluid migration and trap configuration. Production data document sour gas with H₂S concentrations up to 7.5×10^4 mg m⁻³, commonly accompanied by CO₂.

Integrated petrographic, geochemical and seismic analyses were carried out to constrain the genesis of these H₂S-bearing reservoirs in the framework of tectonic evolution and burial–thermal history. Gypsum records $\delta^{34}\text{S}$ values of 27–31 ‰, whereas associated crude oil and solid bitumen yield 21–24 ‰ and 18–23 ‰, respectively. Isotopic fractionations < 8 ‰, together with S/C ratios > 0.03, indicate an open-system thermochemical sulfate reduction (TSR) driven by gypsum dissolution. Es₄U carbonates are buried at 3.3–3.7 km; with a mean geothermal gradient of 35 °C km⁻¹, reservoir temperatures of 120–140 °C fall within the favourable TSR window. Statistical evaluation shows that H₂S content rises sharply where gypsum thickness exceeds 10 m and the reservoir lies within ≤ 800 m of an active fault.

We propose a “deep TSR sulfur supply – fault conduit – proximal carbonate storage” model: H₂S generated by TSR in the deep evaporites is channelled upward by post-Guantao reactivated faults into porous grain-shoal carbonates, producing localized high-sulfur accumulations. The up-thrown blocks adjacent to faults F8 and F501 are therefore identified as the main high-risk fairways. The model provides a predictive framework for risk assessment and safe development of sulfur-rich carbonate reservoirs in the Bohai Bay Basin.

Terrestrial Hot Springs as Analogues for Early Earth and Mars: Insights from Modern and Fossil Hydrothermal Systems

PhD Federica Barilaro^{1,2}, PhD Andrea Di Capua^{1,2}

¹Unical, Cosenza, Italy, ²CNR-IGAG, Milan, Italy

6B: Microbial architects of carbonates: Insights from modern to deep-time systems, Tāwhirimātea C (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

The identification of ideal sites that meet the combined criteria of high habitability and strong biosignature preservation potential is crucial for reconstructing early Earth's history and carries profound implications for astrobiology. In this context, terrestrial hot spring systems are emerging as key environments and potential cradles of life. These settings are well known for hosting microbial mats and biofilms with diverse morphologies and pigmentation, sustained by highly abundant and diverse microbial communities. Typically powered by magmatic heat and located in volcanic regions, hot spring systems also represent underexplored archives of explosive volcanic activity. Their dynamic physicochemical gradients foster complex interactions among geological, geochemical, and biological processes that co-evolve over time. This contribution presents a multidisciplinary, multiscale investigation of both fossil and active hot spring systems from various European localities. The comparative research integrates sedimentological, petrographic, mineralogical, geochemical, and geomicrobiological approaches, alongside high-resolution analytical techniques, to elucidate the role of microbial activity in the formation, transformation, and preservation of minerals in hydrothermal contexts. In particular, the study highlights how indigenous microbial communities in hydrothermal waters, comprising archaea, bacteria, eukaryotes and viruses, influence the nucleation and textures of authigenic minerals, as well as the alteration and transformation of volcanic deposits embedded within travertines. These processes contribute significantly to enhancing the preservation potential of biosignatures. The findings demonstrate that terrestrial hot spring systems serve as natural repositories of biological traces, offering critical insights into early Earth's microbial processes and bearing important implications for the exploration of analogous environments on Mars.

Fossil Hot Spring Systems in Preserving Explosive Pyroclastic Deposits: Evidence from Southern Tuscany

PhD Federica Barilaro^{1,2}, Dr Andrea Di Capua^{2,1}, Prof Paola Donato¹

¹Unical, Cosenza, Italy, ²CNR-IGAG, Milan, Italy

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Explosive volcanic activity has significantly influenced Earth's geological history, producing distinctive volcanoclastic deposits. Although pyroclastic deposits have been extensively studied in marine and lacustrine environments, terrestrial hot spring systems remain underexplored as archives of explosive volcanism. Identifying primary volcanoclastic units is essential for reconstructing volcanic events and evaluating their environmental impact; however, preservation challenges and post-depositional alteration often hinder their recognition. This study investigates primary volcanoclastic deposits derived from pyroclastic density currents and fallout within a fossil hot spring system in southern Tuscany, Italy. It provides the first comprehensive analysis of their accumulation, post-depositional alteration, and preservation potential in such settings. Petrographic and high-resolution electron microscopy reveal extensive alteration of pyroclastic textures and the formation of secondary (bio)minerals. Our findings show that post-depositional processes led to moderate to complete obliteration of key pyroclastic features, including accretionary lapilli, glassy matrix, phenocrysts, pumices, and flame structures, and resulted in the formation of secondary clay minerals (e.g., kaolinite, halloysite, nontronite, montmorillonite, illite/muscovite), as well as minor calcite, iron oxides, and pyrite. Notably, evidence of biomediated weathering and mineral formation is documented, alongside mineralised biological entities such as bacteria, fungi, putative viruses, and remnants of extracellular polymeric substances. This research provides novel insights into the behaviour and preservation of volcanoclastic materials in continental hydrothermal systems. It also carries broader implications for the comprehension of Earth history and the evaluation of past and present habitability of Mars and other planets.

Palaeosols and Channel Deposits Reveal Increasing Humidity Prior to the Paleocene-Eocene Thermal Maximum (Tremp-Graus Basin, Spanish Pyrenees)

PhD Giorgio Basilici¹, Professor Juraj Janočko², Doctor Paolo Lorenzoni³, MS Student Taisa Rebuá Barroso¹, Doctor Marília Prado Freire¹, Doctor Dailto Silva¹, Doctor Áquila Ferreira Mesquita¹, Professor Selma Simões De Castro¹, Associate Professor Luca Colombera⁴, Professor Alexandre Ribeiro Cardoso⁵, Professor Carlos Roberto de Souza Filho¹, Professor Nigel Philip Mountney⁶, Doctor Raphael Bianchi Hunger

¹Instituto de Geociências - Unicamp, Campinas, Brazil, ²Institute of Geosciences, Faculty BERG, Technical University of Kosice, Košice, Slovakia, ³Professional consultant, Rieti, Italy, ⁴Università di Pavia, Pavia, Italy, ⁵Universidade Federal do Vale do Jequitinhonha e Mucuri, Diamantina, Brazil,

⁶University of Leeds, Leeds, United Kingdom

4D: The continental sedimentary successions and their ability in understanding the present and forecasting the future of the Earth's surface (1), Rongomātāne A (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

Clear criteria for determining whether river channel morphology and associated deposits vary as a direct or indirect function of climate factors are currently lacking. One effective approach to address this issue is the concomitant analysis of coeval floodplain palaeosols.

In the Esplugafreda and Claret Formations, an alluvial plain sedimentary succession that records abrupt climate change across the Paleo-Eocene transition, we compared reconstructed palaeo-river hydrodynamics with the genetic characteristics of interchannel palaeosols. The aim was to discriminate the climatic influence on fluvial dynamics and pedogenesis.

Within a 150 m-thick vertical succession, we identified three Vertisols pedotypes and three coeval channel-deposit types. From the base to the top of the succession, the palaeosols show: (i) a transition from reddish-brown (Bss) horizons to greenish-grey (Bssg) horizons; (ii) increasing of goethite substituting haematite; (iii) progressive disappearance of Bssk horizons; and (iv) greater abundance and dimension of slickenside fractures. From the base to the top of the succession, the channel-fill deposits exhibit: (i) a fining-upward trend from conglomerate to medium-grained sand; (ii) decreasing thickness and frequency of palaeopedogenised sandy mudstone interlayers, culminating in their disappearance; and (iii) a shift of conglomerate indicative of hyperconcentrated flows and sandstone associated to upper flow regime, to lower flow regime deposits organised in lateral accretion surfaces.

While Vertisols typically indicate strong seasonality with alternating dry and wet periods, their upward variations reflect a progressive increase in soil moisture. At the same time, the channel deposits suggest a hydrodynamic transition from intermittent (seasonal or longer) to more uniform, perennial flow conditions. Together, palaeosols and channel deposits record a gradual increase in both the amount and regularity of precipitation prior to the Paleocene-Eocene climate crisis.

Fitted Clast Textures in Fan Delta Mouth Bar Settings: Cretaceous Paparoa Formation, Greymouth Basin, New Zealand

Dr Kari Bassett¹

¹University of Canterbury, Christchurch, New Zealand

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Intricately jigsaw-fitted clasts can be seen in the Cretaceous-Paleocene conglomerates of the Paparoa Formation in the Greymouth Basin. The ~600 m thick section contains clast supported cobble to boulder conglomerates with sandstone lenses and soft sediment deformation. Locally, lenses of pebble-cobble conglomerates are clast supported with little to no matrix present. Clasts show jigsaw-like fitted edges with sharp contacts and angular indentations on clast interfaces. The clasts are composed of Greenland Group metasandstones and siltstones with vein quartz and granite present in minor amounts. The metasedimentary clasts are fitted tightly together regardless of the relative hardness of argillite vs metasandstone with examples of either lithology indenting the other. The fitted clasts occur in lenses approximately 5-7 m wide and 1-2 m thick. The thick section of conglomerates contains abundant soft sediment deformation including load casts and convolute bedding indicating a subaqueous environment alternating with subaerial braided river deposits. The interpreted depositional setting for the intricately fitted clasts is one of a channel mouth bar in a fan delta into a deep fault-controlled lake.

Intricately fitted beach boulders have been described for modern rocky shore platforms on a promontory with large waves. The interpreted process of forming tightly fitted clasts relies on in-situ abrasion from wave impacts on the cliffs causing jostling of the clasts until the intricately fitted contacts form. Much older studies of in situ abrasion in fluvial environments suggests the role of microvibrations from clast collisions and winnowing of fines in gravelly fluvial environments. The context of the intricately fitted clasts in the Paparoa Formation conglomerates in the delta mouth bar channels from high energy, steep alluvial fans into low energy lacustrine environments suggests that microvibrations and winnowing by currents may both be necessary.

Legacy of a Shipwreck: Sedimentary and Hydrodynamic Imprints of the Scotsman on the St. Lawrence Estuary Shelf (Québec, Canada)

Mr Quentin Beauvais¹, Pr Guillaume St-Onge¹, Pr Dany Dumont¹

¹ISMER-UQAR, Rimouski, Canada

2C: Coastal to shelf environments across time and space (2), Tāwhirimātea E (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

On November 20th, 1846, the merchant ship Scotsman sank in the St. Lawrence Estuary, eastern Canada, after striking a reef during a storm. The wreck now rests at a depth of 25 meters on the continental shelf and has been altering the surrounding sedimentary environment for more than 175 years. It provides a unique case study to evaluate the long-term impacts of historic maritime wreck through time and space. To investigate the evolution of these processes, a multi-scale approach was employed, combining high-resolution geophysical surveys with sediment core analysis collected along the wreck.

Multibeam bathymetric surveys (2013 and 2019) using a Teledyne Reson Seabat 7125 and a R2Sonic 2026 reveal significant sedimentary variability around the wreck of the Scotsman. These data were crucial in identifying a distinct scouring pattern, marked by active zones of seafloor erosion and sediment accumulation. This pattern reflects the interaction between prevailing marine currents and the physical structure of the wreck, which locally modifies hydrodynamics and sediment transport.

Sediment cores collected along the wreck show a consistent composition of fine sands and coarse silts, typical of the regional sediment supply. Grain size and geochemical analyses reveal the presence of a distinct layer characterized by normal grading and specific variations in elemental ratios. We interpret these observations as a resuspension and redeposition process, likely triggered by the arrival and impact of the wreck on the seafloor. This interpretation is supported by ²¹⁰Pb dating, suggesting a strong correlation between this distinct layer and the documented sinking of the Scotsman.

Our study highlights the benefit of integrating geological, geophysical, and oceanographic data to offer new insights into sedimentary processes on the estuarine shelf at a shipwreck site. It also sheds light on the long-term degradation of shipwrecks on the seabed and their influence on sediment dynamics in coastal settings.

How Would This Outcrop Look in the Subsurface? A Synthetic Well Log Approach

Mr Guillermo Bello¹, Mr John Howell¹, Mr Adrian Hartley¹, Ms Nicole Naumann¹, Ms Jessica Pugsley¹, Mr Kachalla Aliyuda¹

¹University of Aberdeen, Aberdeen, United Kingdom

5A: Can Forward Stratigraphic Modeling enhance geological understanding of the subsurface and predict sedimentation through time and space? (2), Tāwhirimātea A (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

Depositional facies are the fundamental control on petrophysical properties within subsurface reservoirs, aquifers and repositories. Outcrop analogues provide dimensional information on architectural elements and their constituent facies and are routinely used to forecast the distribution of those properties in subsurface systems. Outcrop observations are typically different to those made in subsurface datasets, especially in well logs. Selecting appropriate analogues and matching them to subsurface reservoirs remains a challenge. Behind outcrop boreholes are one way to bridge the gap between the outcrop and the subsurface but these are typically expensive and rarely collected. Creating synthetic well logs from the outcrop is a lower cost solution which can potentially generate large volumes of data.

This study uses a novel empirical approach to generating synthetic well logs from interpreted outcrop architecture. The challenge is addressed by building a relational database of petrophysical responses for key architectural elements in a series of cored wells. Using publicly available data from the UK and Norwegian sectors of the North Sea, the database is populated with gamma ray, deep resistivity, sonic and density-neutron measurements. It provides a comprehensive record of petrophysical log responses corresponding to the architectural element's classification defined within the SAFARI data standards. This dataset supports the development of an innovative automated methodology that integrates geodata-science and geostatistics to generate subsurface-based synthetic well logs across multiple clastic outcrop environments. The resulting synthetic well logs have been validated through direct comparison with drilled wells located behind outcrops. These comparisons demonstrate a high degree of similarity, confirming the feasibility of performing realistic petrophysical scenarios on outcrop cross-section panels. This approach further strengthens the connection between subsurface reservoirs and their analogue outcrops.

The Irish Continental Margin: New Perspectives on the Interplay of Alongslope and Downslope Depositional and Erosional Processes

Professor Sara Benetti¹, Ms Rebecca Davage¹

¹Ulster University, Coleraine, United Kingdom

6F: Contourites and Mixed Depositional Systems (2), Rongomātāne C (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

The Irish continental margin sits within the glacially influenced portion of the NE Atlantic continental margin (Weaver et al. 2000). The interplay of alongslope and downslope sedimentary processes has long been recognized as key to understanding the shaping of this margin in the long term (e.g. Stoker, 1998; Elliott et al. 2006; Georgiopoulou et al. 2021). While some parts of this margin (both geographically and within the stratigraphic record) show extensive contouritic deposition (e.g. Feni drift), others have been inferred to have been predominantly shaped by downslope processes in the Late Quaternary (Sacchetti et al. 2012; Verweirder et al. 2021). Bathymetric, sedimentological and sub-bottom data however seem to show a predominance of contouritic deposits along this margin, on both sides of the Rockall Trough and at varied water depths. This region is known to be the pathway for the exchange of water masses in the North Atlantic (New & Smythe-Wright, 2001), but limited data exists to date on their actual distribution and velocity. We propose that the current seafloor geomorphology and sediments can help to refine the oceanographic models for this region with implications for our understanding of the broader North Atlantic circulation patterns and we present the first view of the Irish margin as a predominantly contouritic margin at different temporal and spatial scales.

Cenozoic Sea-Level Influence on the Sedimentation of the Western Margin of Southern Africa

Dr Eugene Bergh^{1,2}, Mr Daniël Louw¹, Mr Pieter Louw¹, Dr Petrus le Roux², Prof. John Compton²

¹North-West University, Potchefstroom, South Africa, ²University of Cape Town, Rondebosch, South Africa

7E: Deciphering climate and environmental records in shallow marine environments across space and time (1), Rongomātāne B (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

An extensive ~7800 million tonnes of phosphorite-rich sediments, with a mean P₂O₅ grade of 19 wt%, span the broad western continental shelf of southern Africa. These deposits, dated from the Miocene to Quaternary, record a rich palaeoenvironmental history of biogenic and phosphorite-rich sediments, allowing for studies to decipher the interplay between climate and marine environments, and its influence on the regional sedimentary geology of the area. A total of 21 cores from the Namibian shelf and four cores from the western South African shelf (water depths of 199 m to 305 m) were studied to document the palaeoenvironmental evolution of this margin. Through sediment core analysis, X-ray fluorescence and foraminiferal palaeoenvironmental analyses, five main stages of sea-level influence on the shelf were identified. Two cores from the study region revealed basal Cretaceous terrestrial influence through woody material and increased quartz content, followed by a major hiatus, where Cretaceous sediments are overlain by Miocene deposits. Sea-level rise from the early Miocene (Aquitania-Burdigalian) to middle Miocene (Langhian) resulted in a deeper marine, more subtropical environment. Several hiatuses from the late Miocene to Pliocene followed Miocene deposition. Increasing sea-level fluctuations in the Pleistocene led to enrichment and cyclicity in phosphorite formation on the shelf as the climate shifted between glacial and interglacial cycles as well as overall cooling upwelled marine conditions. Sea-level lowstands marked estuarine and lagoonal influences on the study area, evidenced by high abundances of the foraminifera species *Ammonia batava* and *Elphidium advenum*, while sea-level highstands are evidenced by deeper taxa such as *Cassidulina laevigata* and *Uvigerina* spp. Increasing amplitude and frequencies of sea-level fluctuations along this shelf are therefore interpreted to have played a major role in concentrating the P₂O₅ content in the sediments, the occurrence of widescale erosional hiatuses, compaction of the sedimentary sequences and changing biotic responses.

Honest Crusts? Interrogating Two Enigmatic Boundaries in the Lower Cambrian Arrowie and Stansbury Basins, South Australia

Dr Marissa Betts¹, Clara Wong², Ms Stephanie Richter Stretton¹, Eury Speir², Mr Jack Castle-Jones³, Ms Suwijai Jatupohnkhongchai¹, Ms Rose Gates¹, Professor John Paterson¹, Professor Glenn Brock³, Dr Sarah Jacquet²

¹University of New England, Armidale, ARMIDALE, Australia, ²University of Missouri, Columbia, USA,

³Macquarie University, Sydney, Australia

7B: Carbonate depositional systems from platform, slope to basin (1), Tāwhirimātea C (Level 2),
January 29, 2026, 10:15 AM - 11:45 AM

The Red Crust (RC) is an iron- and manganese-rich deposit that caps the Flinders Unconformity (FU)—a time gap in the lower Cambrian succession in the carbonate-dominated Hawker Group in the Flinders Ranges, South Australia. A similar crust is developed in the lower Cambrian carbonate succession in the western Stansbury Basin to the south. Both are distinctive, with abundant *Frutellites* microstromatolites, rare *Gravestockia* spongiomorphs and diverse shelly fossils entrained within them. Hence, they have been used as important intra- and inter-basinal sequence boundaries defining the transition between regional Sequence Sets 1.1 and 1.2. Formation of the RC in relation to the FU is spatially complex, manifesting in predominantly shallow proximal shelf environments following platform drowning. Additionally, while shelly fossil biostratigraphy (in concert with carbon isotope chemostratigraphy and CA-TIMS volcanic dates) has established that the RC/FU across the Arrowie Basin occurs at relatively consistent stratigraphic levels, diachronism is likely to be an inherent characteristic. In addition, whether the RC is truly synchronous with the crust in the neighbouring Stansbury Basin remains unresolved. The successions in the Arrowie and Stansbury basins are thick (~5 km), well preserved and contain abundant fossils that reveal rich and diverse lower Cambrian ecosystems associated with carbonate lagoons, archaeocyath-microbialite bioherms, ramps and distal shelf deposits. The Red Crusts in both basins correspond with base-level shifts in sedimentological regime and provenance and associated faunal changes. They may also foreshadow regional volcanism in an evolving tectonic context. Key questions remain: How has diachronism affected development, and how do the surfaces manifest in shallow versus deep-water settings? This talk will synthesise lithostratigraphic, chemostratigraphic and biostratigraphic data, carbonate microfacies investigations and geochemical studies (stable isotopes, REY element data) that are re-shaping our understanding of the Red Crusts—key surfaces central to refining tectono-sedimentary, palaeoenvironmental and chronostratigraphic models for the lower Cambrian successions of South Australia.

Sedimentological–Ichnological Analysis of a Transgressive Estuary to Regressive Delta Transition in Middle Permian Barren Measures Formation, West Bokaro Basin, India

Mr Arnab Bhattacharya¹, Dr. Biplab Bhattacharya¹

¹Indian Institute of Technology, Roorkee, Roorkee, India

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Deltas and estuaries, as components of tidal brackish-water system, represent dynamic transitional environments between terrestrial and marine settings, characterized by selective colonization of diminutive infaunal tracemakers that respond to a variable range of physico-chemical conditions. In the Middle Permian Barren Measures Formation of the West Bokaro Basin, India, a sandstone–siltstone–shale succession records such fluvio-marine interactions, marking a transition from a tide-dominated estuary to a mixed-energy deltaic setting, as revealed through integrated sedimentological and ichnological analyses. Fifteen lithofacies are grouped into eight facies associations. The ichnoassemblage exhibits low diversity and small-sized ichnotaxa, comprising fourteen ichnogenera. The basal succession, representing inner estuarine meandering channels, is characterized by high fluvial discharge and limited bioturbation. Overlying carbonaceous shales, interpreted as central estuarine deposits, reflect a low-energy bedload convergence zone. A decrease in fluvial input and enhanced tidal and wave influence facilitated opportunistic colonization by suspension-feeding ichnotaxa, forming a depauperate *Skolithos* ichnofacies in subtidal bars and a mixed *Skolithos*–*Cruziana* ichnofacies in mouth bars, found in the overlying successions. The estuary–delta transition is represented by thick, low-oxygen carbonaceous shale interbedded with lenticular sandstone with *Cruziana* ichnofacies. Tidal sandflats in the distal delta front show energy fluctuations and preserve small-sized ichnotaxa of mixed *Skolithos*–*Cruziana* ichnofacies. Intertidal bars in the proximal delta front exhibit *Cruziana* ichnofacies on bar tops under waning hydrodynamic conditions. Braided channels in the subaqueous delta plain reflect colonization constrained by episodic high sediment discharge and frequent channel avulsions. The uppermost tidally influenced floodplain deposits record recurring colonization, resulting in softground *Cruziana* and firmground *Glossifungites* ichnofacies. The vertical and lateral distribution of marginal marine ichnofacies illustrates complex organism–substrate interactions governed by fluctuating energy conditions and sediment supply. This combined ichnological–sedimentological approach enables reconstruction of Middle Permian paleogeography across Gondwanaland, shaped by an initial transgressive followed by a regressive phase.

Miocene Sediment Transfer of the Río Negro System: A Source-to-sink Record from the Andes to the Argentine Continental Margin

Dr Andrés Bilmes¹, Prof Leandro D'Elia², Dr. José Cuitiño¹, Dr Manuel Lopez², Dr Rodrigo Feo², Prof Károly Németh^{3,4}, Dr. Emilio Rojas Vera⁵, Dr. Pedro Kress Frieling⁵, Dr. Juan Pablo Lovecchio⁵

¹Instituto Patagónico de Geología y Paleontología (CONICET), Puerto Madryn, Argentina, ²Centro de Investigaciones Geológicas, CONICET–Universidad Nacional de La Plata, La Plata, Argentina, ³National Program of Earthquakes and Volcanoes, Saudi Geological Survey, Jeddah, Saudi Arabia, ⁴Volcanic Risk Solutions, Massey University, Palmerston North, New Zealand, ⁵YPF S.A., Argentina

4E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (1), Rongomātāne B (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

During the Miocene, the primary configuration of the Atlantic-draining systems that currently cross Patagonia (Colorado, Negro and Chubut fluvial systems) was established. These systems record the dynamic evolution of the orogen, with extensive synorogenic deposits extending from the Andes to the distal Argentine Continental Shelf–Argentine Basin. Since the initial Atlantic-vergence configuration in the Late Cretaceous, the Miocene represents the period of major tectonic reconfiguration and highest sediment transfer rates from the Andes to distal depositional zones. Thus, the Andes-Argentine Basin system during the Miocene serves as a natural laboratory for studying sediment transfer and preservation (source-to-sink systems, S2S), enabling the development of conceptual and quantitative models to understand sediment distribution and accumulation mechanisms across the Andean foreland and Atlantic margin.

The Río Negro transfer system connects the Andes with the Argentine Sea, crossing the Patagonia over 700 km. Through high-resolution spatial and temporal analyses—including geological mapping, sedimentological-stratigraphic profiles, structural sections, digital outcrop modeling, subsurface data, magnetostratigraphy, and U/Pb geochronology—an allostratigraphic model of the Miocene record (21–5 Ma) was constructed, spanning the North Patagonian Andes to the continental margin. Results reveal two major continental-marine sediment cycles: an early volcanoclastic-dominated phase (21–15 Ma) and a later epiclastic-dominated phase (12–5 Ma), separated by a 3–5 Myr hiatus (longer distally). The resulting modeling integrates sediment pathways across more than 1000 km from the North Patagonian Andes to the continental margin, establishing the first high-resolution source-to-sink reconstruction of Miocene sediment dynamics across this critical paleogeographic domain. The comparison between cycles reveals how the Andean margin influenced different tectonic, volcanic, and climatic conditions, as well as relative sea-level changes, during its evolution.

The Early Cretaceous McMurray Sediment Routing System

Professor Mike Blum¹, Senior Researcher Abdullah Wahbi

¹University of Kansas, Lawrence, United States, ²Saudi Aramco, Dhahran, Saudi Arabia

2A: Next Generation Sediment Provenance (2), Tāwhirimātea A (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

The Early Cretaceous McMurray Formation occurs along the eastern margins of the Mesozoic foreland basin in Alberta. This presentation describes the McMurray's continental-scale sediment-routing system based on ~20,000 detrital zircon (DZ) U-Pb ages from Alberta, and from time-equivalent fluvial deposits in the Rocky Mountains and midcontinent regions of the United States.

McMurray deposits in Alberta display three distinct DZ U-Pb provenance signatures. The first dominates the axial south-to-north McMurray in the Cold Lake area, east-central Alberta, and is dominated by Paleozoic and Meso-Proterozoic age groups that represent the Appalachian Cordillera, with a minor contribution from the Mesozoic Western Cordillera magmatic arc as well. The second is present in the Ft. McMurray area, 300 km farther north, and is dominated by Paleo-Proterozoic and Archean age groups from the Canadian shield. The third defines a tributary-trunk stream relationship, also in the Ft. McMurray area, and consists of a ~50-50 mix of south-derived and east-derived populations.

South-derived McMurray DZ U-Pb age distributions from Cold Lake are statistically indistinct from age-equivalent fluvial sandstones in SW Kansas and Western South Dakota in the southcentral and northcentral US, respectively, which indicates a fluvial system that can be traced over a total north-to-south distance of ~3000 km. This axial system represents a mix of sediments derived from the Appalachian Cordillera of the southeast US, and from the Mesozoic Western Cordillera.

We conclude that the Early Cretaceous McMurray Formation represents a continental-scale system with a catchment of ~5,000,000 km² and headwaters that extended from the southwest to southeast US, and north to the Canadian shield.

Fingerprints of Tectonics and Climate Change in Sandy Turbidites of the Deep-Sea Bengal Fan

Professor Mike Blum¹, PhD Student Xiaolin Han, PhD student Zuana Alam

¹University of Kansas, Lawrence, United States

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Himalayan-sourced Ganges-Brahmaputra (GB) river system and the deep-sea Bengal Fan represent Earth's largest source-to-sink sediment-dispersal system, and a globally significant CO₂ sink. IODP Expedition 354 (2015) drilled a 7-site transect in the Bengal Fan, ~1400 km south of the shelf margin, to understand the impacts of tectonics and climate on fan deposition. Our work has developed a detrital-zircon (DZ) U-Pb record of sediment routing from IODP 354 cores and modern river samples.

Bengal Fan turbidites record the strong tectonic and climatic forcing associated with the GB system in a number of ways. First, India's NNE motion relative to Asia places IODP 354 drill sites ~800 km and ~400 km farther south from the GB delta at 20 Ma and 10 Ma, relative to where they are today. Prior to ca. 18 Ma, these locations were too far from the GB shelf to accumulate siliciclastics, whereas from ca. 18 to 10 Ma these locations accumulated muddy turbidites, but remained too far away for significant sand-sized turbidite deposition, and after ca. 10 Ma core locations were close enough to the shelf for thick sand-rich turbidites to become the dominant type of deposit. Second, after ~4000 km of fluvial and turbiditic sediment transport, the DZ U-Pb record faithfully represents Himalayan and Tibetan source terrains, especially the <300 Ma ages from Tibetan magmatic arc(s), which are present by the Early Miocene, and increase in significance over time. Third, sand-rich turbidites display different proportions of DZ U-Pb age groups than modern river sands, especially after the Plio-Pleistocene transition when Northern Hemisphere glaciation began. We speculate these differences reflect pre-glacial vs. glacial period sediment production: Miocene and early Pliocene periods were dominated by monsoon rains and production of sediment from lower elevations, whereas Plio-Pleistocene glacial periods are instead dominated by higher-elevation cold-climate and glacial processes.

Ichnoliths: Mineral Matter Accumulation, Precipitation, or Replacement Associated with Animal Traces

Assoc. Prof. Maciej Bojanowski¹, Prof. Andreas Wetzel

¹Institute of Geological Sciences, Polish Academy of Sciences, Warsaw, Poland

10A: Ichnology and sedimentary basin research (2), Tāwhirimātea A (Level 2), January 30, 2026,
11:00 AM - 12:30 PM

Animal-made bioturbational structures modify physio-chemical conditions and biota on the sediment surface and below. These changes are chiefly controlled by the behavior of the burrowers, especially in case of deep-in-sediment irrigation, mucus lining, organic matter storage, microbial gardening etc. Such traces represent preferential loci for accumulation of organic material and possible syn- to post-bioturbational mineral authigenesis. Similar processes occurring in association with roots of higher plants have already been described and termed. Among the terms related to products of root bioturbation, in particular, the term "rhizolith" (accumulation and/or cementation around, cementation within, or replacement of mineral precipitates around roots) can also be applied to animal traces then to be called ichnolith.

In this context, the focus is on early-diagenetic concretions that have grown preferentially around animal traces, which are referred to as "ichncretions". Such early cementation close to the sediment surface produces a rigid, compaction-resistant concretionary framework that prevents mechanical and chemical destruction of primary biotic and sedimentary features. Therefore, ichncretions represent potential containers of environmental data enabling more reliable and detailed reconstruction of the depositional settings and ecological conditions compared to the surrounding, not cemented sediment. In particular, concretionary carbonate cements are important archives of past biogeochemical reactions and composition of fluids circulating shallow in sediment during or shortly after bioturbation. For illustration, results of several case studies are presented, which are based on comprehensive and interdisciplinary research on carbonate ichncretions through ichnological, mineralogical, petrographic, and geochemical investigations, which allowed recognition of the interplay between benthic activity, environmental parameters, fluid circulation, biogeochemical processes, and carbonate precipitation in marine basins. Very likely, other types of ichncretions represent yet unexplored archives and can provide important paleoenvironmental data if analyzed with a suitable set of methods.

This work was funded by the National Science Centre grant 2024/53/B/ST10/03806.

Tracking Long-Term Ecological Dynamics and Late Holocene Anthropogenic Signals in Varved Sediments of Lake Lehmilampi, Eastern Finland

Dr Alicja Bonk¹, Aleksandra Orłowska¹, Dr Iwona Bubak¹, Dr Maarit Kalliokoski², Prof. Piotr Kołaczek³, Dr Saija Saarni², Prof. Wojciech Tylmann¹, Dr Marta Wojewódka-Przybył⁴

¹University of Gdansk, Gdansk, Poland, ²University of Turku, Turku, Finland, ³Adam Mickiewicz University, Poznan, Poland, ⁴Polish Academy of Sciences, Warsaw, Poland

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Täkinä Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Varved lake sediments serve as exceptional archives of past environmental changes, offering high-resolution chronologies for paleoenvironmental reconstructions. Here, we analyze the uppermost 257 cm of the sediment record from Lake Lehmilampi, situated in eastern Finland. The age model was established through varve counting, supported by radiometric dating techniques, including Cs-137, Pb-210, and C-14, indicating an age of 3317 ±66/-77 BCE at the bottom of the profile.

A multiproxy analysis incorporating biological proxies (pollen, diatoms, cladocerans) and geochemical indicators (XRF, CNS) suggests a generally stable environment throughout the investigated period. Both cladoceran and diatom assemblages indicate that the lake maintained an oligotrophic to mesotrophic trophic status. During the earlier phase of the record (1300 BCE to ~1200 CE), the macrophyte community was relatively poor, or the littoral zone was less developed compared to the pelagic zone. In the later phase, this trend reversed, suggesting littoral expansion or increased macrophyte complexity.

Pollen-based reconstruction revealed that the surrounding landscape was predominantly forested. However, around 1500 CE, human activity intensified. This is evidenced by increased occurrences of cereal pollen and grazing indicators, alongside higher charcoal concentrations, suggesting the use of fire in agricultural practices and/or increase in local settlement with which household and/or manufacture utilization of wood.

Geochemical profiles remain relatively stable throughout the core, further supporting the inference of long-term ecological stability in the lake system, with no significant geochemical disturbances being observed.

The sedimentary archive of Lehmilampi reveals a largely stable lacustrine and catchment environment over the past three millennia, punctuated by a shift in the late Holocene associated with anthropogenic land use in the 16th century. These findings enhance understanding of long-term ecological dynamics in boreal lake systems under natural and human-influenced conditions.

This study was financed by the National Science Centre, Poland grant no. NCN 2021/43/D/ST10/00212.

Marine Sediment Dynamics and Paleoceanography of the New Zealand Region

Professor Helen Bostock¹

¹University of Queensland, Brisbane, Australia

Keynote: Prof. Helen Bostock, Tāwhirimātea A (Level 2), January 26, 2026, 12:45 PM - 1:30 PM

New Zealand sits across an active plate boundary between the Pacific and Australian plates, as well as at the intersection of the tropical Pacific and polar Southern oceans. This has resulted in complex bathymetry and ocean circulation that influences the biological productivity in the oceans, as well as significant terrigenous sedimentary flux from volcanic and tectonic activity, and climatically driven high weathering rates. The combination of these factors has led to the development of distinct marine sedimentary regimes in the oceans around New Zealand. These sedimentary regimes also influence the paleoceanographic records of this region, for example some regions have very high terrigenous sediment flux and extreme sedimentation rates (up to 20 m/ kyr), while other regions are dominated by biogenic carbonate sediments, and have low sedimentation rates (~1cm/kyr), while others are a combination of both with moderate sedimentation rates (10-50 cm/kyr). Each of these sedimentary regimes has advantages and disadvantages for developing paleoceanographic records. Here I will highlight some of the recent paleoceanographic knowledge gleaned from two active tectonic regions – the Hikurangi Subduction Margin, off the northeast of the North Island, and the Macquarie Ridge/Solander Trough, south of the South Island. A range of sedimentary, microfossil and geochemical proxies have been used to disentangle the paleoceanographic and paleoclimatic changes of these regions over the last glacial cycle and back to the last ~1 million years. The results show that the oceanographic circulation is dynamic, varying between glacial/interglacial cycles, but also over millennial timescales, with a strong influence over the local climate, including changes in vegetation and the glaciers in the Southern Alps.

A Multidisciplinary Approach to the Paleoenvironmental Changes of the Carnian Pluvial Episode (CPE) in the Continental Record of Iberia, Western Tethys.

Miss Isabel Boullosa^{1,2}, Dr José F. Barrenechea^{1,2}, Dr Raúl De La Horra³, Dr José López-Gómez¹

¹Instituto de Geociencias (CSIC-UCM), Madrid, Spain, ²Departamento de Mineralogía y Petrología, Facultad de Ciencias Geológicas, Universidad Complutense, Madrid, Spain, ³Departamento de Geodinámica, Estratigrafía y Paleontología, Facultad de Ciencias Geológicas, Universidad Complutense, Madrid, Spain

5D: The continental sedimentary successions and their ability in understanding the present and forecasting the future of the Earth's surface (2), Rongomātāne A (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

The Late Triassic Carnian Pluvial Episode (CPE) was a time of global environmental changes, biological turnover in marine and terrestrial ecosystems and possibly substantial coeval volcanism. This episode was linked to a major extinction event and might have been the trigger of the radiation of many groups. The CPE represents a general palaeoclimatic shift from arid to warm and humid conditions, but this trend is marked by pulses that are still poorly understood. This study addresses these pulses through a multidisciplinary approach, including sedimentology, palynology, paleosols and clay mineralogy analysis of continental and transitional environments from Iberia (western Tethys).

Data were obtained from surface outcrops and drill cores for a detailed study of sedimentary processes. After ruling out tectonism in the study area, climate and eustatism emerge as the main allogenic controls in the sedimentary record. These are related to the development of different fluvial systems with huge floodplain and aeolian environments, but also coastal and shallow marine environments towards the east. Additionally, palynological samples have also been studied to date the sediments and reconstruct the flora.

The study of paleosols shows alternating profiles with humid and arid features, allowing the differentiation of distinct pulses with increased humidity levels. The clay mineral assemblage shows some important differences between purely continental sediments and those from transitional continental-marine environments. The former are dominated by illite, with minor kaolinite and traces of smectite in some layers, indicative of relatively increased humidity. The latter contain illite and Mg-rich chlorite, but no kaolinite is detected. The Mg-chlorite X-ray diffraction peaks are sensibly less intense and sharp in samples from organic-rich lacustrine layers compared to chlorites from other environments.

In summary, the whole data set suggests that humidity in both continental and transitional sediments is lower than expected during the CPE in this western Tethys area.

Sedimentology & Geochronology of the Upper Cretaceous Lachman Crags (Beta) Member of the Santa Marta Formation on James Ross Island, Antarctica

Ms Zoë Bowers¹, Dr. Eric Roberts¹, Dr Brian Atkinson², Dr Selena Smith³

¹Colorado School of Mines, Denver, United States, ²University of Kansas, Lawrence, United States,

³University of Michigan, Ann Arbor, United States

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The James Ross Basin of the Antarctic Peninsula preserves the only known exposures of Upper Cretaceous sedimentary strata from anywhere in Antarctica. In 2024, a field investigation focused on the Santonian-Campanian Santa Marta Formation resulted in important new fossil discoveries. Prior to this expedition these strata were not known to preserve vertebrate fossils, and the abundance of terrestrial plants was unexpected. The primary aim of this study is to conduct the first radioisotopic dating of these deposits, and several other Upper Cretaceous units on James Ross, Vega and Snow Hill islands. Additional project goals include investigating the sedimentary provenance for these strata. To achieve these goals, twelve volcanic tuff and volcanoclastic sandstone samples were collected from throughout the stratigraphy for dating and petrographic analysis. A small suite of the tuff and detrital zircon samples have already been dated via U-Pb LA-ICP-MS geochronology. These results indicate alternating periods of syndepositional magmatic activity in adjacent volcanic arc systems, along with periods of magmatic quiescence, and that sediment routing into the basin was primarily from the arc itself, west of the basin. Several of the volcanic tuffs are surprisingly zircon poor, limiting their potential for U-Pb dating and suggesting alternating bimodal magmatism in the arc. Initial dating results for the upper Santa Marta Formation reveal a minor, but persistent population of syndepositional detrital zircon grains that yield maximum depositional ages between 75-79 Ma for the top of the unit, which closely matches our preliminary Sr-isotope stratigraphy results for the same intervals. This combined data provides significantly improved tie points for calibrating existing magnetostratigraphy results. Similarly, a period of late Maastrichtian syndepositional volcanism in the arc can be deduced based on populations of detrital zircons and tuffs between 69-65 Ma, permitting precise dating of portions of the Lopez de Bertodano Formation in the basin.

Deep-water Turbidite Systems: Importance of Tectonic Context for Predicting Stacking Patterns and Their Use for Reservoir Analogues

Dr Guilherme Bozetti¹, Dr Jean-François Ghienne¹, Prof Gianreto Manatschal¹

¹University of Strasbourg, Strasbourg, France

1D: Controls on sedimentation at submarine active margins (1), Rongomātāne A (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

Deep-water turbidite systems form significant hydrocarbon reservoirs due to their large areal extents and high sand content. They are composed of multiple sub-environments, including channels, levees, channel-lobe transition zones, lobes and basin plains; each commonly associated with a particular facies architecture and bed thickness distribution. Detailed work on continuous exposures of ancient systems at outcrop scale provides valuable information on the facies and architecture of these deep-water systems, allowing the creation of two- and sometimes quasi-three-dimensional depositional models, as well as the generation of step-by-step multiphase reconstruction of the systems. However, the importance of the tectonic context in which the system was formed remains unclear, especially when using outcrops as analogues to subsurface reservoirs. The random use of turbidite systems as analogues can only be justified for process comprehension, and not for stacking patterns or source-to-sink studies. Here we propose to analyse and compare four different tectonic settings generating rather different stacking patterns and compositions: 1) Convergent settings, i.e., foredeep and foreland basins (e.g., Gres d'Annot), which show an overall shallowing up and basinward propagation, with flysch deposition happening during a short period of time in a rather limited space, and with sediment source close to the depocenter. 2) Early syn-rift turbidites in necking zone, (e.g., Brae Play), which are limited in space, deepening upwards, with 'proximal' signature). 3) Late syn-rift turbidites (e.g., Angola and Campos), unlimited in space, deepening upwards, with 'intermediate' signature). 4) Post-rift turbidites (e.g., Orange system), that are unlimited in space, long time for deposition, sediment dispersal, stacking pattern, and architectural signature driven by dynamic topography. Access to world-class field analogues of all four types (Grès d'Annot, Grès Singuliers, Saluver and Gault) in the Alpine domain provides the possibility to describe and compare differences in time, space and proximity of the sediment source area of all systems, which is pivotal for the comprehension of reservoir characteristics of different turbidite systems in order to correctly predict them in different tectonic settings.

Climate Drivers in the Palaeoenvironmental Evolution of the Middle Buntsandstein Group, Lower Triassic, Upper Rhine Graben (NE France and SW Germany)

Ms Gabriela Knobelock¹, **Dr Guilherme Bozetti**¹, Dr Jean-François Ghienne¹, Dr Mathieu Schuster¹, Dr Lucas Bofill², Professor Claiton Scherer³, Dr Ezequiel Galvão⁴

¹University of Strasbourg, Strasbourg, France, ²University French Azerbaijani, Baku, Azerbaijan,

³Universidade Federal do Rio Grande do Sul - UFRGS, Porto Alegre, Brazil, ⁴Univesidade do Pampa, Caçapava do Sul, Brazil

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

During the Early Triassic, the NE of France, and most of modern Europe composed the Central European Basin System (CEBS), which was made out of a series of intracontinental sedimentary basins sharing a common depocenter. At the SW margin of the CEBS (Vosges and Palatinate, France and Germany respectively), the fluvial-aeolian succession of the Middle Buntsandstein (Vosges Sandstone Fm.) have been interpreted as part of a large braided fluvial system with main palaeocurrent towards NE. A sedimentological survey conducted using facies analysis from 52 outcrops (450 metres of outcrops of the Middle Buntsandstein) in an area of approximately 2,500 km²; and core analysis from the EPS-1 well (Upper Rhine Graben, France); permit the organisation of this data into nine large composite logs, covering most of the field area. Three facies associations were defined: fluvial-channel-fill, sheet flood, and wind- and water-laid. The correlation of composite logs and core shows a stratigraphic evolution related to climatic variations expressed in retrogradational and progradational trends. This evolution is recorded in the transition between the variation of the predominance of fluvial dominant (proximal part), fluvial and sheet flood deposits (medial part), or the expansion of aeolian deposits (distal part). The palaeoenvironmental evolution was correlated with palaeohydraulic reconstruction based on the fluvial aggradational dune elements, in six composite logs. Using the mean set thickness variation related to the stratigraphic positions and the estimation of mean depth flow, it was possible to characterise the palaeohydraulic conditions in the stratigraphic evolution model and the reconstruction of the fluvial system. In addition, the palaeocurrent data from fluvial deposits shows a radial pattern towards SW in the southern region, and towards NE-N in the northern region. Considering the aforementioned indicators, this study recognises different climate stages related to the palaeoenvironmental model of a distributive fluvial system for the Middle Buntsandstein in the Vosges, Palatinate, and Black Forest region.

Early and Late Crises of the Long-Lived Mesozoic Adriatic Carbonate Platform

PhD Vlatko Brčić¹

¹Croatian Geological Survey, Zagreb, Croatia

4B: Carbonate systems and processes (3), Tāwhirimātea C (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

The earliest peri-Mediterranean Tethyan carbonate deposits in the Croatian Dinarides date back to the Middle Permian, while the youngest were formed during the Eocene. Within this broader context, the Adriatic Carbonate Platform (AdCP) developed as a distinct and isolated palaeogeographic unit within the Western Tethys. The AdCP, a typical shallow-marine carbonate platform - existed for a shorter interval, from the Toarcian to the end of the Cretaceous, spanning approximately 125 million years. During this time, a sedimentary sequence over 5 km thick was deposited, recording multiple environmental crises characterised by platform drowning and periods of emersion. These changes were driven by a combination of global and regional factors, including climate warming, water-column stratification, anoxic and hypoxic conditions, increased organic matter accumulation, ocean acidification, and major disturbances in the global carbon cycle. In this study, we present new results based on an integrated approach that combines lithological, biological, and microfacies analyses with scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDS), total organic carbon (TOC) measurements, and stable isotope data ($\delta^{13}\text{C}$ and $\delta^{18}\text{O}$). Our primary aim is to provide new insights into the nature and impact of global anoxic events on shallow-marine carbonate environments in the Western Tethyan realm. The results show that global Oceanic Anoxic Events (OAEs) significantly affected the AdCP, most notably the Toarcian OAE (T-OAE) in the Early Jurassic and the Cretaceous OAEs (OAE2 and OAE3). These events left distinct geochemical and sedimentary signatures within the platform, interbedded with typical shallow-marine limestones. Crisis-related deposits include calcisphere-rich limestones, bioturbated intervals, carbonate turbidites, slumped beds, organic-rich interlayers, neptunian dykes, tempestites, firmgrounds, and subaerial exposure surfaces. Biotic responses included the extinction of numerous benthic foraminifera species, alongside the diversification and expansion of planktonic foraminifera and calcareous dinoflagellates. The observed paleoenvironmental shifts were driven by both local/regional synsedimentary tectonics and global sea-level fluctuations.

Insights From High-Resolution 3D Seismic Data into Subglacial Erosion and Tunnel-Valley Formation in Northern Germany

Dr. Sonja Breuer¹, Anke Bebiolka¹, Dr. Axel Ehrhardt¹, Dr. Vera Noack¹, Dr. Jörg Lang¹

¹Federal Institute for Geosciences and Natural Resources [BGR], Hannover, Germany

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

This study examines the distribution, morphology, and sedimentary infill of buried Pleistocene tunnel valleys in northern Germany and adjacent offshore areas, with relevance to the long-term safety assessment of radioactive waste repositories. Tunnel valleys, formed by pressurized subglacial meltwater, represent major erosional landforms reaching depths of up to 600 meters below the surface.

The initial phase of the investigation focused on delineating the spatial occurrence, geometry, and distribution patterns of subglacial tunnel valleys. Subsequently, the influence of the geological substrate on tunnel-valley location and orientation was analysed, considering salt structures, faults, and lithologies. The results indicate that tunnel valleys form distinct depth zones, with maximum incision depths positively correlating with the main subsidence axis of the North German Basin. At the regional scale, structural controls were assessed by comparing tunnel-valley orientations with tectonic features. While some valleys align with neotectonically active faults - especially where ice flow paralleled fault trends - no consistent correlation with underlying geological structures was observed.

In the second phase of the project, we utilised high-resolution 3D seismic data from the German North Sea sector (survey "GeoBasis3D" acquired in 2021). These data enable the detailed interpretation of tunnel-valley geometries and internal depositional architectures. Steep valley flanks and chaotic basal reflectors indicate rapid subglacial infill, while cut-and-fill structures, erosional unconformities, and parallel reflectors point to multiple depositional phases. The tunnel-valley fill and the seafloor are displaced by the crestal faults of an underlying salt structure, confirming Pleistocene fault activity.

The study highlights the importance of integrating seismic stratigraphy, sedimentology and structural geology to understand tunnel-valley development, which reflects complex interactions between ice dynamics, meltwater flow, and substrate geology.

Geological Heritage and Geodiversity of the Mesozoic Southern Carpathian Dinosaur World: The Hațeg Country Unesco Global Geopark

Dr Andrei Briceag¹, Dr. Mihaela Melinte-Dobrinescu¹

¹GeoEcoMar, RO5194978, Bucharest, Romania

3E: Geoheritage and geodiversity of the sedimentary record & Open Science in Sedimentology, Rongomātāne B (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

The Hațeg Country UNESCO Global Geopark is a member of the European Geoparks Network and UNESCO Global Geoparks. Its main geological values are the dinosaur-bearing deposits, containing endemic species, i.e., dwarf dinosaurs, but the faunal assemblage from the end of the Cretaceous also includes representatives of all major vertebrate groups from fishes to mammals. This Geopark is situated in the Hațeg post-orogenic intramountainous depression, encircled by the Southern Carpathian chain, formed at the Cretaceous end within the Getic Realm, in response to the Laramian tectonics. Previous palaeogeographic studies indicated the existence of an archipelago of islands in the NE Tethys during the Late Cretaceous, including the Hațeg Basin. Palaeomagnetism shows for this area a mean palaeolatitude of 25°N, consistent to the Late Cretaceous subtropical climate, endorsed by sedimentology, palaeontology, and stable isotopes.

The Hațeg Country Geopark is representative for its sedimentary record, covering Jurassic and Cretaceous Periods. The deposition starts with continental Lower Jurassic sediments, followed by mainly marine sedimentation from the Middle Jurassic to the Upper Cretaceous (upper Campanian), interrupted by continental sedimentation during the Albian, and topped by continental deposits in the Maastrichtian. The Middle Jurassic – Lower Cretaceous sedimentation is dominated by carbonate facies, including reef limestones, characteristic of the Urgonian facies. Following the tectonics of the middle Cretaceous times, the region was uplifted for a short interval; during the exhumation period which lasted throughout the Albian, the weathering products have been accumulated within the karstic depressions formed on top of the Urgonian limestones, generating the bauxite deposits. Marine conditions resumed at the beginning of the Late Cretaceous, and lasted from the Cenomanian to the Late Campanian, with fluctuations among shallow-water, outer shelf, and deep -water settings. Products of volcanic eruptions are present in the Maastrichtian, while from the Tertiary thick piles of molasses are deposited.

On Pachyderms and Pastiche: Reasons Why Star Dunes Are Rarely Recognised in the Rock Record

Professor Charlie Bristow¹, Professor Geoff Duller

¹Birkbeck University of London, London, United Kingdom

4D: The continental sedimentary successions and their ability in understanding the present and forecasting the future of the Earth's surface (1), Rongomātāne A (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

Star dunes are the tallest dunes on Earth and are amongst the larger and more spectacular aeolian landforms. They are widespread in modern sandy deserts, and found in areas with the greatest sand accumulations, complex wind regimes with low RDP/DP. In theory star dunes should be preserved in the rock record, yet we know of only one well documented example. We suggest that this is because star dunes are difficult to identify because their component parts are a pastiche, resembling the structures formed by different types of sand dunes.

We present a new sedimentary model for the structure of a star dune based on ground penetrating radar (GPR) surveys at Erg Chebbi in Morocco (Sahara Desert). Profiles across the dune arms resemble the sedimentary structures seen in linear, transverse or barchanoid dunes. Because different parts of the star dune resemble other types of sand dunes this is likely leading to misidentification in the rock record. However, the suite of features described in this paper will permit identification of star dunes in future studies of the rock record. Optically stimulated luminescence (OSL) dating shows that accumulation of the Erg Chebbi star dune post-dates the end of the African Humid Period (AHP). At the base of the dune, there is an ~8,000-year hiatus in the record. Since then, the dune has grown rapidly to create a 100 m high dune within the past 1000 years and is migrating towards the west. Changes in the cross-strata support the idea that star dune construction was accompanied by a change in the wind directions.

New Experimental Insights into Hydrogen Storage in Depleted Fields: a Case Study of the Rough Field, UK

Mr Joe Brown¹, Dr Stuart Jones¹, Dr Julia Knapp¹, Professor Jon Gluyas¹

¹Durham University, Durham, United Kingdom

8F: Sedimentology and Sustainable GeoEnergy, Rongomātāne C (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

Large-scale underground hydrogen storage is expected to play an important role in the energy transition. Despite this potential, experience in underground hydrogen storage remains limited. This research experimentally investigates the potential storage of hydrogen in sandstone reservoirs from depleted fields in the UK Southern North Sea where there is an ongoing pioneering project to convert the Rough field from storing natural gas to hydrogen. This project will be one of the first depleted fields to store pure hydrogen and the largest hydrogen storage site globally, storing 10TWh of energy. However, as hydrogen storage in depleted fields is still in its infancy, investigation is required to understand how the reservoir rock and pore fluids will react with hydrogen, potentially causing dissolution, reprecipitation and pore clogging. Therefore, this study aims to present first a reservoir characterisation of the Rough field, followed by experimental work which mimics hydrogen storage under reservoir temperature and pressure (90°C and 30MPa respectively based on bottom hole temperature and planned injection pressures) to investigate how the reservoir rock, porosity and fluid change. The Rough field comprises the Permian Leman Sandstone Formation and is sealed by the Zechstein evaporites. Three samples from different facies within the reservoir have been subjected to hydrogen storage conditions and analysis has been conducted on the rock using SEM, microCT and XRD, and fluid using ICP-OES. The petrographic analysis highlights a strong heterogeneity between different facies in terms of mineralogy, porosity and permeability and the hydrogen storage experiments demonstrate how the mineralogy and porosity are affected by geochemical reactions, such as the dissolution of carbonates and clay minerals, and that these reactions vary based on facies. Therefore, reservoir rocks with higher clay or carbonate content are more likely to negatively impact reservoir quality during hydrogen storage, with pore clogging leading to permeability reduction.

Antarctic Ice Sheet Development and Deep Ocean Circulation During the Early to Middle Miocene: Paleoceanographic Insights from a Drift Deposit East of Aotearoa/New Zealand

Dr. Imogen Browne^{1,2}, Dr Molly Patterson¹, Dr Melissa Berke², Ms Thea Barbelet¹, Ms Halima Ibrahim¹, Ms Gretl King¹, Dr Adriane Lam¹, Dr Denise Kulhanek^{1,3}, Mr Jared Nirenberg⁴, Dr Georgia Grant⁵, Dr Bella Duncan⁶, Dr Rob McKay⁶, Dr Greg Browne⁵, Dr Kathleen Marsaglia⁷

¹Binghamton University, Binghamton, United States, ²University of Notre Dame, Notre Dame, United States, ³Christian-Albrechts Kiel University, Kiel, Germany, ⁴Brown University, Providence, United States, ⁵Geological and Nuclear Sciences, Lower Hutt, New Zealand, ⁶Victoria University of Wellington, Wellington, New Zealand, ⁷California State University, Northridge, Northridge, United States

7F: Contourites and Mixed Depositional Systems (3), Rongomātāne C (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

The Early to Middle Miocene encompasses both the Miocene Climatic Optimum (MCO; ~17–14.7 Ma), the warmest interval of the Neogene, and the Middle Miocene Climatic Transition (MMCT; ~14.7–13.9 Ma), a major interval of global cooling and Antarctic Ice Sheet (AIS) growth. Global ocean circulation also underwent a major change across the MMCT, including cooling of surface to deep waters, permanent establishment of deep-water formation in polar regions, and widespread formation of drift deposits. To better understand cryosphere response including changes in proto-AABW (Southern Component Water; SCW) during the Early to Middle Miocene, we use a drill core from Ocean Drilling Program Site 1123, drilled in the North Chatham drift east of Aotearoa (3290 m water depth). Previous studies from this site revealed orbitally paced (41 kyr) changes in intensity of bottom current speed from 15.5–12.5 Ma and intensification of SCW formation at ~14.5 Ma, associated with expansion of AIS (Hall et al., 2003). To understand sedimentological and paleoceanographic changes from ~20–14 Ma, we use sedimentary X-ray fluorescence and grain size data. We demonstrate that Site 1123 lithology is controlled by the relative input of lithogenic and biogenic sediments, driven by changes in surface ocean productivity, sea level, and SCW formation on glacial/interglacial timescales, and by changes in tectonics and cryosphere dynamics on million-year timescales. This study provides insight into sedimentologic, oceanographic, and tectonic processes occurring in Aotearoa during the Early to Middle Miocene and provides perspective on how Southern Ocean circulation, which ventilates the global ocean and influences climate, may have changed in the past.

Using Dust to Explore Early Palaeozoic Windiness in the Post-Glacial Marine Mudrocks of the Soom Member (Cedarberg Formation, South Africa)

Dr Claire Browning^{1,2}, Professor Sarah Gabbott³, Professor Emese Bordy²

¹Iziko South African Museum, Cape Town, South Africa, ²University of Cape Town, Cape Town, South Africa, ³University of Leicester, Leicester, United Kingdom

1C: Coastal to shelf environments across time and space (1), Tāwhirimātea E (Level 2), January 26, 2026, 10:15 AM - 11:45 AM

Dust plays a significant role in Earth's climate by influencing energy balance, atmospheric chemistry, and nutrient supply to terrestrial and marine ecosystems. Although dust has affected climate throughout Earth's history, its signal is often difficult to detect in the geological record—especially in ancient offshore sedimentary deposits—due to alteration by depositional and erosional processes. We present a record of dust-bearing marine mudstones from the Late Ordovician Soom Member (Cedarberg Formation, South Africa), offering a rare palaeoclimatic glimpse into the Early Palaeozoic Icehouse and faunal recovery following the Hirnantian glaciation. Fossilized marine snow (organomineral aggregates) is closely associated with dust particles in the Soom. Using mudstone sedimentology and μ CT scanning, we show that an original aeolian signature is preserved through pelagic aggregation and rapid settling of dust-ballasted marine snow to a quiet sea floor. To assess the Soom Member as a potential deep-time windiness archive, we measure dust particles in-situ (size, mineralogy, and abundance) using scanning electron microscopy on mudstones from a ~40 m research borehole at Holfontein. Although poor age constraints limit our interpretations, the clear interconnectivity between marine snow and dust supply suggests that windiness fluctuations may be resolved in these mudstones. The consistent dust provenance and persistent dust–marine snow association suggest stable tectonic and local weather conditions during deposition, while dust size and concentration are correlated at meter- and millimetre-scales, demonstrating the potential to understand windiness fluctuations at multiple temporal resolutions. Two intervals of increased windiness—identified from meter-scale increases in maximum dust size and relative concentration—may relate to minor Early Silurian glaciations recorded in coeval Gondwanan strata. This study lays the foundation for future research, offering an opportunity to explore the palaeoclimatic significance of the interplay between phytoplankton blooms, dust, and carbon drawdown in deep time.

Evidence for Gas Hydrate-Filled Fractures Forming at the Sulfate-Methane Transition Zone, Hikurangi Subduction Margin, New Zealand

Dr Morgane Brunet¹, Dr Ann Cook², Miss Saffron Martin², Dr Joshu Mountjoy³

¹Institut des Sciences de la mer de Rimouski (ISMER), Rimouski, Canada, ²Ohio State University, Columbus, USA, ³NIWA, Wellington, New Zealand

4F: Sedimentary processes in the northern Hikurangi Margin of New Zealand: Insights from IODP Expeditions 372/375, Rongomātāne C (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

Using high-resolution X-ray computed tomography (X-CT) of sediment cores from International Ocean Discovery Program (IODP) Expedition 372 offshore New Zealand, we identify a network of near-vertical, low-density structures interpreted as relics of gas hydrate-filled fractures. These fractures occur at shallow depths near the sulfate-methane transition zone (SMTZ), with widths ranging from 0.5 to 5 mm and vertical extents between 7 and 60 mm. They are characterized by diffuse boundaries and steep dip angles. In contrast to previously documented hydrate-filled fractures, which are typically larger (centimeter to meter scale) and located deeper within the sediment column, these findings suggest that hydrate formation can initiate at much shallower depths.

We propose that these fractures represent early-stage hydrate formation, which may expand and migrate deeper over time as microbial methane production increases. The formation, dissociation or dissolution of hydrate-filled fractures may alter sediment structure, fluid migration pathways, and microbial community dynamics during early diagenesis. Moreover, the existence of shallow, fracture-hosted gas hydrate could facilitate rapid methane transport to the seafloor if dissociated, with significant implications for climate-sensitive environments such as the Arctic.

Similar features identified in other settings support the hypothesis that shallow hydrate-filled fractures may be widespread but remain underreported due to limited X-CT imaging of shallow sediment intervals in scientific drilling. Expanding the application of high-resolution X-CT scanning, particularly across the SMTZ, is crucial to improve detection and understanding of near-seafloor hydrate systems and their potential environmental impacts.

Mn-Driven AOM Generating the ^{13}C -Depleted Marinoan Cap Dolostones

Chunfang Cai¹, Dr Dawei Liu², Dr Yongjie Hu^{3,1}, Dr Hong He²

¹China University of Petroleum, Beijing, China, ²Petroleum Exploration and Production Research Institute of SINOPEC, Beijing, China, ³SINOPEC International Exploration and Production Corporation, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Marinoan cap dolostones with negative carbon isotope excursion in two South China sections are found to contain calcites (Cal1) with $\delta^{13}\text{C}$ as low as -58‰ and Mn contents up to 20000 $\mu\text{g/g}$. In the unit 3 of the cap dolostone, these calcites were precipitated as limestone lenses. In the underlying units 1 and 2, the calcites present as vug- or cavities-fillings intergrowing with superheavy pyrite, and were crosscut by the later calcite (Cal2) showing replacement of fibrous and bladed dolomites. All these calcites show similar geochemical features, and are considered to have formed from oxidation of methane by MnO_2 in unit 3 water column, simultaneously with the oxidation by down-migrated MnO_2 -rich fluid in pore and cavities of Units 1 and 2 sediments. We propose that the calcites were formed from environments with sulfate concentrations < 1 to 3 mM and high suspended MnO_2 particles. Under such an environment, sulfate-driven AOM generated pyrite and free H_2S with variable $\delta^{34}\text{S}$ values until sulfate concentration is < 0.2 mM, and some less reactive species of suspended MnO_2 particles in the unit 3 water column may have survived manganese and sulfate reduction zones, and penetrated down the cavities and vugs of the units 1 and 2 of the cap dolostone along fractures or highly porous sediments. This process was followed by the reaction of MnO_2 with sulfides producing high Mn Cal1 and ^{34}S -rich pyrite. This is the first report of sulfate-dependent AOM driven by Mn- or Fe- oxides from the entire Precambrian record. Such a previously unrecognized biogeochemical cycling during Marinoan global deglaciation may serve as the mechanism for major methane sink during the Proterozoic and Archean with low sulfate concentrations in the oceans.

Evolution of Neogene Heterozoan Carbonate Factories in a Tide-Dominated Multiple-Strait System Along the Actively Deforming Hikurangi Margin, Northern Hawke's Bay, New Zealand

Dr Vincent Caron¹, Dr Julien Bailleul², Dr Frank Chanier³, Dr Geoffroy Mahieux¹, Mr Nelson Pain⁴

¹Université de Picardie Jules Verne, Amiens, France, ²Institut UniLaSalle, Beauvais, France, ³Université du Littoral Côte d'Opale, Lille, France, ⁴Géosciences Environnement Toulouse, University of Toulouse, Toulouse, France

8B: Carbonate depositional systems from platform, slope to basin (2), Tāwhirimātea C (Level 2), January 29, 2026, 1:40 PM - 3:10 PM

Hawke's Bay geology relates to deformation along the Hikurangi subduction margin since the Early Miocene. It includes emerged portions of a forearc basin filled with thin heterozoan limestone sheets intercalated between thick siliciclastic successions. By late Neogene times, differential uplift of the inner part of the subduction wedge induced formation of a NE-SW-orientated forearc seaway bounded to the west by a continent-attached shelf, and to the east by a continent-detached depositional system formed by elongated submarine ridges and depressions. Late Neogene limestones in northern Hawke's Bay are composed of barnacles, molluscs, brachiopods and bryozoans derived from carbonate factories, whose development and demise were controlled by hydrodynamic processes and siliciclastic inputs. Their high-energy depositional conditions are reflected in small- to large-scale cross-beds, which are interpreted as the foresets of subaqueous dunes produced by strong tidal currents flowing between sub-parallel antiforms. As such, shallow-water carbonate production sites have formed in association with the development of a morphostructurally-controlled multiple-strait system, following regional deformation and uplift. Tectonic control on the onset and termination of carbonate production is outlined by the lower and upper bounding surfaces of the carbonate deposits. Angular unconformities underlie limestones indicating that the tilting and folding of the underlying strata preceded the onset of carbonate production. Conversely, limestones are sharply overlain by deep-water siliciclastics recording the submergence and termination of skeletal carbonate production.

Limestones are interpreted to have accumulated following tectonic uplift causing relative sea level to fall. These conditions brought the seabed to tidal influence and favoured the development of a multiple strait where heterozoan organisms could flourish. By contrast, regional tectonic subsidence led to relative sea level rise and seabed drop, resulting in drowning and shut down of tide-dominated carbonate systems.

Organic Carbon Transport to Deep Water by Extreme Events: Case Study of Elliot Creek GLOF Event, BC, Canada

Dr Sanem Acikalin¹, **Dr Matthieu Cartigny**², Sefa Sahin¹, Sophie Hage³, Gwyn Lintern⁴, Megan Baker², Steve Hubbard⁵, Dan Shugar⁵, Stacy Cooper⁴, Ian Geisbrecht⁶, Romit Aggarwal¹

¹Newcastle University, Newcastle Upon Tyne, United Kingdom, ²Durham University, , United Kingdom,

³Ifremer, France, ⁴Geological Survey of Canada, Canada, ⁵University of Calgary, Canada, ⁶Hakii Institute, Canada

9E: Fjord sediments: Archives of climate and tectonics through time, Rongomātāne B (Level 1),
January 29, 2026, 4:25 PM - 5:55 PM

Burial of organic carbon (OC) in marine sediment is important as it forms the second-largest sink of atmospheric CO₂, and thus contributes to long-term regulation of climate. Fjords play a key role in the burial of OC in marine sediments, as they are responsible for burying 11% of global OC flux into the oceans. Our previous work has shown that the exclusion of coarse-grained sediment makes the 11% a strong underestimate and OC input from the extreme events are not considered.

Elliot Creek Glacial Outburst Flood event occurred on 28th November 2020 due to a massive landslide (~50 million tonnes of sediment, equivalent energy released to Mw4.9 earthquake) and triggered a ~100m high displacement-wave in the glacial lake. This wave in turn broke through the lake's moraine-dam, releasing tremendous amounts of water and sediment, which scoured Elliot Creek before entering Bute Inlet fjord. Large volumes of sediment and OC were transported and delivered into the fjord. Fortuitously, Bute Inlet is the site of the most detailed time series of seabed surveys for any fjord worldwide, as it was mapped ten times in between 2008 up to 2020. The exceptionally detailed pre-event baseline data makes it possible to locate GLOF deposits throughout the fjord.

Years following the event (2021-2022) the submarine channel system was sampled and we found that the GLOF deposited extensive coarse-grained deposits. Preliminary results show that these deposits have an OC content of over twice (~10%) that in "normal" coarse grained deposits, and hence might be even more important in the long-term burial of OC. Overall, it is clear that coarse-grained sediment deposited in fjords during normal and extreme events will host a significant part of the global flux of OC buried in marine sediments, however, full quantification of the relative amounts is yet to be explored.

Direct Measurement of Sediment Concentration Profiles in a Turbidity Current Coming Down the Congo Canyon

Dr Matthieu Cartigny¹, Dr Sanem Acikalin², Prof Peter Talling¹, Dr Megan Baker¹, Dr Rebecca Englert³, Dr Ricardo Silva Jacinto⁴, Dr Bernard Dennielou⁴, Dr Pelle Adema⁵, Dr Morgan Wolfe⁶, Dr Michael Clare⁷

¹Durham University, Durham, UK, ²Newcastle University, Newcastle, UK, ³Monterey Bay Aquarium Research Institute, Moss Landing, USA, ⁴IFREMER, Brest, France, ⁵Utrecht University, Utrecht, The Netherlands, ⁶University of Southampton, Southampton, UK, ⁷National Oceanography Centre Southampton, Southampton, UK

Keynote: Assoc Prof Matthieu Cartigny, Tāwhirimātea A (Level 2), January 30, 2026, 9:45 AM - 10:30 AM

Turbidity currents are a key process to transport sediment, including organic carbon and pollutants like plastic, from the shallow seas to the deep ocean. In contrast to their important role in transporting sediments across our planet, we only have a very limited capability in predicting or modelling these flows. Modelling turbidity currents is held back by our lack of knowledge on the capability of these flows to transport sediment. This knowledge is key as turbidity currents are driven by the excess density that is supplied by the sediment they carry, and hence there are strong feedback loops between the velocity of the currents and their capacity to transport sediment. The most essential bit of data that is missing here, is that we do not yet have direct simultaneous measurements of the velocity profile of such flows and their sediment concentration profiles. Here we present the first of such data to our knowledge. These data have been collected by lowering a CTD carousel with an attached ADCP into an active turbidity current in the Congo Canyon offshore West Africa. In this presentation we explore how these new measurements align with existing models.

Depositional Environments and Microbial Biosignatures of the ~2.8 Ga Hardey Formation

Mr David Cartwright¹, Dr. David Flannery¹, Dr. Patrick Hayman¹

¹Queensland University of Technology, Brisbane, Australia

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Continental depositional environments have been overlooked when studying Archean biosignatures because of the low probability of finding biosignatures and the rarity of Archean continental rocks. The Hardey Formation of the Fortescue Group (Pilbara Craton) provides a unique window to study such continental settings, given the remarkable preservation of the rocks, the diversity of depositional environments and the previous discovery of microbial biosignatures. In this study, we develop a facies model for the depositional environments of the Hardey formation and characterise the biosignatures for each setting. Field work was done over two seasons and included preparation of stratigraphic sections in graphic log form of field exposures. Samples were collected for petrographic, geochemical and mineralogic study.

Our results found that the main facies are a diverse range of siliciclastic rocks, ranging from mudstone, siltstone, bedded and cross-bedded sandstones, and conglomerates as well as various volcaniclastic rocks. These facies are grouped into four main depositional environments, including: braided rivers, deltas, overbank and lacustrine deposits. In addition, episodic volcanism resulted in the deposition of large volumes of volcaniclastic debris with these fluvio-lacustrine systems. Textural biosignatures, including microbially induced sedimentary structures and stromatolites, have been found in the fluvial and lacustrine deposits. Additionally, core samples will be studied with SEM-EDS and Nano-SIMS to explore for isotopic and fine scale biomineral biosignatures. The outcome of the study may inform the search for past life in Mars, where NASA's Perseverance rover is exploring clastic fluvial, lacustrine and deltaic facies, for which the Hardey Formation is an excellent depositional and biosignature analogue.

Geochronology, Geomorphology and Sedimentology Characteristics of Three Different Beach Ridge Systems in Central Victoria, Australia

Dr Rafael Carvalho¹, Dr Daniela Mueller², Dr Juliet Sefton³, A/Prof Ruth Reef⁴

¹James Cook University, Townsville, Australia, ²The University of Liverpool, Liverpool, UK, ³The University of Melbourne, Australia, ⁴Monash University, Australia

4C: Coastal to shelf environments across time and space (4), Tāwhirimātea E (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

Beach ridges are ubiquitous landforms developed on prograded coasts in various settings, such as strandplains, barrier islands and spits. These ridges are typically part of coastal systems that comprise the dune, beach and shoreface facies, and can potentially provide a relative chronological palaeoenvironmental record, which can serve as a time-series for understanding coastal evolution. We investigated three different sandy beach ridge systems on the southeast coast of Australia, through the use of OSL dating, LiDAR data, elemental composition and texture of sediments.

At Somers, a complex drift-aligned prograded barrier with highly truncated and asymmetrical ridges was formed at the main entrance of Western Port Bay. OSL dating within a limited area revealed an age of ~2.6 kyr for the landwardmost dated ridge, situated about halfway across the plain. Significant erosion of the ridges' record occurred on the western side of the barrier between 2600 and 700 yr ago and between 600 and 240 yr ago, with sediment characteristics suggesting that the type of material provided for barrier accretion remained the same throughout the late Holocene.

Across the bay, at the Bass River Delta, LiDAR data showed the presence of at least 10 low ridges on the southern part of the plains. Coring of these ridges revealed distinct facies with significant textural variability ranging from medium sand to silt-sized sediments. OSL dating yielded an age of ~16.2 kyr for the most-landward ridge, whereas the youngest dated ridge was deposited ~2.7 kyr.

At Tidal River, further to the east, a strandplain formed by ~15 parallel sandy beach ridges developed between the Devonian granite headlands of Wilsons Promontory. The oldest of these ridges (~5.4 kyr) is composed of Si-rich medium sand grains, whereas the remaining of the ridges are Ca-rich, suggesting that changes in parent material occurred before ~3.1 kyr.

Sedimentology and Geochemistry of a Pelagic Record from the Early Aptian Oceanic Anoxic Event OAE 1a (Western Tethys): Local Vs. Global Factors

Dr José Manuel Castro¹, Dr Ginés A. de Gea¹, Dr María Luisa Quijano², Dr Cristina Sequero³, Dr Sandro Froehner⁴, Dr Aluana Schleder⁴, Dr Luis O'Dogherty⁵, Dr David Naafs⁶, Dr Richard Pancosr⁶

¹Department of Geology & CEACTEMA, University of Jaén, Jaén, Spain, ²Department of Inorganic and Organic Chemistry & CEACTEMA, University of Jaén, Jaén, Spain, ³Department of Geodynamics, Stratigraphy and Paleontology. Complutense University, Madrid, Spain, ⁴Department of Environmental Engineering, Federal University of Paraná, Curitiba, Brazil, ⁵Department of Earth Sciences, University of Cádiz, Puerto Real, Spain, ⁶Organic Geochemistry Unit, University of Bristol, Bristol, United Kingdom

7C: Sedimentology of Black Shales through Phanerozoic (2), Tāwhirimātea E (Level 2), January 29, 2026, 10:15 AM - 11:45 AM

The early Aptian Oceanic Anoxic Event OAE 1a represents one of the most prominent hyperthermal events in Earth's history. This event is associated with global environmental and biotic perturbations, including a global rise in temperatures, ocean oxygen depletion, and widespread deposition of organic-rich marine sediments. The global geodynamic context was characterized by accelerated seafloor spreading, and development of extensional rifting along continental margins.

The development of OAE 1a coincided with a major disturbance of the global carbon cycle, recorded as a sharp negative spike followed by a long-lasting positive excursion in the C-isotope record. A complex response of the environmental and biotic system occurred, ultimately triggered by volcanism on the Ontong-Java Plateau.

In this study, we investigated the sedimentology and geochemistry of an expanded record of OAE 1a from the Southern Iberian Palaeomargin (SIP, Western Tethys): the Carbonero section, deposited on a fault- bounded, highly subsiding sector of the pelagic basin of the SIP, affected by rifting and regional volcanism.

The studied succession is composed of black shales, radiolarites, marls, and volcanoclastics, with discontinuous turbidite levels and other slope deposits, as well as carbonate and barite concretions. Geochemical analyses included stable C and O isotopes, TOC, elemental composition and biomarker distributions. Integration of sedimentological and geochemical records has served as a basis for discussion on the factors controlling sedimentation, including the global environmental and biotic changes related to the OAE 1a, and local factors, mostly related to tectonic and volcanic symsedimentary activity.

New Evidence for an Episode of Accelerated Environmental Change in the Late Barremian: Geochemical, Paleontological and Sedimentological Records from the Subbetic Basin (Western Tethys)

Dr Gines A. de Gea¹, Dr José Manuel Castro¹, Dr Miguel Company², Dr Luis O'Dogherty³, Dr Jose Sandoval², Dr Maria Luisa Quijano⁶, Dr Cristina Sequero⁴, Dr Sandro Froehner⁵

¹Departamento de Geología & CEACTEMA, Universidad de Jaen, Jaen, Spain, ²Departamento de Estratigrafía y Paleontología, Universidad de Granada, Granada, Spain, ³Departamento de Ciencias de la Tierra, Universidad de Cadiz, Puerto Real (Cadiz), Spain, ⁴Departamento de Geodinámica, Estratigrafía y Paleontología, Universidad Complutense de Madrid, Madrid, Spain, ⁵Departamento de Ingeniería Ambiental, Universidad Federal de Parana, Curitiba, Brazil, ⁶Departamento de Química Orgánica e Inorgánica and CEACTEMA. Universidad de Jaén, Jaen, Spain

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

We investigate a new event of accelerated environmental change that was recorded during the late Barremian in the pelagic Subbetic Basin (Western Tethys). Two pelagic sections have been studied using a multi-proxy approach based on C-isotope stratigraphy, sedimentology and a high-resolution quantitative study of nannofossil assemblages, along with major and trace elements and biomarkers. Our results provide a detailed biostratigraphy and C-isotope stratigraphy, and outline the paleoenvironmental conditions recorded during the early stages of the Taxy Episode. A disturbance has been identified in the C-isotope record, called the IFeNE (Intra-Feradianus negative C-excursion), which is coeval with environmental and biotic changes that predate the well-known ISNE (Intra-Sarasini negative C-excursion). The combined analysis of nannofossil associations, C-isotopes, major and trace elements, and biomarker distributions indicates a separate episode of warming heralding the ISNE, resulting in the acceleration of the hydrological cycle and a consequent increase in continental inputs and the fertilization of surface waters. The origin of the Taxy Episode (the IFeNE and ISNE) has been related to orbital factors (high-eccentricity cycles), and to a global increase in volcanism, probably related to the early phases of the Ontong Java Plateau.

Biofilm Remains Preserved in Cretaceous Carbonates from a Cave in Northern Mexico

Prof. Dr. Elizabeth Chacon¹, Edgar Medina¹, Prof. Dr Cesar Francisco Ramirez-Peña¹, Prof- Dr Jose J. Aranda-Gomez²

¹Autonomous University of Nuevo Leon (UANL), Linares, Mexico, ²Autonomous University of Nuevo Leon, Linares, Mexico, ³Universidad Nacional Autonoma de Mexico, Ciudad de Mexico, Mexico

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Layered carbonates generally form under the influence of microbial communities across a wide range of geological environments. The most common are stromatolites, which form through the precipitation, entrapment, and binding of sedimentary particles from a substrate. While they were dominant throughout most of the Precambrian, during the Phanerozoic, these microbial 'ichnofossils' have been limited to environments under very specific conditions. This study presents examples of stromatolitic crusts and their basic geochemical analyses, formed by late-diagenetic hydrothermal solutions within Cretaceous limestones. These calcitic crusts developed in calcitic veins and record a sequential colonisation of carbonate substrates during microbe-mineral interactions. The preservation of biofilms and microbial textures within the fabric indicates the active development of microbial populations under changing microenvironmental conditions. These crystals are associated with irregular particles and subparallel bands perpendicular to the crystalline aggregates.

Provenance of Detrital Zircons with Ages of the Mesozoic Magmatic Hiatus (160–110 Ma) in Korea: Insights from the Cretaceous Gyeongsang Supergroup

Dr Yongun Chae¹, Dr Sujin Ha², Professor Hyoun Soo Lim², Professor Young Ji Joo¹

¹Pukyong National University, Busan, South Korea, ²Pusan National University, Busan, South Korea

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Prior to the Cretaceous, progressive slab shallowing during the Jurassic led to the development of a flat-slab subduction regime beneath East Asia, which caused magmatism to migrate inland (NE China), away from the trench (SW Japan), and resulted in a magmatic quiescence (MQ) on the Korean Peninsula (KP) from approximately 160 to 110 Ma. However, detrital zircon U–Pb results from the Cretaceous strata in the KP include ages that correspond to MQ, and determining their provenance and transport mechanism remains challenging.

In this study, we identified a 3–5 cm thick ash-fall tuff from the MQ period at the boundary between the Hasandong and Jinju formations in the Cretaceous Gyeongsang Basin, Korea. To determine its age and provenance, we conducted fieldwork, petrographic analysis, XRD, whole-rock geochemistry, zircon U–Pb dating, and Hf–O isotope analysis.

The ash-fall tuff discovered at the boundary between the Hasandong and Jinju formations in the Miryang Subbasin of the GB is the oldest primary deposit (117.4 Ma) of Cretaceous magmatic origin reported in Korea to date. It is interpreted to have erupted in an intraplate extensional setting, associated with A-type magmatism. Based on an integrated U–Pb ages and Hf–O isotopic compositions of zircons from this tuff and those from the MQ period reported in the Miryang Subbasin, it is inferred that such zircons were primarily sourced from volcanic activity in the NCC and transported to the KP by prevailing westerly winds during the MQ period.

Geochemical Signatures as a Tool to Estimate the Inundation Limit of Past Tsunamis Beyond the Sand: Implications for Tsunami Hazard Along the Nankai Trough, Japan

Dr Catherine Chagué^{1,2}, Associate Professor Shigehiro Fujino³

¹UNSW Sydney, Sydney, Australia, ²National Institute of Water & Atmospheric Research Ltd, Christchurch, New Zealand, ³University of Tsukuba, Tsukuba, Japan

8D: Sedimentary evidence of geohazards – past and present (1), Rongomātāne A (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

The Nankai Trough subduction zone is one of the most seismically active regions in the world, with a long record of tsunamis having affected the coastal areas of western and southern Japan. Research carried out in a coastal wetland on Shima Peninsula has identified up to 10 sand layers in a core (SH-1) about 250 m from the present shoreline. Based on their sedimentary characteristics and the occurrence of abundant marine micro- and macrofossils, these sand layers were attributed to tsunamis that had occurred between about 4500 and 500 years ago (Fujino et al., 2018, QSR).

However, it is recognised that using the limit of sand deposition leads to an underestimation of the tsunami inundation limit and magnitude of the generating event. Thus, here, we aim to use geochemical signatures to help trace tsunami deposits beyond the extent of the visible sand layers. Two cores (SH-1, and SH-2, 150 m further inland) were analysed using an Itrax core scanner. All sand layers, in both cores, had distinct geochemical signatures (mineral content, and shell material in a few instances). Furthermore, three mud layers, most likely representing deposits left behind by tsunami inundation beyond the sand limit, could be recognised in core SH-2. One layer is characterised by elevated Ca, Sr and Br, reflecting the occurrence of marine shell material, whereas the other two exhibit a slightly higher mineral content (slightly higher Si, K, Ti and Rb), compared to the surrounding organic-rich mud. While it is recommended to use other proxies, such as organic biomarkers, to confirm the incorporation of marine-derived compounds in these fine-grained layers, Itrax core scanning provides a useful tool to identify tsunami deposits beyond the sand limit. This helps provide a better estimation of the inundation limit by past tsunamis, thereby improving risk assessment and preparedness.

High-Resolution Imaging of Biofilms in Holocene Tufa from the Murujuga Rock Art Province, Northwest Australia

Dr France Champenois¹, Dr Caroline Mather², Dr Maurice Tucker³, Dr Jo McDonald¹

¹Centre for Rock Art Research and Management, School of Social Sciences, The University of Western Australia, Perth, Australia, ²UWA School of Agriculture and Environment, The University of Western Australia, Perth, Australia, ³School of Earth Sciences, University of Bristol, Bristol, United Kingdom

6B: Microbial architects of carbonates: Insights from modern to deep-time systems, Tāwhirimātea C (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

Calcium-carbonate tufa deposits form in freshwater environments and are frequently utilised as palaeoenvironmental archives. Tufa precipitates from calcium-carbonate saturated waters driven by carbon dioxide degassing as well as microbial processes. Many tufa display a dominance of microbial fabrics, highlighting the role of microbes and their biofilms in precipitation. Further knowledge of the role of microbes in tufa precipitation are needed to accurately interpret tufa-derived palaeoenvironmental records.

Tufa deposits from the semi-arid Murujuga (Dampier Archipelago, Western Australia) provide an opportunity to investigate the microbial influence on tufa precipitation. Here the tufa are widespread within ephemeral streams, primarily occurring as fluvial tufa, barrages and cascades. The tufa consist almost entirely of microbial fabrics and are still forming, allowing us to investigate the modern biofilms and microbes associated with recent tufa precipitation.

Here we use a range of microscopic techniques to analyse the microbial structures and fabrics, and investigate the microbial communities involved in constructing the fabrics. Petrographic study revealed that the tufa primarily comprises a laminated-stromatolitic internal fabric consisting of alternating layers with laminar, peloidal to dendrolitic microfabrics. The laminar and dendrolitic microfabrics include networks of calcified filaments, whereas peloidal microfabrics consist of interconnected clusters of dense micritic peloids (clots) including filamentous structures insinuating filamentous cyanobacteria played an important role in the tufa construction. High-resolution imaging techniques, such as confocal microscopy, scanning electron cryomicroscopy (CryoSEM), as well as other SEM techniques involving critical point drying are applied to investigate microbial communities and their relationship to surrounding mineral phases to understand how these tufa carbonates were formed.

Insights from this study advance our knowledge on the variety of microbial components and communities that influence tufa formation. These outcomes also improve our understanding of the conditions and mechanisms of tufa formation at Murujuga, enhancing our ability to develop rigorous palaeoenvironmental records for this region.

Microbially-Mediated Carbonate Precipitation Accretion Model for Precambrian Laminated Microbialites

Dr France Champenois^{1,2}, Dr Maree Corkeron², Dr Annette D George²

¹Centre for Rock Art Research and Management, School of Social Sciences, The University of Western Australia, Perth, Australia, ²School of Earth and Oceans, The University of Western Australia, Perth, Australia

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Microbialites are organosedimentary deposits formed by carbonate precipitation and/or trapping and binding of sediments in biofilms encrusting micro-organisms such as filamentous cyanobacteria. They represent sedimentary archives recording the environmental conditions in which they formed, therefore making them important proxies for paleoclimatic and paleoenvironmental conditions. In this study, we show evidence for an alternative microbially-mediated accretion model through the multiscale analysis of Cryogenian shallow marine microbial dolostones from the Arkaroola Reef (South Australia) deposited during a major interglaciation. Micritic threads, micropeloids (clots) and micro-pillars were identified in the grumous and disorganised microfabrics that characterise these subtidal reefal dolostones. Nano- to microscale analysis of microbialite microfabrics using high resolution imaging techniques like scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS) and nanoscale secondary ion mass spectroscopy (NanoSIMS) revealed extracellular polymeric substance (EPS), bacterial sheaths, and filaments suggesting a mixed microbial community dominated by filamentous cyanobacteria. The close spatial association between microfossils, aggregates of authigenic clays and primary cryptocrystalline dolomite crystals suggests microbial metabolic processes facilitated syngenic organomineralisation of bacterial templates resulting in the preservation of microfossils. We propose that the clays further chemically altered the microenvironment lowering kinetic barriers for the initiation of syngenic microbially-mediated nano- to microscale dolomite precipitation. The resulting solid microframework served as the basis for the continued upward and outward growth of filamentous cyanobacteria. The microframework of laminae and pillars accommodated precipitation of syngenic marine cement and early diagenetic dolomite in the interstitial pore space. This study offers new insights into ancient microbialite growth mechanisms and challenges the taphonomic limitations commonly set for microbial microfossil preservation in Precambrian dolomites.

Tectonic Subsidence of the Southeast China Coast: New Evidence from Late Pleistocene Transgression in Ningde Bay

Professor Jing Chen¹

¹East China Normal University, Shanghai, China

6A: Sedimentology and Luminescence keys to tune late Quaternary tectonic, climate and eustatic events, Tāwhirimātea A (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

Subsidence of the ancient Zhejiang-Fujian Uplift (ZFU) is important to understand opening of the Chinese marginal seas and geomorphology of the east China coast. However, little was known about its subsidence history during the Quaternary. In this study we clarify three marine sedimentary layers constrained by luminescence (OSL) chronology in the Ningde area of the southeast China coast, to reveal the regional subsidence evolution related to the ancient ZFU. The results show that three marine sedimentary layers above bedrock in the Ningde area are formed during global sea-level highstands of MIS1, MIS3 and MIS5e, constrained by OSL datings of the three representative cores. Limited marine influence of MIS5e highstand indicated both by microfacies of the representative cores and by the paleo-shoreline outlined from 120 cores, implies that tectonic subsidence occurs here during the Late Quaternary. The offsets between the peak global sea level and the corrected paleo-shoreline elevations of MIS5e and MIS3 reveal that the average subsidence rate is ~ 0.5 m/kyr since MIS5e and ~ 0.8 m/kyr between MIS5e and MIS3 in the Ningde area. This evidence suggests that the ancient ZFU possibly subsided rapidly since MIS5e and stabilized since MIS3. This study provides new insights into the subsidence history of the ancient ZFU and land-sea interaction in the tectonic subsidence region.

Early Cretaceous Jehol Biota Flourished in a Humid Mountain Lake Drainage

Jiquan Chen¹, Yuan Gao¹, Daniel Ibarra², Lijuan Sha³, Chengshan Wang¹

¹China University of Geosciences, Beijing, China, ²Brown University, Providence, USA, ³Xi'an Jiaotong University, Xi'an, China

9A: Deep time biogeomorphology (2) & Ichnology and sedimentary basin research: assessing environmental conditions, Tāwhirimātea A (Level 2), January 29, 2026, 4:25 PM - 5:55 PM

Water shapes the Earth surface through modulating climate, sculpting landscapes and sustaining ecosystems; however, relationships among hydrological, biological and topographical evolutions in deep time remain ambiguous, due to challenges to quantitatively reconstruct hydrological parameters, e.g., relative humidity (RH). Here, we use triple oxygen and clumped isotope measurements of lacustrine carbonates to provide insights into the environmental RH for the Early Cretaceous Jehol Biota, known for rich biodiversity of the earliest flowering plants, feathered dinosaurs, and early birds, etc. The isotopic results suggest a humid climate with an RH value of 0.82 (± 0.03 , 1σ), consistent with humidity-sensitive fossil evidence (RH > 0.65). Combined with annual mean temperatures of 6.5 to 13.9 °C, which indicate elevations of 2.1 to 3.1 km, the habitat of the Jehol Biota is analogous to that of modern biodiversity hotspots such as Shangri-La in the Hengduan Mountains or Páramos in the tropical Andes. In the Early Cretaceous, greenhouse climate and regional tectonism facilitated abundant moisture in a high-relief topography, cultivating a humid mountain lake drainage sustaining the flourishing of the Jehol Biota.

A Decrease in Low-latitude Weathering Flux Facilitated the Demise of the Late Paleozoic Ice Age

Professor Anqing Chen^{1,2}, Assistant Professor Shi Sun^{1,2}, Professor Mingcai Hou^{1,2}, Professor James Ogg³, PhD student Guanghui Huang^{1,2}, PhD student Runan Yong^{1,2}

¹State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Chengdu University of Technology, Chengdu 610059, China, ²Key Laboratory of Deep-time Geography and Environment Reconstruction and Applications, MNR & Institute of Sedimentary Geology, Chengdu University of Technology, Chengdu 610059, China, ³Department of Earth, Atmospheric, and Planetary Sciences, Purdue University, West Lafayette, USA

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Late Paleozoic Ice Age (LPIA) was a series of modulated glacial-interglacial pulses that characterized the climate of the late Carboniferous through Permian. Although the ages and durations of the main major episodes of the LPIA have been calibrated from glacial deposits in eastern Australia and elsewhere, the causal factors for the final transition from the oscillating icehouse climate to a continuous hothouse remains uncertain. To aid in unraveling the potential causes for this climatic turnover and its characteristics in the tropical latitudes, we measured the weathering indices and redox proxies recorded by the Lopingian (Late Permian) strata in the Shangsi section of the Upper Yangtze region in South China. The multiple weathering indices derived from the geochemical composition of the acid-insoluble residues in the carbonate rocks exhibit consistent trends. These trends, when combined with published coeval weathering data from other regions, trace four global phases of weathering changes during the late Permian. After the middle Wuchiapingian, the observed increase in the weathering indices and a negative excursion in carbon isotope are apparent responses to gradual warming. The simultaneous increase in ocean oxygenation may have also played a role in the deglaciation. Based on the changes in tropical exposed land area through the late Permian, we quantitatively estimated the low-latitude chemical weathering flux by combining contemporaneous weathering indicators. The curve of that estimated flux support the hypothesis that a sustained decrease in low-latitudes weathering flux, the implied apparent decrease in the amount of exposure and total weathering of silicate rocks, may cause a weakening of the carbon sink and a continuous accumulation of atmospheric CO₂, which in turn facilitate the stepwise deglaciation of LPIA and the onset of a long-term hothouse climate.

Mass-Transport Deposits as Tectonostratigraphic Markers of Thrust Activity and Trench-Slope Basin Development: Example of the Southern Hikurangi Margin

Dr Barbara Claussmann¹, Dr Julien Bailleul², Dr Frank Chancier³, Dr Geoffroy Mahieux⁴, Dr Vincent Caron⁴

¹Slb, Oxford, United Kingdom, ²U2R 7511, Basins-Reservoirs-Resources (B2R), Geosciences department, UniLaSalle, Beauvais, France, ³University of Lille, CNRS, ULCO, IRD, UMR 8187, Laboratory of Oceanology and Geosciences (LOG), Lille, France, ⁴U2R 7511, Basins-Reservoirs-Resources (B2R), University of Picardie Jules Verne, Amiens, France

3D: Controls on sedimentation at submarine active margins (3), Rongomātāne A (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

Along submarine active margins, sediment transport, distribution and preservation are strongly influenced by tectonic processes, particularly where thrust faulting and seafloor deformation drive slope failure and mass-wasting. Mass-transport deposits (MTDs), key expressions of this coupling, often exhibit considerable variability along the margin, in form and origin, reflecting differences in structural context and basin evolution. This study explores the nature and tectonostratigraphic significance of thrust-related MTDs in the frame of subduction-margin sedimentary basins (e.g., trench-slope basins [TSBs]).

For this, we examine Miocene MTDs exposed onshore in the southern Hikurangi subduction margin (New Zealand) and combine our detailed outcrop analysis with regional offshore seismic data to link fine-scale depositional features to broader basin- to margin-scale understandings. Our findings emphasize (1) that thrust ridges exert strong spatial and temporal control on sediment redistribution in TSBs, influencing both the style of slope failure and nature of MTDs and basin infill; and (2) that MTDs originating from distinct structural settings—such as thrust forelimbs and thrust backlimbs—exhibit systematic differences in architecture and emplacement mechanisms.

Overall, these deposits are not merely the product of slope failure but serve as sensitive recorders of basin evolution and deformation history. Their occurrence aligns with key phases of thrust propagation and slope reorganization, marking them as important stratigraphic and tectonic indicators. They can therefore provide key clues to reconstruct the development of the southern Hikurangi margin—and more specifically its associated TSBs—since the onset of subduction. By documenting the relationships between tectonic structures, slope failure, and depositional patterns, this work highlights how gravity-driven sedimentation along active margins is dynamically governed and impacted by structural growth.

Our findings contribute to a refined understanding of the interactions between tectonic deformation and sedimentary processes in submarine active settings. It also offers valuable insights for interpreting sedimentary records, assessing geohazards, and constraining margin evolution through time.

Mixed Siliciclastic–Carbonate Shelf-Derived Redeposition in Tectonically Active Settings: Example of the Southern Hikurangi Margin Gravity-Driven Systems

Dr Barbara Claussmann¹, Dr Julien Bailleul², Dr Frank Chancier³, Dr Vincent Caron⁴, Dr Geoffroy Mahieux⁴, Dr Adam McArthur⁵, Mr Corentin Chaptal⁶, Dr Hugh Morgans⁷, Dr Bruno Vendeville³

¹Slb, Oxford, United Kingdom, ²U2R 7511, Basins-Reservoirs-Resources (B2R), Geosciences department, UniLaSalle, Beauvais, France, ³University of Lille, CNRS, ULCO, IRD, UMR 8187, Laboratory of Oceanology and Geosciences (LOG), Lille, France, ⁴U2R 7511,

Basins-Reservoirs-Resources (B2R), University of Picardie Jules Verne, Amiens, France, ⁵School of Earth and Environment, University of Leeds, Leeds, United Kingdom, ⁶Offshore Wind Consultant LTD, East Point Geo Limited, Chalgrove, United Kingdom, ⁷GNS Science, Lower Hutt, New Zealand

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Understanding carbonate slope redeposition in tectonically active settings requires accounting for both structural complexity and the nature of sediment supply. This study investigates gravity-driven depositional systems sourced from mixed siliciclastic–carbonate shelfal domains developed atop and around actively growing thrust structures along the southern Hikurangi margin (New Zealand). Using integrated photogrammetry, field observations, and taphonomic data, we document the stratigraphic architecture and variability of turbidites and mass-transport deposits (MTDs) sourced from structurally contrasting shelfal settings— specifically continent-attached and continent-detached thrust forelimbs and thrust backlimbs. These shelf-derived deposits span several kilometers laterally and range from tens to a few hundred meters thick. They developed over durations of 1–2 million years, closely tracking the evolution of the underlying tectonic structures. This study highlights that actively deforming settings with mixed sediment supplies can produce highly variable gravity-driven systems, which differ from both classic carbonate and siliciclastic slope models. Deposits sourced from continent-attached forelimbs show simpler geometries, whereas those derived from continent-detached backlimbs display more complex internal architectures— reflecting variations in slope gradient and evolving tectonic control. Our findings show that tectonic setting governs not only slope destabilization but also the nature of sediment redeposition, with shelf-edge and slope morphologies influencing flow transformation, particle segregation, and depositional architecture. Redeposition occurred on both sides of the thrust ridges, demonstrating the dual sourcing potential of structurally partitioned carbonate shelves. Yet, the MTDs sourced from thrust backlimb settings recorded the subtle imprint of tectonic motion and margin reorganization and can therefore act as sensitive indicators of fault activity and slope reorganization, informing on the growth history of individual thrust structures. This study provides new insights into carbonate slope redeposition processes in fold-and-thrust belts, with implications for predicting sediment architecture, reconstructing tectonostratigraphic evolution, and assessing geohazards in mixed carbonate-siliciclastic settings.

Enhancing Subsurface Understanding Using Forward Stratigraphic Modeling: Case Studies from Taranaki and Malampaya

Robin Ulwig¹, **Dr. Barbara Claussmann**², Dr. Mostfa Lejri²

¹Bayerisches Landesamt für Umwelt, Germany, ²SLB

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Forward Stratigraphic Modeling (FSM) offers a process-based approach to simulating sedimentary systems, providing valuable insights for better understanding and predicting the subsurface. This study presents two applications of SLB's FSM software, Geological Process Modelling (GPM), which was used to create 2D models of geologically complex settings.

The first case study focuses on the clinoform development of the Plio-Pleistocene Giant Foresets Formation in the northern Taranaki Rift Basin, offshore New Zealand, where deposition was strongly influenced by the tectonic activity of a normal fault zone. An iterative modeling approach, calibrated with well log and 3D seismic data, was used to test different fault slip rates, timings and sediment input scenarios. The resulting model successfully reproduced the clinoform geometries observed in the seismic data, refining the timing and magnitude of fault activity and revealing detailed sedimentary heterogeneity through high temporal resolution.

The second case study examines the evolution of the Late Eocene – Late Miocene Malampaya carbonate platform offshore the Philippines, where lithofacies distributions reflect a complex interplay between regional tectonics and sea-level fluctuations. GPM helped constrain key parameters such as carbonate growth rates and tectonic phases, challenging and refining our geological understanding of the platform development.

From both models, synthetic seismic data tuned at different frequencies (5-100 Hz) were generated and compared to the original data. High-frequency (>50 Hz) synthetic data revealed geological features not visible in conventional seismic, highlighting the power of combining FSM with synthetic seismic modelling.

Overall, these case studies demonstrate how FSM can better inform interpretations of stratigraphic architecture, depositional history and lithofacies distribution. Such studies not only enhance our geological understanding locally, but also provide information on the general interaction between geological processes, which can then be applied to other study areas.

Deposition and Preservation Potential of an Intermittent Lacustrine Braid-Delta at Ivanpah Dry Lake, Mojave Desert, CA

Mrs Constance Cooper¹, Mr Christopher Fedo¹, Mr Jeffrey Moersch¹

¹University of Tennessee, Knoxville, Knoxville, United States

6D: The complexity of braided rivers that reach the base level, Rongomātāne A (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

Braided rivers, and their terminal deltas, played a critical role in clastic terrestrial deposition through Earth history. Braid deltas occur throughout the sedimentary record, with modern examples on all continents except Antarctica. The Mojave Desert in Eastern California and Nevada forms part of the Basin-and-Range province where continental extension has created half-graben rift basins filled with clastic sediment, including underfilled lakes. At Ivanpah Dry Lake (IDL), gravelly braided rivers feed into the northern margin of this N-S elongate basin from the Clark Mountains and State Line Hills. Initially interpreted as a beach deposit, mapping using imagery from a small unmanned aircraft system, GoogleEarthTM, and ground documentation show the formation and evolution of an intermittent, lacustrine, linear, braid delta using a newly developed classification system. The IDL braid delta progrades during extreme, short-lived rainfall events. Changes in braid-delta configuration shown in sequential imagery from 2010-2021 identify multiple depositional events, which establishes deposit geometry and time of formation for individual braid-delta lobes and jet deposits. Imagery also documents that present surface deposits are actively undergoing reworking and erosion. Hourly precipitation, wind speed, and wind direction records provide a basis to document annual depositional events and their subsequent erosional modifications, with implications for preservation potential. Extreme precipitation events that impact IDL derive from monsoon and hurricane precipitation bringing large amounts of water and sediment into the lake by sheet wash and the development of braid-delta lobes at the end of major channels. Between depositional events, ~4000 hours of Santa Ana winds and ~1000 hours of wind from Pacific frontal storm systems rework and erode delta deposits, resulting in braid-delta lobes losing ~50% of their area after six years, raising questions about how these types of braid deltas preserve within the rock record.

Stratigraphy and Luminescence Dating of the Gulf of Baratti Coastal Deposits (Tuscany, Italy)

Dr Giulia Cossu¹, Dr Marta Lai¹, Professor Stefano Andreucci², Dr Daniele Sechi², Professor Vincenzo Pascucci¹

¹University of Sassari, Sassari, Italy, ²University of Cagliari, Cagliari, Italy

6A: Sedimentology and Luminescence keys to tune late Quaternary tectonic, climate and eustatic events, Tāwhirimātea A (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

The Gulf of Baratti, located in the Tuscany coast (Italy), preserves a stratigraphic record of marine, and continental deposits that has drawn scientific interest in the last 30 years. Previous interpretation focused mainly on the number and age of marine terraces, proposing two or more. The sequence begins with a marine terrace extending from basal transgressive lag to foreshore. Above this, three generations of coastal dunes are identified, intercalated with reddened paleosoil levels. In the upper succession, the dunes are intensely bioturbated and interrupted by several coarse-grained sheetflood deposits indicating episodic flows in a wadi-like fluvial system. A paleosol separates these deposits from an overlying meandering river point bar, which is now capped by modern soil.

To assess the depositional history of Baratti this study combines sedimentological and stratigraphic analysis with Luminescence dating. Samples from key units, including the marine foreshore, the sheetflood layers and an upper paleosol, were dated and compared with existing chronological data. Preliminary results date the marine terrace to 88 ± 6 ka, ascribing it to a late Marine Isotopic Stage 5. The sheetflood deposit and the overlying paleosoil yielded ages of 44 ± 3 ka and 36 ± 4 ka, respectively, placing them within MIS 3. According to previous data the point bar deposit is 19 ± 2 ka, shortly after the Last Glacial Maximum.

This study confirms that the succession records a single marine unit from late MIS 5 interglacial overlain by continental deposits encompassing MIS 4 to Holocene. During MIS 3, climatic instability triggered dry-wet episodes, recorded in the dune–channel–soil alternation. Notably, wet conditions post-Last Glacial Maximum supported the development of a meandering river system, challenging assumptions of regional aridity during glacial phases. This work underscores the interplay of global climatic variations and local environmental controls in shaping coastal archives.

Local Hydrogeochemistry and Geology Control Beachrock Formation in a Non-Tropical Mediterranean Shoreline

Dr Giulia Cossu¹, Dr Myriam Francesca Stelletti¹, Mr Paolo Marras², Professor Daniela Medas², Dr Elisabetta Dore², Dr Dario Fancello², Professor Vincenzo Pascucci¹, Professor Stefano Andreucci²

¹University of Sassari, Sassari, Italy, ²University of Cagliari, Cagliari, Italy

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Beachrocks are sandstones that undergo rapid cementation by calcium carbonate precipitation in the intertidal zone, typically because of interactions between marine and meteoric waters. While the precise mechanisms behind their formation are still debated, including possible microbial influence, these features are significant markers of ancient shorelines and widely used in reconstructing Holocene sea-level changes. Typically described in tropical settings, often associated with coral reefs or barrier-lagoon systems that facilitate water mixing and oversaturation, beachrocks are rarely reported in temperate zones or along cliff-bounded beaches.

In this study, we document actively forming beachrock at Punta Tramontana (NW Sardinia, Italy), a small embayment bounded by a cliff where the volcanic basement is overlain by Pleistocene marine sandstones. Clasts of previously cemented sandstone occur within the Pleistocene deposit. Small perennial freshwater springs emerge at the contact between these formations. The mixing of freshwater with marine waters appears to drive seasonal cementation along the shoreline, which also incorporates anthropogenic materials such as plastics.

Samples were collected along land-to-sea transects aligned with freshwater rivulets and analyzed through thin section petrography, scanning electron microscopy, and cathodoluminescence. Water chemistry was characterized by pH, salinity, major and trace elements, and isotopic composition by $\delta^{18}\text{O}$ and δD analysis. Preliminary results show spring waters are sodium-chloride dominated and the beachrock displays meniscus-type cement with a decreasing Mg/Ca ratio toward the sea (from 2.8 to 1.96%), against expectations. This suggests cementation is primarily driven by waters enriched through interaction with Pleistocene sediments rather than by marine contribution. The presence of beachrock fragments within Pleistocene deposits indicates these conditions have persisted over long timescales.

These findings expand understanding of beachrock formation beyond classical tropical settings, highlighting how local hydrogeochemistry and geology can facilitate rapid cementation in temperate environments. This study offers new insights into the processes driving beachrock development and their environmental significance.

If Trees Could Fly: Living Landscapes in a Late Palaeozoic Dryland River System

James Craig¹, Professor Neil Davies¹, Dr William McMahon¹

¹University of Cambridge, Cambridge, United Kingdom

8A: Deep time biogeomorphology (1), Tāwhirimātea A (Level 2), January 29, 2026, 1:40 PM - 3:10 PM

Pennsylvanian and Early Permian strata from Euramerica record a shift from lycopsid-dominated tropical 'coal swamps' to conifer-dominated dryland environments. One record of this interval is the Prince Edward Island (PEI) Group of Canada, a red-bed succession deposited in a semi-arid river system during the latest Carboniferous to early Permian. In this talk, we discuss the stratigraphic distribution of sedimentary facies and plant and trace fossils from the PEI Group and outline how these biological records provide insights into ancient river hydrology.

In the lower portion of the PEI Group, plant fossils are common but bioturbation is relatively sparse. Plant fossils include fallen trees up to 28 m in length and standing *Walchia* trunks which expand sparse Palaeozoic records of in situ conifers. The plant fossil record is complemented by vegetation-induced sedimentary structures (VISS), which provide evidence of early conifers mediating sedimentation and erosion. In younger strata, plant fossils are scarce, but bioturbation becomes more abundant. This trend may record ecological responses to continuing aridification through the Early Permian. Alternatively, the trends could reflect changing extents of sedimentary stasis recorded in the succession as aridification reduced flood recurrence; lower in the succession, rapid burial of substrates may have protected plant material from decay and not allowed time for bioturbation, while in younger strata, greater time between depositional events may have favoured the inverse.

Plant and animal signatures evidence ancient discharge variability on a range of timescales. Burrowed dune foresets evidence short periods (days-months) of stasis between punctuated flood events while parautochthonous fossil trees evidence longer-term (years-decades) variability, spanning years of forest growth followed by rapid burial. Decay-related VISS constrain minimum burial rates around trees, as their creation requires plant entombment to outpace decay.

Fidelity of Earth Historic Archives Unrelated to Rock Quantity

James Craig¹, Ralph Battle¹, Yorick Veenma¹, William McMahon¹, Ben Slater², Anthony Shillito³, Neil Davies¹

¹University of Cambridge, Cambridge, United Kingdom, ²Uppsala University, Uppsala, Sweden,

³University of Saskatchewan, Saskatoon, Canada

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The sedimentary-stratigraphic record is the principal repository of empirical historic evidence for evolution and deep time environments. However, the spatial heterogeneity of deposition and erosion means unequal quantities of rock are preserved from different intervals of Earth history. This is argued to bias fossil records, with correlations apparent between fossil diversity and mapped rock area from different intervals. However, mapped rock area is a poor measure of the amount of rock available for fossil studies because 1) most is concealed; and 2) spatially diminutive older rocks commonly sample a greater stratigraphic transect per unit exposure area than widespread younger rocks because the tectonic forces that drive recycling additionally result in tilting.

We propose observable stratigraphic thickness as an improved measure of rock quantity available for palaeoenvironmental studies, and calculate this value throughout geologic history for southern Britain. We show that potential sample availability increases with age through the Phanerozoic due to tectonic tilting, in contrast to general models of rock survivorship. Using the extensively studied British record as a calibration sample for the global record, we find no correlation between available stratigraphic thickness and palaeobiodiversity, except in flat-lying strata. Our work suggests that preservation biases induced by variability in rock quantity have been overstated and that local tectonic history renders different regions as stratigraphic hotspots for specific intervals, in which intensive high-veracity fossil records have exceptional value for elucidating global trends and timing in evolutionary history. The British non-marine Palaeozoic record is highlighted as such an example, with high-fidelity palynological records of plant evolution and ichnological records of animal terrestrialization.

Controls of High-Frequency Base-Level Oscillations on Shallow-Water Delta Architecture: Implications for Reservoir Prediction in Lacustrine Basins

思念 **Yingkun Cui**¹, Professor Fujie Jiang¹

¹China University of Petroleum, Beijing, Beijing, China

5D: The continental sedimentary successions and their ability in understanding the present and forecasting the future of the Earth's surface (2), Rongomātāne A (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

Shallow-water deltas in low-accommodation continental lacustrine basins serve as excellent natural laboratories for recording high-frequency paleoclimate and depositional environment changes, as well as key targets for hydrocarbon exploration. However, the mechanisms controlling high-frequency base-level oscillations and their impact on sandbody evolution remain poorly understood. To address this, we investigated the Cretaceous Quantou Formation in the Songliao Basin using core, well-log, and petrological data, integrated with INPEFA analysis and redox-sensitive chromaticity indices. A high-resolution sequence stratigraphic framework was established, comprising four fourth-order (MSC1-MSC4) and thirteen fifth-order sequences (SSC1-SSC13). Chromaticity variations reveal alternating oxic-anoxic deposition, reflecting high-frequency lake-level oscillations under a transgressive background. Sedimentary analysis shows that SSC1-SSC6 are dominated by progradation, forming multi-stage, mud-free, high-energy distributary channels with strong erosion, evolving from narrow, high-sinuosity to stable braided patterns. In contrast, SSC7-SSC12 exhibit retrogradation, with mud-rich, weakly scoured channels under low-energy conditions, transitioning from delta plain to distal front, where isolated distributary channels dominate. SSC13 returns to progradation, featuring narrow channels and thin but continuous sheet sands. This study demonstrates that high-frequency base-level fluctuations control sandbody stacking patterns and reservoir quality, providing both theoretical insights into shallow-water delta dynamics and practical applications for hydrocarbon reservoir prediction in analogous lacustrine basins.

Feldspar Dissolution Controlled by Coal-Measure Fluids and the Impacts on Pore Structure of Tight Sandstone Reservoirs

Dr Zhicheng Cui¹

¹中国石油大学(华东), Qingdao, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Coal-derived diagenetic fluids play a pivotal role in controlling reservoir quality through feldspar dissolution intensity and the distribution of kaolinite and quartz. This study innovatively quantifies the impact of varying degrees of diagenetic alteration by coal-derived organic acids on pore structures and reservoir properties, integrating mineralogical and fluid geochemistry evidence in the Mobei and Mosuowan uplifts within the Junggar Basin. The results reveal that authigenic minerals predominantly originate from K-feldspar dissolution facilitated by coal-derived organic acids. They precipitate preferentially in situ within intergranular pores through diffusion in relatively closed diagenetic environments. Detailed analysis indicates that feldspar dissolution marginally enhances porosity by up to 0.4%, with permeability reduction primarily attributed to authigenic mineral precipitation blocking pore throats. Proximity to hydrocarbon source rocks dictates differentiation in reservoir quality: the Mobei reservoirs exhibit high porosity and permeability characteristics, driven by well-developed network pore structures featuring effectively connected pore-throat systems, contributing 88.8% to permeability.

In contrast, the Mosuowan reservoirs, closer to coal-measure source rocks, undergo more intensive diagenetic modification, resulting in lower compositional and structural maturity. They primarily exhibit relatively high-porosity but low-permeability reservoirs, dominated by tree-like pore structures associated with clay minerals. This systematic study of differential pore structure formation demonstrates how fluid-rock interaction distances fundamentally control reservoir quality evolution, contributing to the comprehensive research of deep tight sandstones.

Transport and Deposition of Organic Carbon by Outsized Turbidity Currents

Dr Celeste Cunningham^{1,2}, Dr. Bill Arnott²

¹St. Francis Xavier University, Antigonish, Canada, ²University of Ottawa, Ottawa, Canada

7A: Applications of Sedimentology for the Green Energy Transition & The role of subaqueous sediment gravity flows in carbon sequestration, Tāwhirimātea A (Level 2), January 29, 2026, 10:15 AM - 11:45 AM

Deep-marine levees are really extensive features that experience high rates of sedimentation, making them ideal sites for significant carbon burial and preservation. Although modern deep-marine levees have been shown to sequester a large proportion of the world's total buried organic carbon (OC), relatively few studies have examined OC sequestration in ancient deep-marine slope channel systems. Furthermore, many of the physical and chemical processes by which OC is transported, deposited, and preserved in deep-marine environments remain unknown. Physical observations and chemical analyses of well-exposed slope levees in the Neoproterozoic Windermere Supergroup (Western Canada) have shown that the presence of high quantities of organic matter in turbidity currents can alter the flow properties by increasing viscosity and promoting increased aggregation, resulting in the deposition of unique organic-rich facies. OC in these strata occurs primarily as clay-organic nanocomposites derived from dissolved organic carbon in the water column, but also as uncommon sand-sized organo-mineralic aggregates and discrete sand-sized amorphous grains (derived from particulate organic carbon). Notably, this OC occurs mostly in anomalously thick, mud-rich sandstone beds interspersed in successions of thin-bedded, comparatively organic-poor turbidites. The concentration of OC in thick beds suggests that even when primary productivity is high it only becomes mobilized in significant quantities into the deep sea by uncommon, outsized turbidity currents. As these outsized flows overspilled the channel margins, the rapid collapse of the turbulent suspension resulted in elevated rates of sediment fallout that promoted aggregation of organic matter and clay particles, increasing fluid viscosity, and ultimately en masse deposition. Rapid burial plus association with clay mineral surfaces prevented organic matter degradation, thereby effectively sequestering significant amounts of carbon in the sediment. This work provides key insight into the fundamental physical and chemical processes that control OC transport and deposition from sediment gravity flows.

Deciphering the Submerged Landscape of Taranto: Geophysical Evidence of Environmental and Depositional Change since the Last Glacial Maximum

Dr Vito D'Abbicco¹, Dr Francesco De Giosa², Dr Alessia de Luca¹, Dr Teresa Fracchiolla¹, Dr Guglielmo Gianolio¹, Dr Stefania Lisco¹, Prof Giuseppe Mastronuzzi¹, Prof Massimo Moretti¹

¹Università degli studi di Bari "Aldo Moro", Bari, Italy, ²En.Su Environmental Surveys S.r.l., c/o Dipartimento di Scienze della Terra e Geoambientali, Università degli studi di Bari "Aldo Moro", Bari, Italy

3C: Coastal to shelf environments across time and space (3), Tāwhirimātea E (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

This PhD research is conducted within the framework of the Italian National Cartographic Project (CARG) and focuses on the geological and environmental characterization of the submerged offshore area of Taranto (Apulia, southern Italy). The study integrates a multidisciplinary dataset acquired through Multibeam Echosounder, Side-Scan Sonar, Sub-Bottom Profiler, and Multichannel Seismic instrumentation. The area, encompassing Mar Piccolo, Mar Grande, and the northern Ionian sector, is particularly suitable as a natural laboratory due to the coexistence of intense anthropogenic pressure and high marine biodiversity. The main objectives are to reconstruct the geological evolution of the area from the Last Glacial Maximum (LGM) to the present and to develop a comprehensive geodatabase for evaluating sedimentary, ecological, and anthropogenic interactions on the seafloor.

Stratigraphic interpretation is based on the identification of key seismic unconformities and depositional sequences, distinguishing Lowstand (LST), Transgressive (TST), and Highstand System Tracts (HST). In Mar Piccolo basin, the sequence is studied with high detail through borehole data, radiocarbon dating, and facies analysis. However, challenges arise when correlating this framework to the adjacent shelf and slope domains in the other two marine basins. The presence of chaotic seismic bodies interpreted as landslides, consistent with Falling Stage System Tracts (FSST), further complicates interpretation in the slope sector.

This study contributes to the creation of the first complete geological map of the Italian seabed as part of the CARG project. High-resolution surveys provide a detailed and extensive dataset of the Taranto offshore area, supporting future research beyond strictly geological point of view.

The results provide a basis for understanding the interplay between sedimentary processes, sea-level fluctuations, and anthropogenic impacts in a complex coastal-marine system. Furthermore, the integration and interpretation of these data offer solid foundations for marine ecosystem conservation and the ecological transition promoted by regional, national, and European development plans.

Side Scan Sonar Data in Taranto Area (CARG Project)

Dr Vito D'Abbicco¹, Dr Francesco De Giosa², Dr Alessia de Luca¹, Dr Teresa Fracchiolla¹, Dr Guglielmo Gianolio¹, Dr Stefania Lisco¹, Prof Giuseppe Mastronuzzi¹, Prof Massimo Moretti¹

¹Università degli studi di Bari "Aldo Moro", Bari, Italy, ²En.Su Environmental Surveys S.r.l., c/o Dipartimento di Scienze della Terra e Geoambientali, Università degli studi di Bari "Aldo Moro", Bari, Italy

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

This research project focuses on the Marine Geology aspects of the offshore submerged area of Taranto as part of the Italian national cartographic project CARG coordinated by ISPRA. All the acquired data allowed us to obtain a comprehensive assessment of the seabed with a multidisciplinary approach, studying the interconnections between sedimentological, eco-biological and anthropogenic dynamics.

The study area of Taranto (Northern Ionian Sea) is particularly interesting not only from a geological point of view. The area includes three different marine basins: a semi-enclosed, shallow basin (Mar Piccolo), a deeper open basin (up to 1,500 meters - Northern Ionian Sea), and a circular basin (Mar Grande) with intermediate hydrodynamic features and depths between the other two. The submerged sector of the area hosts great biodiversity but is affected by intense anthropogenic impacts.

The morphological survey was conducted using a KLEIN 3000 Side-Scan Sonar with simultaneous dual frequency (100 kHz - 500 kHz). SSS morphological data have been processed to produce georeferenced acoustic images (mosaics) with 0.50 m resolution, which have been imported to the GIS platform for morphological classification of the seabed and the subsequent interpretation and digitization phase.

The SSS data allowed us to recognize and produce the map of the distribution of habitats on the sea floor, like seagrass meadows and bioconstructions. This map has been produced correlating the backscattering signal to the type of substrate, the degree of light penetration and depth.

Finally, the mosaic resolution enables the recognition of morphologies on the seabed as a consequence of different anthropogenic activities. Due to the large extent of the areas affected, and the density of the traces recognized, only their areal distribution has been mapped.

The collected data will give stronger foundations to support the ecological transition and conservation of marine ecosystems, promoted in the Blue Economy sections of several development plans.

Unveiling Mesoproterozoic Tidal Architecture: a Digital Outcrop Model of the Morro Do Chapéu Formation

Mr Erik Dario¹, Claiton Scherer¹, Ezequiel De Souza²

¹Universidade Federal Do Rio Grande Do Sul, Porto Alegre, Brazil, ²Universidade Federal do Pampa, Caçapava do Sul, Brasil

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Proterozoic tidal dynamics remain poorly understood due to scarce, well-preserved outcrops. These deposits are key to reconstructing Earth–Moon interactions and their influence on early sedimentary systems. The Morro do Chapéu Formation (Espinhaço Supergroup, São Francisco Craton, Brazil) preserves a Mesoproterozoic tidal succession. This study employs a high-resolution digital outcrop model of a 30 × 9 m quarry wall to characterize its architectural framework. A total of 1308 drone images were processed in Agisoft Metashape to reconstruct the outcrop, generating a high-resolution model and orthomosaics for detailed stratigraphic analysis. From this virtual outcrop, paleocurrent data were extracted from georeferenced surfaces, aiding the interpretation of depositional evolution. The same model was used to construct a 3D stratigraphic interpolation in Petrel, capturing vertical and lateral variability between the quarry walls and refining the architectural understanding of tidal elements. Sediments consist of well-sorted, fine- to medium-grained sandstones with trough and low-angle cross-stratification, reactivation surfaces, mud drapes, and bidirectional ripple marks. We identified different architectural elements formed by the association of ripples and/or dunes with varying morphologies, reflecting distinct depositional dynamics. Forming lens-shaped bodies generally under 50 cm thick. Paleocurrent data show dominant foreset dips toward the NW (310°), with ripple marks and cross-stratification in localized zones oriented SE (105°), indicating an ebb-dominated tidal regime. Stratigraphic and geometric analysis uncovers pronounced vertical and lateral variations in tidal energy and bedform types. Vertically, there is an upward increase in reactivated and simple-to-compound dunes with a decline in climbing ripples; laterally, zones of enhanced flood influence are marked by cross-strata dipping opposite to the dominant foresets. Average element thicknesses range 15–20 cm, with some dunes up to 50 cm. These thin-bedded, small-scale features align with Proterozoic tidal models and underscore the absence of large-scale macroforms common in Phanerozoic analogs, raising questions about environmental or preservational constraints on bedform development. Beyond sedimentological insights, our findings refine ancient tidal depositional models and improve predictions of heterogeneity in low-permeability tidal reservoirs, with implications for energy exploration and carbon storage.

Harnessing Deep Geothermal Energy from Sedimentary Rocks: Outlook from a Pilot Well in the Vienna Basin

Dr Kanchan Dasgupta¹

¹OMV, Vienna, Austria

7A: Applications of Sedimentology for the Green Energy Transition & The role of subaqueous sediment gravity flows in carbon sequestration, Tāwhirimātea A (Level 2), January 29, 2026, 10:15 AM - 11:45 AM

To decarbonize its district heating system till 2040, more than 200 MWth thermal power is required for the Greater Vienna area. As part of this ambitious plan to develop deep geothermal energy, a pilot well has been drilled within the city of Vienna in 2025. The pilot well has provided core and well-log data from the Rothneusiedl Formation, informally known as Aderklaa Conglomerate, in the sedimentary basin of Central Vienna. Previous in-house studies calculated that this formation has the capacity to provide 125000 Viennese households with renewable district heating by 2030. The current study presents the first-hand experience of a multidisciplinary project aimed at exploiting deep geothermal energy within a city and the sedimentological results obtained from large diameters (13cm) cores and wireline logs. The study innovatively modified geoscience workflows to suit geothermal energy exploitation, thereby, showcasing knowledge and skill transfer from the hydrocarbon industry to the development of low-carbon energy industry.

All the cores were subjected to several analytical techniques sequentially, prior or simultaneous to wireline logs interpretation. During the well operation phase, the unslabbed/whole cores were cleaned and laid out and a quick-look lithological description along with selected X-ray diffraction analysis were done. This formed the basis of targeted sampling for further analysis such as CT-scan, whole-core porosity, triaxial testing, routine core analysis and petrography. Subsequently, CoreDNA testing using an in-house Wombat core analyser and detailed sedimentological descriptions were carried out, simultaneously with wireline log interpretations. The integrated results from these analyses provided the fundamental datasets that improved the existing depositional concept and knowledge of the physical properties, reservoir geometry and drilling parameters. New facies and their depositional evolution, in contrast to previously acquired legacy cores, are identified. The lessons learned are also relevant for exploring conglomerate reservoirs for classical and low-carbon energy solutions elsewhere.

Sediment Management of the Fraser River Delta, Canada

Professor Shahin Dashtgard¹, Professor Jeremy Venditti¹, Dr. Andrew La Croix², Dr. Philip Hill³

¹Simon Fraser University, Burnaby, Canada, ²University of Waikato, Hamilton, New Zealand, ³Natural Resources Canada, Victoria, Canada

5C: Coastal to shelf environments across time and space (5), Tāwhirimātea E (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

Like most deltas, the Fraser River Delta (FRD) is nothing more than a large accumulation of sand and mud. The FRD is home to Metro Vancouver, one of Canada's largest cities, and unlike many other systems with large urban centers, significant portions of the FRD remain in a relatively natural state and support healthy populations of migratory birds and fish. Anthropogenic modification of the Fraser River has probably had a significant impact on the long-term sustainability of the natural environments and ecosystems that comprise the FRD. Many parts of the delta are subsiding due to natural consolidation and this, together with a lack of sediment input to the tidal flats, is contributing to notable erosion of both the flats and marshes. As Earth warms and sea level continue to rise, there is a need to artificially sustain wider and more resilient tidal flats and marshes (i.e., living dikes) to attenuate wave energy and to prevent flooding through over-topping of the man-made dykes that line the landward edge of the tidal marsh and distributaries of the Fraser River. Unfortunately, dykes and dredging that maintain navigable channels up the Fraser River's distributaries also reduce the volume of sediment that reaches the tidal flats and marshes which, in turn, inhibits the sustainability of green coastal management structures.

Many deltas that support large industrial / port facilities are regularly monitored to ensure industrial activity does not undermine the sediment pile on which they are built. In more natural systems, monitoring is not needed as the system self-manages through flooding and channel avulsion. For the FRD and other deltas situated in industrial regions and with significant remaining natural environments, sediment management is vital for finding a balance between maintaining both industrial activity and natural ecosystems. A better understanding of sediment budgets and transport processes is required to support an improved sediment management plan for the FRD.

The Linked Sedimentologic-Tectonic Evolution of a Forearc Basin–Forearc Depression: Georgia Basin, Canada

Professor Shahin Dashtgard¹, Dr. Chuqiao Huang¹, Mr. Maziyar Nazemi¹, Dr. Francyne Amarante¹

¹Simon Fraser University, Burnaby, Canada

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Georgia Basin, Canada and USA has been studied extensively as it records the tectonic evolution of western North America from the Late Cretaceous to today. However, most studies of Georgia Basin strata focused on limited outcrop exposures of Upper Cretaceous strata and this led to the acceptance of a relatively simplistic view of the basin's evolution. Recent studies integrating outcrop and core-based stratigraphic descriptions, 2D seismic, well logs, detrital zircon, and biostratigraphy reveal a complicated history that records both syn-tectonic activity and post-deposition deformation. The fill of the Georgia Basin exceeds 7 km at its deepest point and evidence of syn-sedimentary uplift is recorded in stratigraphic architectures from the Upper Cretaceous through to recent with a general NE-SW trend to structural elements. The strata comprise sediment derived mainly from the adjacent Coast Plutonic Complex.

There was a major shift in depositional environments and drainage patterns from the Late Cretaceous to the Eocene that corresponds to the docking of Siletzia Terrane on North America's western margin. During the Late Cretaceous, sedimentation in the Georgia Basin occurred in deepwater with westward-flowing turbidites. In the Eocene through the Miocene, uplift of the forearc high (Vancouver Island) protected the interior of the Georgia Basin, which was dominated by south through westward flowing rivers in a terrestrial to coastal plain setting. Uplift of the forearc high marked the evolution of the Georgia Basin from a forearc to a forearc depression. The stratigraphic record of the Georgia Basin reveals the close linkage between tectonic activity along North America's active margin and sedimentation responses in the adjacent basin. The Georgia Basin is an example of how a forearc basin can evolve through several different geometries in response to regional tectonic events, and highlights the need to resolve how basin architecture is tied to local tectonic regime.

From a 3D Tank Model to the Taranaki Basin, New Zealand: Understanding Controls on Sedimentary Depositional Systems

Michele D'Ath-Woodd¹, Dr Vitor Abreu²

¹SeisMomentum Limited, Inglewood, New Zealand, ²ACT-GEO, United States of America

5A: Can Forward Stratigraphic Modeling enhance geological understanding of the subsurface and predict sedimentation through time and space? (2), Tāwhirimātea A (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

Seismic sequence stratigraphy is a technique for interpreting seismic data to understand local to regional scale sedimentary depositional processes. Mapping seismic sequences, system tracts, and stacking patterns reveals insights into facies distribution, depositional hiatuses, and shoreline movement. The technique has evolved to explore the interactions of sea level change, local tectonics, and sedimentation rate on depositional geometries; however, it is often enigmatic which of these factors prevail.

The XES02 tank model from the National Center for Earth-Surface Dynamics at the University of Minnesota was designed to demonstrate how controlling mechanisms determine stratigraphic development under known conditions. It is a learning tool to provide insights and explain how the key variables of eustasy, tectonics, and sediment supply interact. SeisMomentum Limited converted the 599 high-resolution photographs of dip- and strike slices through the resultant sediment model into 3D gridded elastic depth models, upscaled to real-world dimensions, and converted the models into synthetic 3D seismic data.

The Taranaki Basin, onshore and offshore the west of the North Island of NZ, is a ~100,000 km² Cretaceous to Paleogene sedimentary basin formed from the breakup of Gondwanaland. As NZ's hydrocarbon-producing province, the basin is extensively covered by seismic surveys and contains ~700 wells - many with detailed well logs and core. All such data are held by the NZ Government in confidence for a period of five years before becoming available to the public. The basin exhibits all of the main features encompassed by seismic sequence stratigraphy. In this project, we integrated a large number of 3D and 2D seismic surveys to produce a true basin-scale interpretation.

For the first time, seismic stratigraphic methods are being applied simultaneously to a real-life basin-scale seismic dataset and a relevant 3D tank model to investigate the relative influences of the major controls on a depositional system.

From Deep Time Biogeomorphology to Geo-Evolutionary Feedback

Professor Neil Davies¹, Dr William McMahon¹, Dr Anthony Shillito², Dr Yorick Veenma¹, Mr Hamilton Allport¹, Mr James Craig¹

¹University of Cambridge, Cambridge, United Kingdom, ²University of Saskatchewan, Saskatoon, Canada

9A: Deep time biogeomorphology (2) & Ichnology and sedimentary basin research: assessing environmental conditions, Tāwhirimātea A (Level 2), January 29, 2026, 4:25 PM - 5:55 PM

In studies of modern landscapes, biogeomorphology describes the two-way interaction between biotic and dynamic abiotic landscape elements. As organisms interact with landforms and Earth surface processes, they can modify attributes such as stability, dynamics and roughness, all of which can moderate sedimentary erosion, deposition and stasis, and thus register signals in the sedimentary deposits of an environment. The recognition of such signatures in the deep time record has potential significance for understanding the role of life in planetary surface process because ancient strata enable access to timescales in excess of the finite historicity of instrumental records afforded in the study of modern biogeomorphology. Further, the ancient record encapsulates a wide range of spatio-temporal scales, which enable ancient life-sediment interactions to be interrogated on a micro-to global scale and over durations from the instantaneous to evolutionary timescales. Accessing all of these means a better understanding of how effect cascades can cause the small scale to impact the large scale and thus set boundary conditions for further effects. Using a series of case studies we demonstrate how an understanding of deep time biogeomorphology can be accessed from the sedimentary geological record at the outcrop. In doing so we seek to demonstrate the fundamental role that life and evolution have had in constructing the siliciclastic record and underline that many sedimentary phenomena are essentially physical processes that are mediated through biological processes. Given that populations which evolve on timescales congruent to that of landscape change can have their evolution affected by the change, we emphasise how further investigation in the vein has the potential to shift perceptions of the history of Earth as a living planet through means of coeval interrogation of sedimentary and fossil records.

Contourite Drift-Channel System Evolution Based on Spatio-Temporal Changes in Flow Regimes

Dr Wouter de Weger¹, Javier Hernández-Molina¹, Watcharaphong Phothadee¹, F.J. Sierro², Domenico Chiarella³, Estefania LLave⁴, Juan Fedele⁵, Olmo Miguez-Salas⁶, F.J. Rodrigues-Tovar⁷, Amine Manar⁸

¹Instituto Andaluz de Ciencias de la Tierra, IACT-CSIC, Granada, Spain, ²Dept. de Geologia, Univ. de Salamanca, Salamanca, Spain, ³Dipt. di Scienze Biologiche, Geologiche e Ambientali, Bologna, Italy, ⁴Instituto Geológico y Minero de España, IGME-CSIC, Madrid, Spain, ⁵ExxonMobil E&NV-Global New Opportunities, Houston, USA, ⁶Dept. de Dinamica de la Terra i de l'Oceà, Univ. Barcelona, Barcelona, Spain, ⁷Dept. de Estratigrafía y Paleontología, Univ. de Granada, Granada, Spain, ⁸Office National des Hydrocarbures et de Mines (ONHYM), Rabat, Morocco

6F: Contourites and Mixed Depositional Systems (2), Rongomātāne C (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

Despite the rise in published evidence of deep-marine bottom current processes and associated deposits, there are still very few documented outcrop examples. Herein, we present the late Miocene contourite channel systems exposed in northern Morocco and compare them to more recent analogues of channel–drift systems.

Based on the study of large morphological features related to contourite channels and their subsequent sandstone-dominated infill sequences, we interpret that channel evolution and facies distribution are linked to spatio-temporal changes in the flow characteristics of the paleo-Mediterranean Outflow Water. The recognized facies distribution correlates well with previously established bedform stability diagrams. Erosional features and upper-stage flow regime bedforms are associated with the most vigorous bottom currents, typically corresponding to the core of the flow. Laterally, as flow velocity decreases toward the adjacent drift, bedforms transition into dunes, lower-stage plane beds, and more heterolithic facies. Similar facies changes are also observed down-current, associated with decreasing flow velocities due to turbulent mixing of water masses, reductions in density gradients, and subsequent gravity-controlled deceleration. The results of this study are used to propose a three-dimensional facies model for channelized sandy contourites.

Comparison with documented analogues in more recent and present-day marine environments suggests that the development and evolution of contourite channels generally require at least two main phases. The initiation phase, associated with the highest flow velocities, results in substrate erosion and the formation of a channel. As flow wanes, the channel is progressively filled with sediment. These phases highlight the importance of sediment bypass and transfer through these channels, as well as the intermittent nature of their development.

This study enhances the understanding of contourite systems, supporting oceanographic and climatic reconstructions and improving the predictability of contourite channel systems for industrial geoscience applications.

Classification and Interpretation of Sandy Contourite Deposits in the Great Valley Sequence – California, USA

Dr Wouter de Weger¹, Dr Antonio Grippa², Watcharaphong Phothadee¹, Javier Hernández-Molina¹

¹Instituto Andaluz de Ciencias de la Tierra, IACT-CSIC, Granada, Spain, ²Aker BP ASA, Lysaker, Norway

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Numerous bottom current controlled depositional and erosional features have been recognized in both modern and ancient sedimentary records along many continental margins and in abyssal plains. The recognition criteria for these deposits are mainly well established in present-day systems, and as morphological features at seismic scale. However, despite their scientific and economic importance, these bottom current deposits and their diagnostic sedimentological criteria are not well understood, particularly in sandier facies.

The Great Valley Forearc basin of California is considered one of the best-studied ancient forearc basins, comprising over 100 years of scientific and petroleum exploration. The locally over 13-km thick accumulation of sediments, belonging to the Great Valley Sequence recording Jurassic (?) to early Palaeocene convergent-margin processes.

In this study we investigate some of the Late Cretaceous sandy deposits from the Great Valley Sequence, initially interpreted to be shallow marine, later deep-sea-fan and slope deposits and now, a particular interval, as contourite deposits. Our aim is to increase understanding of the processes, products and characteristics of large-scale sandy contourite depositional features. Furthermore, by studying these outcrops we improve the understanding of the oceanographic and sedimentary processes in the Great Valley Forearc basin and try to unravel the information contained therein on global ocean circulation.

As mentioned, one particular interval within the Great Valley Sequence contains an up to 50 m thick, laterally extensive for at least 20 km, fine-sand grade, apparent massive sandstone interval with associated smaller sandstone intervals below, encased in turbiditic and hemipelagic sediments. We present our field-data and our interpretation here for the first time.

Tracing Paleotsunami Deposits Beyond the Sand Limit Through Organic Geochemical Analysis in Hokkaido, Japan

Jana Decker^{1,2}, Piero Bellanova^{1,2}, Yuichi Nishimura³, Catherine Chagué^{4,5}, Jan Schwarzbauer², Klaus Reicherter¹

¹Institute for Neotectonics and Natural Hazards, RWTH Aachen University, Aachen, Germany,

²Institute for Organic Biogeochemistry in Geo-Systems, RWTH Aachen University, Aachen, Germany,

³Institute of Seismology and Volcanology, Hokkaido University, Sapporo, Japan, ⁴School of Biological, Earth and Environmental Sciences, University of New South Wales, Sydney, Australia, ⁵Environmental Hazards, National Institute of Water and Atmospheric Research Ltd, Christchurch, New Zealand

8D: Sedimentary evidence of geohazards – past and present (1), Rongomātāne A (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

Japan has been subjected to tsunamis throughout the Holocene, with notable events occurring in the last 100 years or so, particularly the devastating 2011 tsunami. Since the research focus intensified, significant underestimation has been revealed in previous tsunami risk assessments, particularly regarding wave heights and inundation distances. This study targets the eastern coast of Japan's northern island, Hokkaido, a region impacted by significant tsunami events (e.g., 1843, 1952, and 2003). While numerous paleotsunami studies exist for this area, none until now uses organic geochemistry. Additionally, this approach is becoming increasingly important for determining past events' spatial extent and recurrence. Until now, studies have focused primarily on sand deposits that have been identified in cores and trenches, with hazard assessments incorporating these findings among other parameters (e.g., inundation distance, tsunami evacuation routes). However, determining the actual inundation extent requires investigation beyond the recognizable sand limit, which can be achieved through organic geochemical analysis.

We collected 1.5-meter-long cores up to 2.5 kilometers inland containing up to five distinct tsunami layers. These layers are interbedded by volcanic ashes, providing a well-constrained tephra chronology (1739 CE [Ta-a], 1667 CE [Ta-b], 2500 cal. BP [Ta-c]). The inland extent of the tsunami deposits beyond their visible recognition was traced using organic biomarkers.

Identified biomarkers include n-alkanes, polycyclic aromatic hydrocarbons, n-aldehydes, and fatty acids. Marine-derived compounds showed elevated concentrations within tsunami deposits compared to background sediments. Our findings demonstrate that organic geochemical analysis can effectively trace paleotsunami inundation distances beyond visible sand deposits. This research helps improve tsunami hazard assessment along eastern Hokkaido by revealing past tsunami occurrences, sediment transport, and inundation extent, ultimately providing crucial data for developing more effective coastal management strategies.

Arc Volcanism as a Driver of Volcaniclastic Sediment Routing Systems: Insights from the Miocene Andean-Atlantic Río Negro System, North Patagonia

Dr Leandro D'Elia¹, Dr Andrés Bilmes², Dr Manuel López¹, Lic Rodrigo Feo¹, Dr Micaela García¹, Dr Károly Németh^{3,4}

¹Centro de Investigaciones Geológicas (CONICET-UNLP), La Plata, Argentina, ²Instituto Patagónico de Geología y Paleontología (CONICET), Puerto Madryn, Argentina, ³Saudi Geological Survey, Jeddah, Saudi Arabia, ⁴Massey University, Palmerston North, New Zealand

4E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (1), Rongomātāne B (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

Arc volcanism may exert a first-order control on sedimentation, yet the links between arc eruptive records and Sediment Routing Systems (SRS) remain poorly understood. A critical gap persists in understanding how arc-volcanic signals are preserved as discrete signals that occur in traditional sedimentary environments or drive large-scale, volcaniclastic-dominated SRS that modulate sediment storage and ultimate delivery to oceanic basins. The Río Negro River system, a 600 km long, Andean–Atlantic corridor of North Patagonia, serves as a natural laboratory to investigate how volcanic processes modulate sediment generation, transfer and storage. During the Miocene this system was affected by profuse arc-explosive volcanism and contractional–transpressive tectonics that drove an orogenic rain shadow in the catchment areas, whereas distal trajectory zones were affected by relative sea level changes. The analyzed data indicates that subduction has imprinted a volcanic, tectonic, and climatic scenario that operates under a weak and highly anisotropic lithosphere, composed of crystalline igneous-metamorphic rocks with a thin sedimentary cover. The SRS factory was influenced by steady-state and flare-up volcanic-arc scenarios that contended with the erosional engine controlled by climatic conditions and tectonically uplifted basement block. Under varying frequencies of climate change, the sediments were determined by a fertility context, where either pyroclastic or reworked volcaniclastic deposits prevailed over the generation of epiclastic products. Thus, in the SRS factory the selective extraction of particles was governed by the fertility of pyroclastic and volcaniclastic materials. Under varying tectonic and climatic conditions, these materials signed both the trajectory areas as well as the pathways to sink zones between 20–15 My. The geomorphological evolution of the margin, under specific tectonic, climatic conditions and relative sea-levels, determined temporary sediment storage in the transfer zone. This storage modulated the propagation of environmental signals from the Andes to the Atlantic Ocean, establishing a reciprocal stratigraphic pattern within SRS.

Geomicrobiology of Terrestrial Hydrothermal Carbonates: Assessing the Role of Extracellular Polymeric Substances (EPS) in Travertine Precipitation

Dr Giovanna Della Porta¹, Prof. Jan-Peter Duda², Prof. Michael Hoppert³, Jakob Schwendele³, Prof. Joachim Reitner²

¹University of Milan, Department of Earth Sciences, Milan, Italy, ²University of Göttingen, Department of Geobiology, Göttingen, Germany, ³University of Göttingen, Institute of Microbiology and Genetics, Göttingen, Germany

6B: Microbial architects of carbonates: Insights from modern to deep-time systems, Tāwhirimātea C (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

Terrestrial hydrothermal environments thrive with thermophilic microorganisms and are among the discussed candidate sites for the origin of life. Travertines, i.e. carbonate deposits precipitated by fluids of geothermal origin outflowing from subaerial springs, potentially store valuable information on the interaction between microbial communities, their biofilms and authigenic mineral formation. This study investigates the geomicrobiological processes in three meso-thermal springs (54-34°C), actively precipitating travertines in Central Italy. Travertines were analysed through sedimentological, mineralogical, geochemical and geomicrobiological techniques (polarized light and fluorescence microscopy, SEM-EDS, XRD, Raman spectroscopy, C and O isotopes, histology, lipid biomarkers, amino acid analysis, DNA sequencing).

The results confirm that microbial communities vary as a function of thermal water temperature with sulphide oxidizing bacteria and Chloroflexi being dominant at temperatures > 45°C and filamentous cyanobacteria prevailing below 40°C. There appear, however, to be additional controls such as water concentration of sulphide and physical parameters (water turbulence, flow velocities). Travertine facies are influenced by the rates of water flow and CO₂ degassing, topographic gradient and organic substrates (e.g. streamers of encrusted filamentous microbes in fast-flowing channel, coated gas bubbles in stagnant cyanobacteria mats). Despite facies diversity, microscale carbonate precipitates similarly consist of calcite and aragonite crystals arranged in radial rosettes (30-500 µm in diameter), which nucleate on the biofilm EPS (extracellular polymeric substances) and are spatially distributed following the EPS structure, despite different temperatures and associated microbial communities. EPS are mixtures of macromolecular polymers including polysaccharides, amino sugars, proteins and carbohydrate-binding proteins. EPS are acidic and capture divalent cations as calcium, acting as a template for non-enzymatically controlled biogenic mineralization.

These findings suggest that travertine precipitation, driven primarily by physico-chemical parameters (temperature, alkalinity, CO₂ degassing), is influenced by EPS acting as substrates for crystal nucleation (EPS-mediated mineralization) and affecting the resultant fabric types, regardless of specific microorganism composition and metabolism.

An Overview of Precipitated Fabrics and Mineralogy of Authigenic Terrestrial Carbonates and Silicates

Dr Giovanna Della Porta¹, Dr. Nina Zeyen², Dr. Andrea Martín Pérez³, Dr. Adrijan Košir³, Dr. Elias Samankassou²

¹University of Milan, Milan, Italy, ²University of Geneva, Geneva, Switzerland, ³ZRC SAZU Ivan Rakovec Institute of Palaeontology, Ljubljana, Slovenia

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Carbonate mineral precipitation is driven by a continuum of abiotic, biologically controlled (skeletal), biologically induced (microbial metabolism) and biologically influenced (organomineralization mediated by biofilm EPS extracellular polymeric substances) processes. Various terrestrial aquatic settings may constitute favourable environments for the formation of authigenic carbonate and silicate minerals, under specific physico-chemical properties of the precipitating fluid. Distinctive fabrics and mineralogy are often associated with microorganisms (e.g. Bacteria, Archaea, Eukarya as algae and fungi), particularly in extreme environmental conditions (e.g., high temperature, alkalinity, salinity, turbulence), unfavourable to multicellular life.

This study aims at examining the fabric and mineralogy of authigenic carbonates and silicates forming hypersaline and alkaline lacustrine build-ups, fluvial tufa and hydrothermal travertine deposits. The overview of these features and their relationship with water properties was achieved through the integration of petrography, SEM-EDS (Scanning Electron Microscopy-Energy Dispersive x-rays Spectrometry), XRD (X-ray diffraction) and ATR-FTIR (Attenuated Total Reflectance Fourier Transform Infrared) spectroscopy. As a comparison to natural systems, inevitably containing microbial mats, anthropogenic carbonate, sulphate, magnesium silicate and hydroxide minerals, precipitated as encrustations of domestic water heaters, were analysed as examples of potentially abiotic, high temperature end members.

The preliminary results demonstrate the occurrence, besides abundant calcite and aragonite, of traces of undetermined hydrated magnesium silicate minerals resembling kerolite and/or smectite, when Si is available in the presence of microbial mats. In the water heaters, aragonite predominates as the carbonate mineral driven by water temperature exceeding 60 °C and may be associated with siderite due to oxygen depletion. Brucite [Mg(OH)₂], talc-like hydrated Mg silicates, and halloysite hydrated alumino-silicates form as abiogenic encrustations of the water heaters. Besides contributing to the mineralogy characterization, ATR-FTIR spectroscopy results are a powerful tool to detect the presence of organic compounds such as lipids, carbohydrates and proteins deriving from microbial EPS in the analysed natural samples.

Microfacies and Paleoenvironment Significance of Foraminifera-Dominated Middle Eocene Ramp Carbonate, Assam Shelf, NE India (Eastern Tethys)

Dr Khumukcham Radhapiyari Devi¹, Dr Yengkhom Singh¹, Raina Singam¹

¹Department of Earth Sciences, Imphal, India

4B: Carbonate systems and processes (3), Tāwhirimātea C (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

The Middle Eocene carbonate of Assam Shelf, Northeast India, is highly fossiliferous, with predominantly larger benthic foraminifers (LBF) viz. Nummulites, Assilina, Discocyclina, Miliolina with minor sub-ordinate algae. Sedimentological studies were conducted to elucidate the intricate relationship between microfacies variability and environmental evolution. Based on the dominating biogenic components and sedimentary fabric six microfacies types (MFTs) have been recognised viz. MFTs-1 (Nummulitid wackestone), MFTs-2 (Nummulitid-Algal wackestone), MFTs-3 (Assilinitid wackestone-packstone), MFTs-4 (Nummulitid-alveolina packstone), MFTs-5 (Miliolid-pellet wackestone and MFTs-6 (Discocyclina packstone-grainstone). These microfacies are related to three distinct sedimentary facies belts (tidal flats, lagoon and open marine environment). Water depth during deposition of the formation was determined based on the variation and types of LBF and non-carbonate components in different microfacies. Staining of thin sections and X-ray diffraction patterns show dominance of calcite over dolomite, suggesting that the major mineral phase has been calcite and no dolomitization occurred during the deposition of the carbonate sequence. Stable carbon and oxygen isotope analysis shows positive $\delta^{13}\text{C}$ values ranging from 1.64 to 0.76 ‰ (PDB) and negative $\delta^{18}\text{O}$ values ranging from -6.25 to -4.67 ‰ (PDB). The range of variation of $\delta^{13}\text{C}_{\text{PDB}}$ and $\delta^{18}\text{O}_{\text{PDB}}$ is relatively small, reflecting to some extent the stability of the depositional environment in the study area. The paleosalinity (Z) values range from 1261.00 to 128.05 and the paleotemperature (T) values range from 33.99 to 41.26°C, indicating a warm paleoclimatic environment during the Middle Eocene in the study area. The stability of tectonic environment and paleoclimate; absence of turbidite and reefal facies; and gradual changes of facies with widespread tidal flat deposits strongly suggest that the Middle Eocene Garampani carbonate sequence was deposited in a ramp setting rather than a shelf environment. Due to abundance and great diversity of foraminifera, this carbonate ramp is referred to as a “foraminifera-dominated carbonate ramp system”.

Impact of the 2011 Puhyeue-Cordón Caulle Plinian Eruption on Terrestrial Sedimentary Systems Over 13 Years

Dr Andrea Di Capua^{1,2}, Dr Mohammed Hammouti¹, Mr. Nicolò Gaudino², Dr Federica Barilaro^{3,1}, Dr Francesco Nattino⁴, Dr. Christian Gencarelli¹, Dr. Gianluca Norini¹

¹CNR - IGAG, Milan, Italy, ²Uninsubria - DISTA, Varese, Italy, ³Unical - DIBEST, Rende, Italy, ⁴Netherlands eScience Center, Leiden, Netherlands

5E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (2), Rongomātāne B (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

Over the past three decades, the study of volcanic impacts on both modern sedimentary systems and ancient sedimentary records has gained increasing importance within the Earth Sciences. Volcanic eruptions are among the few geological processes observable on human timescales, offering a unique opportunity to investigate their environmental effects directly. Despite this, limited data exists on how major eruptions influence surrounding environments over time. This study addresses this gap by examining the environmental changes in fluvio-lacustrine systems following the 2011 Plinian eruption of the Puyehue-Cordón Caulle volcanic complex (VEI 5). Using satellite imagery (Google Earth Engine and SNAP), climatic time series, and a GIS-based geostatistical framework, we developed a workflow to quantify sedimentary changes under climatic control. The analysis focuses on fluvial drainage (Golgol River) and lacustrine sedimentary systems (ca. 26.0 km²). Since the eruption, deltaic systems on both the southwestern and southeastern flanks have prograded, with a notable acceleration from 2015. The Golgol River partially evolved into a braided system due to the rapid influx of tephra over approximately seven years, affecting around 1.0 km². Lacustrine systems downwind of the eruptive column, particularly in the southwestern sector, experienced increased suspended sediment loads, resulting in elevated turbidity for several years and significant delta and shoreline progradation. These findings enhance our understanding of how mid-latitude environments respond to Plinian eruptions, based on a 13-year time series.

Volcanic Signatures in the Leithakalk Formation (Badenian – Miocene – Northern Hungary): a Way to Constrain Volcanic Processes in the Sediment Source Area?

Dr Andrea Di Capua^{1,2}, Dr Federica Barilaro^{2,1}, Dr Peter Gál³, Dr. Réka Lukács³, Prof. Orsolya Sztanó⁴, Prof. Szabolcs Harangi⁵

¹CNR - IGAG, Milan, Italy, ²DIBEST - Unical, Rende, Italy, ³MTA–HUN-REN CSFK Lendület "Momentum" Pannonian Volcano Research Group, Institute for Geological and Geochemical Research, HUN-REN Research Centre for Astronomy and Earth Sciences, Budapest, Hungary, ⁴Department of Physical and Applied Geology, Institute of Geography and Earth Sciences, Eötvös University Budapest (ELTE), Budapest, Hungary, ⁵Department of Petrology & Geochemistry, Institute of Geography and Earth Sciences, Eötvös University Budapest (ELTE), Budapest, Hungary

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Täkinä Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The present work investigates the volcanic signatures recorded in a bioclastic succession accumulated during the Middle Miocene in the Zagyva Trough area (Cserhát Mountains, NE of Hungary). This bioclastic succession, part of the Leitha Limestone Formation, was accumulated on top of a Miocene andesite volcanogenic succession (Nagyhársas Andesite). It comprises shallow marine bioclastic sandstones and limestones, mainly composed of red algae, foraminifera, molluscs, bryozoans, deriving from the remobilization of bioclastic material from small carbonate shoals. In a variable amount, volcanically derived particles are included in the detrital fraction. A pyroclastic deposit, attributed to the Harsány Ignimbrite, is also interbedded within the formation. Petrographic analysis documented variation in abundance and composition of volcanically derived particles. In particular, the lower part of the succession comprises amounts of andesite particles, probably derived from erosional processes acting on the volcanic centers that sourced the underlying Nagyhársas Andesite. These particles constitute a minor portion of the total sediment assemblage. Moving upward in the sedimentary succession, the andesite particles' contribution become neglectable, giving way to a progressive increase in loose crystals with a rhyodacite geochemical signature. This increase, documented immediately below the Harsány Ignimbrite deposit, brings the rhyodacite fraction to become an important constituent of the sediments, suggesting a continued rise in the availability of rhyodacitic material over time. This increase may indicate the occurrence of small rhyodacite eruptions that influenced the drainage system prior to the major eruptive events responsible for the deposition of the Harsány Ignimbrite.

These preliminary results provide evaluable constraints for reconstructing a paleogeographic setting in which carbonate rims were interposed between an active, acid volcano growing onto andesite terrains and the basin. Sediments delivered to the depocenter were predominantly bioclastic before the activation of the volcanic source and acquired a hybrid composition in response to the initiation of acid volcanic activity.

Volcanic and Landscape Evolution of La Fossa Caldera (Vulcano Island, Italy) over the Last Millennium

Dr Federico Di Traglia¹, Prof. Marco Pistolesi², Prof. Costanza Bonadonna³, Prof. Mauro Rosi^{1,2}

¹INGV - Osservatorio Vesuviano, Napoli, Italy, ²University of Pisa, Department of Earth Sciences, Pisa, Italy, ³University of Geneva, Department of Earth Sciences, Geneva, Switzerland

4E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (1), Rongomātāne B (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

This work provides a comprehensive reconstruction of the eruptive and depositional history of the La Fossa caldera on Vulcano Island, Italy, over the last eleven centuries. It combines stratigraphic analyses, updated tephrochronology and detailed tephra dispersal mapping. Since 900 AD, eruptive activity has been dominated by Vulcanian explosions, interspersed with phases of effusive and Strombolian behaviour, sporadic sub-Plinian episodes and short-lived violent and long-lasting phreatic events. These varied styles of activity pose significant volcanic hazards, particularly to the northern sector of the island. In total, we document 30 eruptions, including 25 from La Fossa and five from Vulcanello. These eruptions have generated a wide spectrum of deposits, ranging from fine ash and lapilli layers to extensive ballistic fallout fields composed of blocks and bombs. Eruptive phases are separated by prolonged quiescent periods during which reworking and erosion reshape the volcanic landscape. Fine ash accumulation plays a significant role in enhancing sediment transport, particularly within the caldera's internal drainage network. Notably, continuous sedimentation in the western part of the caldera has led to measurable elevation of the ground level, which could affect areas containing essential infrastructure.

Our findings highlight the dynamic interplay between primary volcanic deposition and secondary sedimentary processes, emphasising the need for an integrated, multidisciplinary approach to hazard evaluation. By considering the cumulative effects of eruptive activity and subsequent reworking, this study enhances our understanding of the long-term evolution of volcanic terrains and associated risks.

From Unstable Slopes to Pyroclastic Density Currents: A Multidisciplinary Study of Deposit-Derived PDCs

Dr Federico Di Traglia¹, DR. Alessia Falasconi¹, Prof Lorenzo Borselli^{2,3,1}

¹INGV - Osservatorio Vesuviano, Napoli, Italy, ²Instituto de Geologia, Facultad de Ingenieria, Universidad Autonoma de San Luis Potosí (UASLP), San Luis Potosí, Mexico, ³Consiglio Nazionale Delle Ricerche, Istituto di Ricerca per la Protezione Idrogeologica, Perugia, Italy

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Deposit-derived pyroclastic density currents (PDCs) are a recurring phenomenon in steep-sided mafic and intermediate volcanoes. Despite their relatively small volumes (10^3 – 10^7 m³), these PDCs can travel several kilometres at high temperatures and represent a major hazard due to their sudden onset during effusive or violent Strombolian phases. These events often occur without clear precursors, posing a threat to both residents and visitors.

There are two main mechanisms responsible for generating such flows: (i) the gravitational collapse of hot volcanoclastic accumulations on oversteepened slopes, often promoted by undercutting or overloading from fresh deposits (Fuego-type); and (ii) increased magmatic thrust (Arenal-type). The latter results from a transition in eruptive style, during which rising, dense, degassed magma builds pressure against the conduit walls, potentially destabilising crater structures.

Effective hazard assessment requires an understanding of the long-term conditions that predispose slopes to failure and the short-term triggers that may induce collapse. This study combines stratigraphic and geomechanical analysis, geophysical monitoring and numerical modelling to examine these processes, using case studies from Stromboli and Vesuvius. A dedicated database of past deposit-derived PDC events informs the analysis. Stability assessments were conducted using the 2D Limit Equilibrium Method (LEM) with various shear strength criteria, integrating local stratigraphic data and mechanical crater rim profiling.

Sensitivity analyses highlight the influence of variations in slope angle, cohesion, friction, the presence of structural discontinuities and deposit thickness on failure potential. Comparing simulated instability zones with actual collapse locations confirms the robustness of this approach and supports its application to other volcanic settings with similar morphological and depositional characteristics.

Integration of New Sedimentological and Fossil Evidence in Reconstructing the Vibrant Palaeoecology of the Mid-Cretaceous Griman Creek Formation, New South Wales, Australia

Ms Sherri Donaldson¹, Dr Phil Bell¹, Dr Nicolás Campione¹, Dr Federico Fanti², Dr Marissa Betts¹

¹University of New England, Armidale, Australia, ²Università di Bologna, Bologna, Italy

9A: Deep time biogeomorphology (2) & Ichnology and sedimentary basin research: assessing environmental conditions, Tāwhirimātea A (Level 2), January 29, 2026, 4:25 PM - 5:55 PM

The Griman Creek Formation (GCF) is a key mid-Cretaceous (Cenomanian, 100.5–96.6 Ma) deposit in the Surat Basin in eastern Australia. Palaeoenvironmental interpretations of the GCF around the township of Lightning Ridge in New South Wales (in the southern part of the basin) are broad and often contradictory, encompassing terrestrial, fluvial, deltaic and marginal marine systems. These interpretations have been based primarily on descriptions of the rich assemblage of opalised fossils; vertebrates (theropod, sauropod and ornithomimid dinosaurs, crocodiles, pterosaurs, turtles, lungfish and fish), less common marine vertebrates (sharks and plesiosaurs) and abundant aquatic invertebrates (bivalves, gastropods, decapod crustaceans). Reliably reconstructing the palaeoecology of the GCF at Lightning Ridge has been difficult due to the lack of targeted sedimentological and stratigraphic studies, absence of high-resolution biostratigraphic data, and overprinting of fossils by opalisation during the Neogene. This study addresses these knowledge gaps by combining existing abundant vertebrate and invertebrate faunal data (including undescribed ichnofossils) and a newly described extensive palaeoflora (comprising conifers, horsetails and ferns) together with new sedimentological, geochemical and stratigraphic data. Within the GCF, sedimentological features including dewatering structures, extensive, organic-rich fine clays and muds, and absence of soils challenge previous assumptions that the region simply represents a terrestrial fluvial ecosystem. In contrast, abundant multi-proxy data invoke more dynamic palaeoenvironments characterised by paralic to deltaic conditions and floodplains, but dominated by a wetter, more lagoonal, low energy system, connected to but protected from the epeiric Eromanga Sea in the final phase of its retreat.

Sedimentary Distribution Characteristics and Main Controlling Factors of Gaotaizi Oil Layer in Qijia Area, Songliao Basin

Yanlei Dong¹, Ying Ma¹, Shuaiqi Sun¹, Yaqi Wang¹

¹China University of Petroleum, Beijing, Beijing, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Gaotaizi oil layer in the Qijia area is a key target for tight oil exploration in the Songliao Basin. Conventional sedimentary facies study methods are no longer sufficient to meet the exploration needs. Wave impedance inversion, with its high resolution and rich geological information, plays a significant role in accurately depicting the distribution patterns of sedimentary microfacies and predicting reservoirs.

This paper takes the Qijia area in the Songliao Basin as an example, firstly, a high-resolution sequence stratigraphic framework of the Gaotaizi oil layer was established. Then, based on seismic, Logging, Drilling and core data, the sedimentary facies types were identified. Subsequently, sand bodies were depicted using seismic attributes and inversion results, and their spatial distribution characteristics were clarified. Finally, the controlling factors of sand body distribution were analyzed. The results show that: (1) By combining seismic reflection events with Drilling and Logging characteristics using seismic synthetic seismogram, the Gaotaizi oil layer can be subdivided into five layers, from bottom to top, namely G4 to G0. (2) The northern source was abundant, and from north to south, inner and outer front of shallow water delta, shore-shallow and semi-deep lacustrine facies types were formed. (3) Sedimentary facies planar distribution patterns were qualitatively predicted using seismic attributes and quantitatively predicted using seismic inversion. The inversion prediction results of the Gaotaizi oil layer were verified by Logging and Drilling data, with a matching rate exceeding 80%. (4) The main factors controlling the distribution of the Gaotaizi oil layer are source supply, lake level fluctuation, and paleogeomorphology. Among them, paleogeomorphology has the most significant control over delta and lacustrine sedimentation. Specifically, slope controls sedimentary facies types, slope breaks control sedimentary facies boundaries, and underwater low uplifts control the development areas of bioclasts.

Geochemical and Petrographic Evidence for Microbially Mediated Aragonite Precipitation in Oligocene Lacustrine Shales

Professor Chengyan Lin¹, Prof. Chunmei Dong¹, Professor Lihua Ren¹

¹China University of Petroleum (east China), Qingdao, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

This study investigates the petrographic, geochemical, and microbial-physicochemical mechanisms behind aragonite formation in Oligocene lacustrine shales. Aragonite displays uniform needle-like crystals (2–10 μm long, 50 nm–2 μm wide) and cryptocrystalline textures. Micro-scale biomineralized structures—algal skeletons, filamentous/sheet-like forms, and EPS-derived nanoglobule clusters—provide direct morphological evidence of microbial mediation and nucleation roles.

Geochemically, aragonite exhibits an exceptionally low Mg/Sr ratio (0.002 ± 0.001) and low vitrinite reflectance (0.34–0.41%), indicating minimal post-depositional alteration and excellent preservation. REE patterns show LREE enrichment ($\text{Pr/Yb} = 3.8\text{--}56.5$), a slight negative Ce anomaly ($\text{Ce/Ce}^* = 0.95 \pm 0.1$), and a positive Eu anomaly ($\text{Eu/Eu}^* = 0.8\text{--}1.8$), reflecting suboxic conditions and possible plagioclase dissolution. LREE enrichment is attributed to organic matter adsorption and mobilization under reducing, methane-rich environments.

Isotopic data reveal high $\delta^{13}\text{C}$ values (+5.4 to +7.2‰ VPDB), consistent with microbial methanogenesis, where ^{12}C -depleted CO_2 consumption enriches DIC in ^{13}C . Clumped isotope ($\Delta 47$) temperatures (29.3–33.7°C) exceed bottom-water values, aligning with optimal growth temperatures for methanogenic archaea and suggesting shallow burial precipitation.

Aragonite formation results from the interaction of arid climate, high evaporation, and elevated Mg/Ca ratios, creating favorable conditions. In deeper sediments, methanogenesis produced ^{13}C -enriched DIC and alkalinity, while upward methane was oxidized by sulfate-reducing microbes (SD-AOM), enhancing carbonate saturation—a “natural carbonate pump.” The co-occurrence of aragonite with rod-like pyrite and Mn enrichment, along with distinctive S/Fe ratios, provides multi-proxy evidence of active SD-AOM. This work advances understanding of microbial carbonate formation in ancient lakes and underscores methanogens’ role in early methane cycling.

Origin and Paleoenvironmental Significance of Aragonite in Oligocene Lacustrine Shales, Bonan Sag

Prof. Chunmei Dong¹, Professor Chengyan Lin¹, **Professor Lihua Ren**¹

¹China University of Petroleum (east China), Qingdao, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

This study investigates aragonite in Oligocene lacustrine shales of the Bonan Sag, Bohai Bay Basin, using petrographic, spectroscopic, and geochemical methods to understand its origin and environmental controls. The Es1 member exhibits distinct aragonite-rich shales in its upper and lower sections, separated by a calcite-rich middle section. This stratigraphic separation indicates episodic, significant shifts in the lake's physico-chemical conditions, suggesting a system highly responsive to climatic and hydrological forcings.

Aragonite-rich layers are characterized by high Sr/Ba and Sr/Cu ratios, indicating arid, hot climates and high-salinity, evaporative lagoonal settings. The recurrence of these conditions suggests a cyclical pattern favoring aragonite precipitation. Moderately elevated U/Th ratios in these layers point to suboxic to anoxic bottom waters, conducive to microbial processes. The presence of overgrowth and rod-like pyrite within aragonite-rich laminae further indicates active sulfate-dependent anaerobic oxidation of methane (SD-AOM) as a key driver for aragonite formation.

Conversely, the calcite-rich layer shows sharp drops in Sr/Ba and Sr/Cu ratios, reflecting a shift to a warmer, more humid climate with enhanced water circulation and well-oxygenated bottom waters (lower U/Th). Abundant calcified coccolithophores in this layer, coupled with geochemical shifts, provide compelling evidence for marine transgressions that significantly altered the lacustrine system's hydrology and chemistry.

The Es1 member thus records a dynamic lacustrine environment oscillating between restricted, evaporative, anoxic conditions favoring aragonite precipitation driven by microbial activity, and transgressive, oxygenated phases conducive to calcite and marine biota.

Ichnofabric Analysis Improving Characterization of Turbiditic Systems: a Case Study from Tabernas Basin (SE Spain)

Dr Javier Dorador¹, Prof Francisco J. Rodríguez-Tovar¹

¹Universidad De Granada, Granada, Spain

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Tabernas Basin, located in southeastern Spain, is part of a complex of small intramontane Neogene basins overlying the exhumed basement rocks of the inner zone of the Betic Cordillera. In the late Miocene, the Tabernas Basin formed a marine trough that became filled with continental and marine sediments from the Serravallian (Miocene) to the Pliocene. During the Tortonian, submarine fan complexes grew in a subsiding basin, distinguishing three, juxtaposed, possibly coeval turbiditic feeder-lobe systems. Ichnological analysis has been proven to be a useful tool for the study of turbidite systems, providing important information about paleoenvironmental conditions, including salinity, oxygen, nutrients, hydrodynamic energy, or sedimentation rate among others. Particularly, ichnofabric analysis is revealed of special interest in characterizing minor scale changes within turbidite settings. Here, we present a case study from the Tabernas Basin focused on the ichnofabric characterization of some outcrops belonging to one of the turbiditic feeder-lobe systems. Two ichnofabrics have been distinguished: the Ophiomorpha ichnofabric and Scolicia/Bichodites ichnofabric. The Ophiomorpha ichnofabric is observed in reddish sandstone beds, and it is clearly dominated by Ophiomorpha (mostly *O. nodosa*) with the local presence of some other trace fossils as is the case of the undetermined horizontal structures. The Scolicia/Bichodites ichnofabric is the most common ichnofabric in the turbiditic beds in this area, clearly dominated by Scolicia and/or Bichordites, but also with the local presence of some other trace fossils such as Taenidium and some vertical structures. The spatial and stratigraphic distribution of both ichnofabrics allows to interpret variable ecological and depositional conditions in different settings from the same turbiditic system.

Facies and Architecture of a Fault-Attached Marine Talus from the Early Pleistocene of Calabria, Southern Italy

Mrs Effi-laura Drews¹, Prof. Dr. Ernesto Schwarz², Prof. Dr. Marcello Gugliotta¹

¹Martin-Luther-University Halle-Wittenberg, Halle (Saale), Germany, ²Universidad Nacional de La Plata-CONICET, La Plata, Argentina

10D: Marine Carbonate-Siliciclastic sedimentary systems, Rongomātāne A (Level 1), January 30, 2026, 11:00 AM - 12:30 PM

Understanding the interplay between sediment supply and tectonic activity in extensional basins with mixed siliciclastic-bioclastic systems is essential for their interpretation. In Oliveto, Calabria (southern Italy), Early Pleistocene mixed arenites and associated breccias and conglomerates were investigated through detailed facies analysis, including sedimentological logging, identification of body and trace fossils, and drone-based photogrammetry (panoramas and orthomosaics). Three main facies associations were identified: (1) coarse breccias with angular clasts, ranging from pebble to boulder in size, encrusted by serpulids and bryozoans, displaying a wedge-shaped geometry and generally low-angle bedding; (2) clast-supported conglomerates, with clasts from fine to coarse pebbles, frequently encrusted by bryozoans; and (3) mixed fine- to coarse-grained, moderately to well-sorted arenites, composed of 10-90% siliciclasts and commonly exhibiting parallel bedding or low-angle cross-stratification. These deposits accumulated in a shallow marine setting adjacent to a tectonically active coastline. Syn-depositional faulting influenced both the geometry and thickness of sedimentary facies, with bed thickness increasing towards fault zones in the talus breccias. Siliciclasts were sourced from erosion of the Aspromonte Massif (mainly schists and granitoids), while bioclasts, reflecting a heterozoan association (including pectinids, corals, and bryozoans), originated from both shelf-derived input and in situ production. Trace fossils indicate organism colonisation within the sediment (Planolites, Scolicia). The mixed arenites feature multiple hardgrounds characterised by in situ growth of barnacles and ostreids, recording seafloor colonisation during episodes of reduced sedimentation. The vertical stacking pattern of the succession shows how relative sea-level rise during the Pleistocene led to landward retreat of the coastline and the landward migration of breccia deposition. Additionally, the mixed arenites were incised by marine channels transporting well-rounded clasts basinward. This study highlights the complex interplay of tectonics, siliciclastic sediment supply, and faunal processes in shaping mixed shallow marine successions, suggesting that our facies models should expand to capture this complexity.

Shorelines as Recorders of Landscape Evolution: Insights from Cosmogenic Krypton in Detrital Zircon, Southern Australia

Dr Maximilian Dröllner^{1,2}, Dr Milo Barham², Prof Christopher L. Kirkland², Dr Taryn Scharf², Mrs Sabrina Niemeyer³, Prof Tibor J. Dunai³

¹Department of Sedimentology and Environmental Geology, Geoscience Center Göttingen, University of Göttingen, Göttingen, Germany, ²Timescales of Mineral Systems Group, Curtin Frontier Institute for Geoscience Solutions, School of Earth and Planetary Sciences, Curtin University, Perth, Australia,

³Institute of Geology and Mineralogy, University of Cologne, Cologne, Germany

4C: Coastal to shelf environments across time and space (4), Tāwhirimātea E (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

Sediment transport and storage exert a first-order control on the compositional and provenance signals preserved in sedimentary archives. The coastal zone represents a critical interface that integrates terrestrial process signals from a wide upstream source area. Here, we investigate drillcore samples from Eocene strandline-hosted heavy mineral sand deposits in the Eucla Basin (southern Australia) and present the first stratigraphic application of in situ-produced cosmogenic krypton in detrital zircon. Cosmogenic krypton in zircon is generated during the interaction of cosmic rays and Zr near Earth's surface, is quantitatively retained in zircon, and overcomes limitations of conventional cosmogenic nuclides (e.g., radioactive decay, diffusion). We use it to elucidate the relationship between sediment residence time, i.e., the duration detritus spends within the sedimentary system, and associated changes in mineralogical composition. The cosmogenic krypton dataset is integrated with rapid-ablation U-Pb geochronology of detrital zircon, supporting a source-to-sink model encompassing an ~800,000 km² catchment and a littoral drift system extending up to ~2,000 km. The results reveal residence times on the order of millions of years and a strong link to heavy mineral composition. Extremely mature deposits, with low heavy mineral concentrations rich in stable phases (e.g., zircon), show consistent downcore patterns and prolonged residence times, consistent with extensive coastal reworking and sediment sequestration. In contrast, relatively immature deposits containing more labile minerals display greater compositional and residence time variability, interpreted as episodic pulses of directly sourced sediment associated with fluctuating sea levels and tectonic uplift. These findings indicate a shift from a buffered sediment-routing system, marked by prolonged storage and compositional homogenization, to a more dynamic regime capable of preserving upstream signals. We conclude that cosmogenic krypton in detrital zircon is a powerful tool for quantifying sediment residence time and reconstructing ancient sedimentary systems, providing insights beyond the capabilities of conventional cosmogenic nuclide techniques.

Mercury Chemostratigraphy and Depositional Conditions at the Cenomanian-Turonian Boundary in the European Chalk Sea: Case Study from the Luka Section, Western Ukraine

Professor Zofia Dubicka¹, PhD Michał Rakociński², PhD Andriy Poberezhskyy³

¹University of Warsaw, Faculty of Geology, Warsaw, Poland, ²University of Silesia in Katowice, Faculty of Natural Sciences, Sosnowiec, Poland, ³Institute of Geology and Geochemistry of Combustible Minerals of NAS of Ukraine, Lviv, Ukraine

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Täkinä Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Cretaceous Cenomanian-Turonian (C-T) event involves the second-order mass extinction of marine organisms that is among the most thoroughly studied biotic crisis during Earth's history. During the event one quarter of marine genera died out, including single-celled organisms such as foraminifera, numerous marine invertebrates, and marine reptiles – ichthyosaurs that were top marine predators during the lower part of the Mesozoic Era. The C-T event is associated with submarine volcanic activity that left its mark on climate warming and with the development of anoxic conditions at the sea floor of deep oceans that are mirrored as dark, C-rich shaly deposits. At first glance, shallow-water deposits of the epicontinental basins may seem not reflect significant changes during this time interval. However, this is not true when examined more deeply.

The subject of our study was a potential record of C-T related submarine volcanic activity in the European shelf reflected as increased Hg concentration. This is because the main source of Hg in geological time is linked to volcanic and submarine hydrothermal activity. To investigate this issue, we have examined relatively shallow carbonate rocks encompassing the Cenomanian-Turonian boundary interval exposed at the Luka section in western Ukraine (eastern part of the Central European Basin System). In the Cenomanian, Hg content is increased with maximum values ~85 ppb, while in the Turonian Hg content does not exceed 8 ppb. Hg/TOC spikes and increased Hg values do not correlate with TOC and TS therefore they might be indicative for gentle volcanic fingerprint. However, further research in higher resolution sampling is needed.

This project was partly financially supported by the grants of the National Science Centre in Poland 2023/49/N/ST10/00868.

Tectono-Stratigraphic Evolution of the Taranaki Basin Since the Late Cretaceous: Insights from Quantitative Seismic Stratigraphy

Mrs Joanna Elliott¹, Dr Victorien Paumard¹, Prof Annette George¹, Prof Simon Lang¹, Prof Bruce Ainsworth²

¹University of Western Australia, Perth, Australia, ²University of Adelaide, Adelaide, Australia

2E: Student Research Forum (2), Rongomātāne B (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

Spatially variable data quality is a major challenge for seismic interpretation studies. Quantitative 3D seismic stratigraphy is a robust method for identification of subsurface chronostratigraphic horizons and stratal packages to resolve spatially and temporally complex sedimentary systems. In combination with full-volume and semi-automated 3D seismic interpretation software, such as PaleoScanTM, this approach can help refine the tectono-stratigraphic evolution of sedimentary basins. Semi-automated tools provide an opportunity to resolve uncertainties caused by poorly imaged areas within a survey through construction of a spatially consistent relative geological time framework.

This study focuses on an area of ~815 km² located in the Taranaki Basin, a back-arc basin on the west coast of New Zealand's North Island. The basin formed during Late Cretaceous rifting that separated Zealandia from Antarctica and Australia and contains marine and non-marine strata over 11 km thick. Resource exploration and production over the last 40 years has included acquisition of numerous seismic reflection datasets. Two adjacent 3D seismic surveys used in this study span the modern coastline thus representing merged marine and onshore seismic surveys.

Fourteen distinct seismic units, bounded by 15 seismic unconformities identified thanks to stratal reflection terminations, have been mapped and over 40 significant faults identified. Spatial and temporal changes in accommodation vs. sediment supply are examined by mapping the thickness of each seismic stratal unit. This highlights the interplay between tectonic and stratigraphic controls on basin development. Specifically distinguishing phases of extensional or compressional tectonic activity and changes in sediment source direction and depocenter progression. Fine-scale seismic attribute analysis has been undertaken to identify depositional elements including fluvial channel belts, beach ridges and submarine channels and canyons within the study area. The tectono-stratigraphic framework provides a rigorous foundation to examine the cyclic changes in Taranaki Basin paleogeography as visualized in legacy seismic data.

A Review of Mixed Carbonate-Siliciclastic Sedimentary Patterns across the Great Barrier Reef, Queensland, Australia

Ms Holly Ellis¹, Professor Helen Bostock¹, Doctor Kevin Welsh¹, Doctor Luke Nothdurft², Professor Jody Webster³, Associate Professor Gavin Dunbar⁴

¹University of Queensland, Brisbane, Australia, ²Queensland University of Technology, Brisbane, Australia, ³The University of Sydney, Sydney, Australia, ⁴Victoria University of Wellington, Wellington, New Zealand

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

A 'reciprocal' model has conventionally been proposed to explain sedimentation patterns across mixed tropical carbonate-siliciclastic continental margins. In this model, production and export of biogenic carbonate is greatest during sea level highstands, whilst erosion and across-shelf transport of land-derived siliciclastic sediment is greatest during sea level lowstands. However, there is now a consensus that whilst a 'highstand shedding' pattern accurately describes the response of biogenic carbonate to sea level change, siliciclastic sedimentation patterns within the Central Great Barrier Reef (GBR) are better described by a 'transgressive shedding' model, whilst the Southern GBR is characterised by a 'coeval' sedimentation pattern. This study integrates data from new Northern GBR marine sediment cores, collected from the continental slope offshore Princess Charlotte Bay (PCB), with existing radiocarbon-dated core records from the Central and Southern GBR, to reassess and compare spatial and temporal patterns of carbonate and siliciclastic sedimentation from these three regions over the past 40,000 years. Radiocarbon dates have been re-calibrated where appropriate using updated reservoir corrections and marine calibration curves to re-calculate mass accumulation rates (MARs), ensuring data consistency. MARs are then compared with newly acquired high-resolution bathymetric data and geomorphological analyses of the GBR shelf and continental slope. Our initial results indicate that margin geomorphology, including reef structure, shelf and slope physiography, and proximity to major rivers, exerts significant influence over sedimentation patterns. For example, along the continental slope offshore PCB, sedimentation patterns follow a more conventional model, characterised by elevated siliciclastic input during glacial lowstands versus increased carbonate deposition during the Holocene highstand. This reflects the presence of four large rivers that discharge into the bay and a well-developed canyon system on the slope that transports terrigenous sediments directly to the deep sea.

A Novel Method for Predicting Sweet Spot Intervals of Shale Oil Based on Catboost and Arithmetic Optimization Algorithm

Xiaoqi Fan¹, Dr Fujie Jiang¹, Dr Di Chen¹

¹China University of Petroleum, Beijing, Beijing, China

1E: Student Research Forum (1), Rongomātāne B (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

The evaluation of sweet spot intervals (SSI) is a crucial aspect in the process of unconventional oil and gas exploration and development. However, traditional stacking methods struggle to quantitatively and reliably predict SSI due to the complexity of shale oil enrichment mechanisms. Therefore, this work proposed a novel method of predicting SSI based on categorical boosting (CatBoost) and arithmetic optimization algorithm (AOA). The continental shales of the Lower Permian Fengcheng Formation in the Mahu Sag, Junggar Basin were taken as the research object. The geological and engineering parameters including oil-bearing, reservoir properties, and compressibility are characterized comprehensively and quantitatively. The optimal features for SSI classification were selected based on the geological significance of indicators and the Spearman correlation analysis. The CatBoost-AOA model was constructed to predict SSI by combining a dataset with petroleum geological theory. Moreover, the CatBoost algorithm was employed to address the missing data issues, and the fivefold cross-validation procedure was applied to ensure the objectivity and consistency of the model. The results indicated that the optimal features for classifying SSI were free hydrocarbon content, effective porosity, and brittleness index. The model achieves precise SSI predictions with an accuracy of 97.22%, a precision of 98.61%, a recall of 97.22%, and an F1 score of 97.56%. It exhibits excellent performance in comparison with seven competing models on all performance evaluation metrics. By addressing the limitations of traditional petroleum geological interpretation techniques, this model enhances the efficiency and success rate of oil and gas exploration.

Rethinking Multi-Realization Alluvial Fan Model of Brani Formation through Digital Outcrops of the Great Harau Valley, West Sumatra

Mr Iqbal Fardiansyah^{1,2}, Dr Indra Gunawan¹, Dr Dwiharso Nugroho¹, Giyatno², Ilyas Anindita³, Rian Cahya Rohmana³

¹Bandung Institute of Technology, Bandung, Indonesia, ²Pertamina Hulu Energi, Jakarta, Indonesia,

³Geopangea Research Group, Yogyakarta, Indonesia

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Extensive exploration and development activities have been aggressively pursued on Neogene reservoirs in the western Indonesian Basins. Therefore, current efforts are increasingly directed toward a deeper target on Paleogene petroleum systems which is untapped hydrocarbon potential. Brani Formation is a part of Paleogene rocks fantastically outcropped in the Harau Valley, Payakumbuh Sub-basin, West Sumatra. This formation is characterized by localized facies distribution, limited geometry, and high heterogeneity facies performed new challenges in subsurface modelling, making it an ideal outcrops analog studies that aimed in reducing facies uncertainties of Paleogene syn-rift reservoir.

This paper emphasizes on the Digital Outcrop Model (DOM) approach to reconstruct a high-resolution 3D static facies model of alluvial fan reservoir. DOM integrates field data with digital imaging techniques to create accurate outcrop representations. Key field data utilized include sedimentological logs, structural and facies geobody measurements, rock descriptions, biostratigraphic, petrographic, and paleocurrent analyses. These real datasets facilitate in validating the model and strengthen the geological interpretation.

The framework involves horizon picking within the DOM, facies classification, construction of structural and stratigraphic grids to develop high resolution 3D static facies models. By integrating diverse field datasets, the resulting model achieves high geological fidelity and directly calibrated against real-world outcrop data. Ultimately, the multi-realization facies models produced in this study provide critical input for predicting subsurface reservoir geometries and narrowing facies uncertainty in Paleogene syn-rift alluvial fan systems across the Sumatra and Java Basins.

Forty-Year (1985-2025) Evolution of the Walker Lake, Nevada, USA Braid-Delta System from Remote-Sensing Imagery

Dr. Christopher Fedo¹, Dr Jason Muhlbauer², Dr Mathieu Lapôtre³

¹University of Tennessee, Knoxville, United States, ²Boise State University, Boise, USA, ³Stanford University, Stanford, USA

6D: The complexity of braided rivers that reach the base level, Rongomātāne A (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

Walker Lake, Nevada (USA) resides in a half-graben basin with thick sedimentary fill. Delta and braid-delta deposits have been forming since the late 19th Century where the southward flowing Walker River enters from the north. Dam construction in the 1920s-1930s and evaporation has resulted in a decrease in lake level by ~50 m, driving forced regression and southward delta progradation into Walker Lake. We focus on the geometry, style, and evolution of braid delta deposits south of Pelican Point using serial imagery from Google EarthTM. From 1985 through 2004, the laterally constrained Walker River entered the lake via a narrow, southward widening valley filled by lacustrine linear braid-delta deposits that prograded >2 km. Continued sediment delivery with decreasing lateral confinement formed a radial braid delta that expanded to a radius of ~400 m in about a year. Between ~ 2006-2009 progradation ceased with stable base level, submerging the braid-delta plain and causing a return to a linear terminus. Renewed base-level drop and incision prograded sediment out ~1 km by 2013 in a radial braid-delta building episode, then paused for several years before returning to a more linear and wave-influenced terminus until ~2019. At that time, base level dropped again causing renewed progradation of a radial braid-delta lobe with a radius of ~700 m. In 2025, this episode ceased with stabilizing or rising base level that submerged and deteriorated the distal braid-delta plain. Stepwise forced regression has resulted in >4 km of progradation driven by ~15 m of base-level fall through multiple pulses of radial braid delta construction with interim times of minimal progradation, wave reworking, and more linear braid deltas. The rapid change in braid-delta terminus geometry and intervening wave reworking across brief time-scales shows that even during consistent base-level fall, expected facies and erosional surfaces may be complexly intermingled.

Complex Interplay Between Downslope and Alongslope Processes in the Pegasus Canyon Offshore New Zealand

Meret Felgendreher¹, Dr. Joshu Mountjoy², Dr. Rachel Barrett¹, Dr. Jörg Bialas³, Hanna Marxen¹, Dr. Mehrdad Soleimani Monfared³, Prof. Dr. Sebastian Krastel¹

¹Christian-Albrechts-Universität zu Kiel, Kiel, Germany, ²National Institute of Water and Atmospheric Research, Wellington, New Zealand, ³GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel, Germany

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Continental shelves and slopes are dominated by the interplay between downslope and alongslope processes, which form contourite and mixed (turbidite-contourite) depositional systems. Although these systems occur across the majority of global continental margins, the study of mixed systems is still a young field of research. Pegasus Canyon, a submarine canyon located between 100 m and 1800 m water depth on the Chatham Rise offshore eastern New Zealand, provides a unique opportunity to investigate past and recent interactions between downslope and alongslope processes in a canyon system that is strongly influenced by changes in sea-level during glacial-interglacial cycles.

In early 2025, a suite of geophysical data (high-resolution 2D reflection seismic and sub-bottom profiler/Parasound) and geological samples (sediment cores) were collected in and adjacent to Pegasus Canyon by RV Sonne during cruise SO310. We make use of this data to examine the depositional processes being active in Pegasus Canyon. This will allow us to understand the evolution of the canyon system and assess how changes in the depositional environment, driven by sea-level changes during glacial-interglacial cycles, shape Pegasus Canyon.

Our extensive network of seismic and Parasound data reveal that the canyon floor is characterised by the complex interplay of mass transport deposits and contourites. The lower slope, in contrast, is dominated by alongslope processes (contourite deposits). The seismic data enable us to map the extent of the contourite bodies across the system. Preliminary age constraints from the sediment cores reveal that the thick contourite deposits were deposited over a considerable timespan allowing us to evaluate temporal evolution of the entire Pegasus Canyon. Our results provide critical information for better understanding the associated geohazard potential in and adjacent to Pegasus Canyon.

Study on Late Mesozoic Geological Evolution, Carbon Storage Potential and Marine Engineering Conditions in Qiantang Sag, East China Sea Basin

Assoc. Prof. Kailong Feng^{1,2,3}, Prof. Weilin Zhu², Prof. Baozhu Jia¹, Dr. Weizhen Chen³, teacher Zhe Yang⁴, Dr. Zengyuan Zhou², Mr. Dongzhen Yang¹, Mr. Bozhou Xie¹

¹Naval Architecture and Shipping College, Guangdong Ocean University, Zhanjiang, China, ²Center for Marine Resources, Tongji University, Shanghai, China, ³Key Laboratory of Deep-Time Geography and Environment Reconstruction and Applications of Ministry of Natural Resources, Chengdu University of Technology, Chengdu, China, ⁴School of Management, Guangdong Ocean University, Zhanjiang, China

8F: Sedimentology and Sustainable GeoEnergy, Rongomātāne C (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

This study focuses on the Late Mesozoic geological evolution of the Qiantang Sag in the East China Sea Basin. Through interdisciplinary research combining marine geology and marine engineering, it aims to conduct an in - depth analysis of the geological carbon storage potential in the Qiantang Sag. We reconstruct the regional tectonic framework by utilizing data on magmatic activities and basement characteristics in the South China continental margin - East China Sea Basin. Combining zircon U - Pb dating and well - seismic joint interpretation, we determine the age and spatial distribution patterns of Mesozoic strata.

By conducting land - sea comparative research and coupling the provenance pedigree analysis of detrital zircons with grain - size analysis and sedimentary facies studies, we reveal the evolution of the provenance system and its response mechanism to tectonic - sedimentary processes. We then construct a tectonic - basin coupling - sedimentary filling model under an arc - basin coupling background, clarifying the control rules of basin evolution on favorable carbon - storage reservoir - caprock combinations.

Integrating the geological evolution of the western Pacific continental margin with the demands of carbon storage engineering, we comprehensively evaluate the geological suitability and engineering feasibility of carbon storage in the Qiantang Sag. By integrating data on rock physical properties, sea conditions, and port and maritime transport conditions, we form a technical chain of "geological process constraints - reservoir - caprock parameter extraction - engineering threshold matching," providing scientific support and engineering pre - research foundations for achieving carbon neutrality in the Yangtze River Delta region.

Evaluating the Marine Sedimentary Imprint of Secondary Lahars Associated With the 2015 Eruption of Calbuco Volcano, Chile

Dr Rodrigo Fernández¹, Amalia Valdivieso¹, Sebastian Watt², Giulia Ferrante³, Anke Zernack⁴, Lorna Strachan⁵, Rebecca Totten⁶, Javier Canete⁵, Alastair Hodgetts⁷, Kerys Meredew², Paola Pena⁸, Constanza Perales⁸, Ivan Puchol⁹, Aaron Micallef¹⁰

¹Universidad De Chile, Santiago, Chile, ²University of Birmingham, United Kingdom, ³National Institute of Oceanography and Applied Geophysics, Italy, ⁴Massey University, New Zealand, ⁵University of Auckland, New Zealand, ⁶University of Alabama, United States, ⁷University of Edinburgh, United Kingdom, ⁸SERNAGEOMIN, Chile, ⁹Sapienza University of Rome, Italy, ¹⁰Monterey Bay Aquarium Research Institute, United States

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The sediment flux to marine environments in coastal volcanic arc settings is often dominated by the transient sourcing of large amounts of volcanic materials and their subsequent transport and delivery to coastal areas. Once in the marine environment, ocean currents and local oceanographic conditions control the distribution and location of volcanic deposits. The resulting tephra layers are important chronostratigraphic markers that provide information on eruption histories and subsequent reworking processes. Calbuco is an active volcano located in the Southern Andes of Chile, 32 km northeast of densely populated areas. Calbuco volcano is characterized by the extrusion of lava flows and domes, mostly of silicic andesite composition, with associated pyroclastic flows and lahars. In April 2015, Calbuco volcano started an eruptive cycle that included two successive sub-Plinian phases, which produced >15 km-high eruption columns and pyroclastic density currents that travelled down most of the flanks of the volcano. Primary and secondary lahars were also generated on the flanks during and following the eruption. Reloncavi fjord is an enclosed and relatively shallow fjord, connected with Calbuco volcano through the Petrohue river. In this contribution, we present the preliminary results of the first marine geology and geophysics survey carried out in Calbuco fjord during the FKt240902 science cruise (RV Falkor(too), Schmidt Ocean Institute; September 2024), aimed at investigating the sedimentary imprint of the Calbuco 2015 eruption. We present a seismic-stratigraphic analysis of sub-bottom profiler data, geomorphological interpretation of multibeam swath bathymetry data, and sedimentological and compositional data from two sediment cores. The results will allow us to evaluate the dispersal and deposition of volcanic products in a fjord that is subject to strong tidal currents, the potential of marine records to complement land-based eruptive histories, and the potential of developing tephra-derived chronostratigraphic frameworks from marine sedimentary archives in the fjords of southern Chile.

Glacial Lake Outburst Floods in Northern Patagonia and their Sedimentary and Morphological Imprint: The Case of the HPN4 Glacial Lake and the Huemules Valley, Chile

Dr Rodrigo Fernández¹, MS(c) Marcelo Santis¹, Sion Moraga¹, Natalia Varela²

¹Universidad De Chile, Santiago, Chile, ²University of Virginia, United States

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Widespread glacier thinning and retreat over the last decades have led to a global increase in the number and size of glacial lakes and the occurrence of Glacial Lake Outburst Floods (GLOFs). These events are produced by the rapid draining of glacial lakes due to the failure of ice dams. GLOFs drive geomorphological, sedimentary, and ecosystem transformations in the fluvial drainage networks, including the erosion of vegetated patches, channel migration, floodplain aggradation, and reworking of existing deposits. However, the relationship between morphological and sedimentary changes and the varying modes of GLOF occurrence remains poorly understood. Owing to the great number of glaciers and glacial lakes currently generating GLOFs with recurrences of a year or less, the southern part of the Northern Patagonian Icefield (NPI) is an ideal place to study the sedimentary record and morphological impacts of GLOFs.

We present results on the sedimentary imprint of GLOFs of different magnitudes in fluvial and lacustrine settings of the Huemules Valley, in the southern margin of the Northern Patagonian Icefield. We evaluate the relationship between the varying modes of GLOF occurrence associated with the HPN4 glacier-lake system and geomorphological changes (vegetation and sediment patches, river sinuosity and braiding) in the Huemules Valley. We established a detailed chronology of GLOF events from 2010 to 2025 using multispectral satellite data and cross-validated hydrological data from a river monitoring station. We identified sedimentary facies associated with GLOFs in the Huemules Valley from sediment cores and surface samples, using laser granulometry, total organic matter content, and Magnetic Susceptibility. Radiocarbon dating of vegetation remains provided approximate age constraints for the sedimentary deposits. This integrated, multiproxy approach not only expands our understanding of GLOFs in the Huemules Valley system but also provides a valuable framework for identifying and interpreting past GLOFs in other glaciated regions.

The Exciting Story of a Dying Lake Margin

Mr Matheus Ferreira¹, Dr Joao Paulo Gomes¹, Dr Alberto Cruz², Dr Daniel Bettú³, Dr Ana Paula Soares⁴
¹Petrobras, Rio de Janeiro, Brazil, ²Beicip-Franlab, Rueil-Malmaison, France, ³UDESC - Universidade do Estado de Santa Catarina, Balneário Camboriú, Brazil, ⁴Pontifícia Universidade Católica do Rio de Janeiro, Rio de Janeiro, Brazil

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

There is a place in southwestern Wyoming, known as Little Mesa Plateau, where 15 meters of Green River Formation deposits record an ancient lake margin. This section has been the subject of significant interest in recent studies, discussing the mixing of drainage system waters with hydrothermal springs to explain the textures of bioherms, as well as the influence of climate cycles on lacustrine facies distribution.

The lacustrine section rests upon the fluvial deposits of the Wasatch Formation and is overlain by the Bridger Formation, suggesting that the shores of Lake Gosiute barely overlapped onto an alluvial plain and the lake was eventually buried by volcanoclastics inflows. Despite its limited thickness and the evidence of a short lacustrine history, the lateral and vertical diversity of facies suggests a remarkably dynamic shore in terms of carbonate colonization. In a field trip during September 2024, nine stratigraphic sections were measured, and high-resolution photogrammetry drone acquisition were conducted to analyse how the lacustrine facies distribution occurs, which surfaces are spatially mappable, and what can be measurable to parameterize sedimentological processes.

Stratigraphical forward simulations were employed as a creative tool to test facies and architectural elements distribution possibilities, integrating our field data with bibliographic research.

The main discussions include the challenges of reproducing the alluvial plains at the top of the Wasatch Formation, evolving to the climax of lacustrine marginal stromatolites until the burial by volcanoclastics inflows. The results indicate that the transportability rate of siliciclastic deposits and a base level curve emulating the floodplain sediment storage are the most critical parameters for reproducing the geometries observed in the field. For carbonate layers, the growth rate of the carbonate fabric plays a significant role. In either case, the architectural elements can be reproduced in a simplified manner with the current stage of tool development.

Machine Learning-Based Seismic Facies Classification of Deep Marine Sediments

Student Tural Feyzullayev^{1,2}, Beatriz Benjumea Moreno¹, David Lubo Robles³, Heather Bedle³, Estefanía Llave Barranco¹, F. Javier Hernández-Molina⁴, Zhi Lin Ng⁵

¹Instituto Geológico y Minero de España, Madrid, Spain, ²Departamento Estratigrafía, Facultad de Ciencias Geológicas, Universidad Complutense de Madrid, Madrid, 28040 Madrid, Spain, ³School of Geosciences, The University of Oklahoma, Norman, USA, ⁴Instituto Andaluz de Ciencias de la Tierra, IACT-CSIC, Granada, Spain, ⁵School of Marine Sciences, Sun Yat-sen University, Zhuhai, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Classifying sedimentary facies using seismic data is essential for characterizing depositional processes and geological heterogeneity in deep-water sedimentary systems, especially when evaluating subsurface reservoirs. This study applies a machine learning-based workflow to analyze the Late Miocene deep-water deposits in the Gulf of Cádiz. These sedimentary deposits were developed in relation to the water mass exchange between the Mediterranean and Atlantic through the Guadalquivir, Betic, and Rifian corridors, resulting in a wide range of sedimentary facies. The structurally and stratigraphically complex sedimentary processes include turbiditic deposits reworked by bottom currents, forming mixed systems from a combination of turbidite, contourite and hemipelagic processes. These features are of particular interest due to their significant potential for carbon dioxide (CO₂) storage. A Probabilistic Neural Network (PNN) is used at the start of the workflow to differentiate between interested Late Miocene sediments and allochthonous units of the Gulf of Cádiz. Key features are then identified, and attribute redundancy is decreased using Principal Component Analysis (PCA). Due to their low inter-attribute correlation and significant contributions to the principal components, four seismic attributes; GLCM energy, coherent energy, peak magnitude, and dip deviation, were chosen. These attributes were then entered into a Self-Organizing Maps (SOM) to perform unsupervised facies analysis within the constrained Late Miocene interval.

The facies results offer valuable insights into coarser deposits, reservoir quality and heterogeneity by revealing complex sedimentary architectures, including predominantly turbiditic-contouritic facies, mounded features, channel systems, and erosional surfaces between stratigraphic units. This integrated approach highlights the potential of machine learning to enhance seismic facies interpretation and support the assessment of CO₂ storage opportunities in deep marine environments.

Acknowledgements:

This research is part of the ALGEMAR project (PID2021-123825OB-I00), conducted in collaboration with SEASTORAGE (TED2021-129816B-I00) and “The Drifters” Research Group. Tural Feyzullayev acknowledges PhD funding from AEI (PRE2022-102745). This research uses data obtained during the Integrated Ocean Drilling Program (IODP Expedition 339), as well as data provided by the Direção Geral de Energia e Geologia (DGEG, Portugal) under confidentiality agreements. Seismic attributes, PNN, PCA, and SOM were computed using AASPI Consortium tools from the University of Oklahoma (USA).

Demise of a Lowstand: Impact of Ravinement on Low Gradient Ramp Margins

Dr Ciaran O'Byrne¹, **Professor Stephen Flint**²

¹Shell International E+P (retired), Houston, USA, ²University of Manchester, Manchester, United Kingdom

2C: Coastal to shelf environments across time and space (2), Tāwhirimātea E (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

The Campanian Blackhawk Formation, Book Cliffs, Utah has been a field laboratory for the definition and characterization of siliciclastic depositional sequences and constituent parasequences over decades. A long-term issue has been the apparent absence of lowstand deposits down dip of regionally developed sequence boundaries. Despite world-class exposures, the outcrop provides a restricted, largely two-dimensional view of the regional scale stratigraphy. Integration of a 3000 sq mile well dataset with the classic outcrops has allowed recognition of new subsurface units across depositional strike and down dip, which are interpreted as subaqueous pro-delta deposits of an age equivalent fluvio-deltaic Grassy Member system named the Bitter Creek Delta. Mapping of internal facies belts and new trajectory analysis of the 3 Grassy parasequences and constituent bedsets indicate a descending shoreline trajectory in the lower Grassy, interpreted as a forced regression. The minimum basinward original position of a lowstand shoreline associated with an intra-Grassy sequence boundary has been constrained by a combination of trajectory analysis, mapping of down-dip stacking patterns from subsurface data and pervasive spherosiderite related to water table fall and meteoric water flushing, restricted to downward stepping parasequences. Older Blackhawk units include similar diagenetic 'fingerprints' together with fills of gullies connected to lowstand deltas. The new regional correlations indicate 15 m of Grassy parasequence 3 has been removed. Such top truncation of falling stage clinoforms is in part related to subaerial erosion during base level fall. More significant ravinement during subsequent transgression removed and reworked lowstand shoreline deposits. The combination of (1) low angle ramp margin where small rises in sea level drove strong transgressive erosion and landward detachment and reworking of transgressive shorelines into younger highstand systems and (2) greenhouse climate suppressing the amplitude of orbital forcing and depth of fluvial erosion on sequence boundaries, both enhanced removal of lowstand shorelines.

Evaluation of Microplastics Distribution in Beach Sub-Environments of the Ionian Sea (southern Italy)

Dr Teresa Fracchiolla¹, Dr Angela Rizzo¹, Dr Alessia de Luca¹, Professor Massimo Moretti¹, Dr Stefania Lisco¹

¹Università degli Studi di Bari Aldo Moro, Bari, Italy

10B: Plastic Pollution in Sedimentary Systems, Tāwhirimātea C (Level 2), January 30, 2026, 11:00 AM - 12:30 PM

Microplastics (MPs) have become a complex problem in coastal areas in terms of pollution, human health and risk to marine flora and fauna ecosystems. Most MPs found in coastal areas are produced in terrestrial environments. A lot of activities are responsible for their production and their direct or accidental dispersion into environmental matrices. MPs arrive at a beach environment transported by sea waves, wind, rainy events and water bodies, to be retained in marine sediments.

Pino di Lenne, part of the Stornara Nature Reserve located in the Apulia Region (southern Italy), is a protected area classified as a Site of Community Interest (SIC) and a Special Protection Area (SPA). It has great value due to its rich river biodiversity and uniqueness. This site was chosen for our research because of its specific location near the mouth of the Lenne River, which originates from a karst spring, and because of the presence of Sabellaria worm colony/bioconstruction, which traps sands and anthropogenic fragments, affecting sediment distribution. The purpose of this work is to understand the distribution and accumulation of MPs in beach sub-environments as a function of waves transport, sedimentation and bottom traction.

Sediment samples were collected along the emerged and submerged beach up to the beach closure depth (around 6 m a.s.l.), and continuing towards the offshore transition and offshore areas (around 8 m a.s.l.) along transects perpendicular to the coastline and at the main morphological features. Assessment of MPs in coastal and marine samples was carried out following the international standard procedure. An oil-based method was applied for the extraction of MPs from sediment, and four MPs types were identified: fibers, films, fragments, and pellets, with black and blue being the most common colors. μ -FTIR and μ -Raman techniques were used to assess the origin of polymers for the identification of microplastics.

The Berms Project: Assessing Beach Dynamics and Erosion Susceptibility Using Multidisciplinary Approaches

Dr Teresa Fracchiolla¹, Dr Vito D'Abbicco¹, Dr Stefania Lisco¹, Dr Guglielmo Glanolio¹, Dr Francesca Micheletti¹, Professor Annamaria Fornelli¹, Dr Roberta Trani¹, Dr Carlotta Nonnis Marzano¹, Professor Salvatore Critelli², Dr Sara Criniti², Professor Massimo Moretti¹

¹Università degli Studi di Bari Aldo Moro, Bari, Italy, ²Università della Calabria, Rende, Italy

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Beach EnviRonMentS project's primary goal is to create a standardised approach for monitoring and evaluating the erosion vulnerability of Mediterranean beach environments, with a focus on how they are affected by increasing human pressures and climate change. The methodology is mainly based on a multidisciplinary approach. This integrates sedimentological, geomorphological, geophysical, compositional, and ecological analyses. These analyses are used to investigate the complexity of wave-dominated sandy beach systems.

Field activities focus on three coastal sites in Southern Italy. These are Torre Guaceto and Porto Cesareo in Apulia and Sibari in Calabria. Each site has distinct sediment dynamics, geomorphological settings and ecological sensitivities. The study combines high-resolution topographic surveys with subsurface imaging techniques (Sub Bottom Profilers, Ground Penetrating Radar, resistivity models), supported by numerical simulations using the Delft3D software. A key part of the project is the way it combines different methods. BERMS combines traditional ways of working in the field with advanced modelling and ecological indicators. This aims to balance protecting the environment with meeting the socio-economic aspect. The identification of primary sediment sources and the understanding of sediment-ecosystem interactions are of essential importance for sustainable coastal management. The results of the BERMS project are expected to provide scalable tools and protocols for long-term beach monitoring across the Mediterranean, which will contribute to more informed decision-making processes in coastal planning and climate resilience strategies.

Late Pleistocene to Holocene Evolution of the Makgadikgadi Playa Lakes in Central Kalahari, Botswana

Ms. Trhas Kahsay¹, Prof. Asfawossen Asrat^{1,2}, **Professor Fulvio Franchi**^{3,4}, Doctor Nitesh Sinha^{5,6}, Doctor Marta Marchegiano⁷

¹Department of Mineral Resources, School of Earth Sciences and Engineering, Botswana International University of Science and Technology, Palapye, Botswana, Palapye, Botswana, ²School of Earth Sciences, Addis Ababa University, Addis Ababa, Ethiopia, ³Dipartimento di Scienze della Terra e Geoambientali, Università degli studi di Bari - Aldo Moro, Bari, Italy, ⁴School of Geosciences, University of the Witwatersrand, Johannesburg, South Africa, ⁵Center for Climate Physics, Institute for Basic Science, Busan, Republic of Korea, 46241, ⁶Pusan National University, Busan, Republic of Korea, 46241, ⁷Departamento de Estratigrafía y Paleontología, Universidad de Granada, Granada, España,

10E: Varved and high-resolution lacustrine sequences as records of climate change, anthropogenic impact and extreme events, Rongomātāne B (Level 1), January 30, 2026, 11:00 AM - 12:30 PM

The Makgadikgadi Basin in northeastern Botswana is covered by ~37,000 km² of playa lakes. This basin is a relic of the Paleolake Makgadikgadi, and its sedimentary sequence recorded ca. 1.5 million years of climate and environmental changes. Previous studies utilized calcrete geochemistry and landform analysis to infer the evolution of the Paleolake Makgadikgadi. However, these approaches are inherently constrained by the spatially and temporally variable and discontinuous nature of the landforms and calcrete formation in the basin. The current study used a multi-proxy approach integrating sedimentological, micropaleontological, and geochemical analysis of four short sediment cores of 60-160 cm depth collected across a transect from the western margin to the central part of the Ntswetwe pan. A Bayesian age-depth model based on AMS¹⁴C dates of ostracod shells indicates the deepest part of the 160 cm core was deposited at ~29 ka BP. The age-depth model also provides a precise constraint on the sedimentation rates in the basin during this period.

In this paper, we present the results of the paleoecological analysis based on ostracod fauna. The ostracod community composition was analyzed using Principal Component Analysis (PCA) and cluster analysis to define ostracod assemblages. Preliminary results reveal distinct stratigraphic levels defined by sediment type and groups of ostracod assemblages and distributions. Accordingly, three significant habitat-specific associations were identified: freshwater, brackish water, and saline habitats at shallower depths (~0-60 cm); sediments with high organic matter (~16%) and relatively low calcium carbonate (<60%) are congenial for a population of temporary shallow freshwater ostracod assemblages (i.e., the *Potamocypris* group). In contrast, the relatively deeper sediments (~72-160cm) are characterized by lower organic matter (2-12%) and very high calcium carbonate contents (60-80%) and are dominated by species common in brackish and saline waters (i.e., the *Limnocythere thomasi* group and *Sarscypridopsis aculeate*).

Shallow Subsurface Playa Lake Sediments: Implications for the Interpretation of Martian Lacustrine Deposits

Professor Fulvio Franchi¹, Dr Luigi Capozzoli², Prof Gerardo Romano¹, Dr Ame Thato Selepeng³, Mr Boniface Kgosidintsi³, Ms Trhas Hadush Kahsay³, Prof Mebatseyon Shawel⁴

¹Università Di Bari, Bari, Italy, ²IMAA/CNR, Potenza, Italy, ³Botswana International University of Science and Technology, Palapye, Botswana, ⁴Addis Ababa University, Addis Ababa, Ethiopia

Keynote: Prof. Fulvio Franchi, Tāwhirimātea A (Level 2), January 27, 2026, 12:45 PM - 1:30 PM

The Makgadikgadi Basin in Botswana hosts one of the largest systems of salt pans (playa) in the world. The formation of these pans is related to tectonic activity linked to the East African Rift System, which caused the subsidence and infilling of a large endorheic basin. Changes in climate and tectonics eventually led to the drying up of the ancient lake and formation of salt pans in the Holocene. These pans are mostly flat, fringed by paleo-shorelines and relict fan deltas. The pan floor is seasonally inundated by rivers coming from the east, although a contribution of water from groundwater upwelling through buried faults was hypothesized. In the western part of the basin there are numerous mounds, several hundreds of meters wide and with a concentric pattern. While several theories have been proposed for their origin (from barchan dunes to spring mounds), the internal sedimentary structure of these geomorphic features remains unknown.

The objectives of this study were: i) to image the subsurface of the pan floor above buried faults (mapped by previous studies) and assess the contribution from groundwater upwelling; ii) to image the internal structure of the mounds in the western part of the basin and unravel their genesis; iii) to study the buried geometry of a relict fan delta that was abandoned ca. 1 kyrs. These objectives were achieved by performing a detailed Ground Penetrating Radar campaign in the study area by the use of a Mala ProEx acquisition system, using rough terrain antennae on an in-line configuration for 30 MHz and 50 MHz frequencies.

The ultimate goal of this work was to understand the formation and preservation of similar lacustrine deposits on the Martian surface, comparing our results with the GPR survey coming from Jezero Crater (from RIMFAX onboard NASA's Perseverance rover) and Utopia Planitia (from Tianwen-1 mission, Zhurong rover).

Analyzing Varved Sediment Sequences Using High-Resolution Scanners: Challenges and Prospects

Pierre Francus¹, Mrs Marie-Eugénie Jamba¹, Dr. Margherita Martini², Mr. Arnaud De Coninck¹

¹Institut national de la recherche scientifique - Eau Terre Environnement, Québec City, Canada, ²INSA, Lyon, France

10E: Varved and high-resolution lacustrine sequences as records of climate change, anthropogenic impact and extreme events, Rongomātāne B (Level 1), January 30, 2026, 11:00 AM - 12:30 PM

Varve sequences are particularly valuable climate archives because they contain a precise chronology, at least at annual resolution, and are undisturbed or only slightly disturbed. However, counting and measuring varve properties has often been a tedious task using conventional means, such as thin-section analysis. The advent of high-resolution micro-X-ray fluorescence scanners, hyperspectral scanners, and computed tomography (medical CT and micro CT) offers new perspectives for the study of varves. However, these analyses present many challenges. The main difficulty comes from the fact that soft sediments tend to dry out during and between analyses, which makes the alignment of these high-resolution measurements on varved sediments cumbersome. Indeed, at the submillimetre scale, these shifts can lead to aberrant results. To be able to combine these analyses, a strict analytical protocol must be followed. This presentation outlines strategies to avoid these pitfalls and shows the latest developments in the use of these new technologies to establish reliable paleoclimate reconstructions. A particularly promising avenue is the use of microCT to measure the density of each varve, which allows the calculation of annual mass accumulation rates (in $\text{g/m}^2/\text{a}$), i.e., annual sediment fluxes. These measurements can therefore be more easily compared with outputs from numerical models of natural processes, such as sediment transport models.

The Effects of OAE-2 on Tethyan Carbonate Platforms: a Summary

Prof. Gianluca Frijia¹, Dr Sahara Cardelli¹, Dr Barbora Krizova¹, Professor Michele Morsilli¹, Professor Mariano Parente²

¹Dipartimento di Fisica e Scienze della Terra, Università di Ferrara, Ferrara, Italy, ²DiSTAR, Università degli studi di Napoli Federico II, Naples, Italy

4B: Carbonate systems and processes (3), Tāwhirimātea C (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

The Oceanic Anoxic Event 2 (OAE-2), at the Cenomanian–Turonian boundary was one of the most severe OAEs of the Mesozoic. Several triggering mechanisms have been proposed: from increased oceanic/atmospheric pCO₂ due to the emplacement of large igneous provinces to increased nutrient inputs to surface waters from continental sources. The Cenomanian-Turonian interval was, also, one of the warmest periods in Earth history with the highest oceans temperatures of the entire Cretaceous reached in the Early Turonian.

Analyses of sedimentary mercury (Hg) in marine sediments are, generally, used as a proxy for volcanic eruptions in the geological record whereas phosphorus (P) concentrations are widely used as proxy for primary productivity. Finally, seawater temperatures reconstruction across the OAE-2 have been, extensively, produced using $\delta^{18}\text{O}$ and Tex86 from sediments and biogenic carbonates.

The majority of geochemical data across the OAE-2 come from deep-water carbonate successions, whereas shallow-water carbonates have been overlooked despite their relevance for biota evolution and climate perspective. However, in the last 10 years a large amount of data was obtained from OAE-2 carbonate platforms deposits cropping in the Tethyan region offering, for the first time, the opportunity to depict the paleoenvironmental changes in these settings and how these perturbations have affected carbonate platforms evolution.

In the present study we summarize recent findings regarding OAE-2 in carbonate platforms by integrating sedimentological, $\delta^{18}\text{O}$, $\delta^{13}\text{C}$, Hg, P analyses and paleontological data. The geochemical dataset is obtained by analyzing both bivalve shells and bulk rock samples from Cenomanian–Turonian successions belonging to the Apennine Carbonate Platform and Adriatic Carbonate Platform (Italy) and the Natih Fm. (Oman). The results show that major geochemical and biotic shifts can be recognized in all the studied successions and, most importantly, that carbonate platforms reacted very similarly independently of their paleogeographic position.

Mapping Aotearoa New Zealand's Diverse Surficial Marine Sediments: Utilisation of Machine Learning to Unveil Sediment Grainsize, Organic Carbon, Inorganic Carbon, and Geochemical Signatures.

Ms Grace Frontin-Rollet^{1,2}, Dr Richard Wysoczanski, Dr Monica Handler², Dr Scott Nodder¹, Dr Sally Watson^{1,3}, Dr Sam Davidson¹, Dr Susi Woelz¹, Dr Ashley Rowden^{1,4}, Dr Alain de Verneil¹, Dr Denise Fernandez¹, Kevin Mackay¹

¹Earth Sciences NZ, ²Victoria University of Wellington, Te Herenga Waka – School of Geography, Environment and Earth Science, Aotearoa New Zealand, ³University of Auckland/ Waipapa Taumata Rau, Aotearoa New Zealand, ⁴Victoria University of Wellington, Te Herenga Waka – School of Biological Sciences, Aotearoa New Zealand

10C: Mapping marine sediments in the world (2), Tāwhirimātea E (Level 2), January 30, 2026, 11:00 AM - 12:30 PM

Aotearoa's marine realm is highly diverse and subjected to different processes mediated through forces such as volcanism, earthquakes, strong currents, and multiple anthropogenic effects. These processes affect the physical characteristics of surficial seafloor sediments such as grainsize distributions, inorganic and organic carbon contents, geochemical compositions, and the incorporation of metal pollutants. Given the large spatial scale of this marine realm at 15 times the size of Aotearoa's landmass, the composition of seafloor sediments at regional scales is still being unravelled.

We present new regional scale maps of grainsize, organic carbon, and inorganic carbon within the Aotearoa New Zealand Exclusive Economic Zone and Territorial Sea that are generated using machine learning. Covariates such as surface currents, gravity anomalies, and geological terrane derivatives enable these machine learning models to incorporate aspects of different physical and geological processes influencing sediment composition to create more detailed and informative maps than previously possible.

The geochemical composition of sediments is highly influenced by sediment provenance, and hence the mineralogy of source rocks. Anthropogenic pollution from urban areas can also add additional heavy metals (e.g., Ni, Zn, Cr, Pb, Hg) into the environment. Based on the machine-learning derived sediment distribution maps, we have also developed geochemical maps of the Bay of Plenty that highlight the diversity of major (Si, Al, Ti, Ca, Fe, K) and trace (Sr, Rb, Zr, Ni, Cr, Zn) elements in relation to sediment provenance. In the future, we will also use the new sediment and geochemical maps to improve habitat suitability models for biotic communities on the seafloor.

The knowledge of multiple facets of sediment composition may help assess the potential vulnerability of sediments, and their biotic communities, to present and future anthropogenic effects such as ocean acidification and seabed disturbance by extractive industries, such as deep-sea mining, bottom trawling, dredging and anchoring.

Comparing the Impacts of Ship Anchoring on Sediment Structure and Composition in Wellington Harbour/Te Whanganui Ā Tara

Ms Grace Frontin-Rollet¹, Dr Sally Watson^{1,2}, Dr Marta Ribó³, Dr Rachel Hale¹, Dr Scott Nodder¹, Dr Stacy Deppeler¹, Dr Alan Orpin¹

¹Earth Sciences NZ, ²University of Auckland/Waipapa Taumata Rau, Aotearoa New Zealand, ³Auckland University of Technology/Te Wānanga Aronui o Tāmaki Makau Rau, Aotearoa New Zealand

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Ship anchoring impacts the seabed with direct and indirect implications for the health of the shallow marine environment. Previous research in Aotearoa New Zealand has demonstrated that anchoring can gouge soft substrates up to 80 cm depth, with average penetration depths ~30 cm. In March 2024, we recovered sediment cores from three sites within Te Whanganui ā Tara Wellington Harbour, Aotearoa New Zealand: a highly disturbed anchoring zone, a recently disturbed, active anchoring zone (with known time/duration of last anchoring) and an undisturbed control site outside the designated anchorage zones. The highly disturbed site seafloor morphology is characterised by elevated roughness and variable slopes attributed to intense historical ship anchoring. The recently disturbed site recorded a ship anchoring event that occurred ~1 month prior to sample collection. Finally, the undisturbed site was at a similar depth and oceanographic regime to the two anchoring zones, but with no morphological evidence of anchor damage. Sediment structure and relative density were determined via Computed Tomography (CT) scans. Down core trends in particle size, organic carbon, total organic matter, calcium carbonate, and porosity were compared across the three sites. X-Ray Fluorescence can identify potential heavy metal pollutants such as Cu, Zn, Ni, and Cr, and any down-core redox changes using ratios of Mn/Fe and Fe/S. Initial results show that disturbance from anchorage impacts sediment density and redox horizons. The recently disturbed anchoring site has lower bulk density than the other two sites. Paired (oxic/anoxic) horizons are limited to the upper 10 cm, compared to much deeper in the sediment core (>35 cm) at the control and historically disturbed sites. These results contribute to broader insights into immediate and cumulative ship anchoring impacts and are progressively quantifying a more complete picture of the environmental signatures of anchoring impacts in the marine coastal zone.

Study on the Genetic Model of Felsic Mudstone and Shale in Continental Lacustrine Basin

Jian Fu^{1,2}, Longwei Qiu^{1,2}, Yongqiang Yang^{1,2}

¹State Key Laboratory of Deep Oil and Gas, Qingdao, China, ²China University of Petroleum, East China, Qingdao, China

10F: Sediment gravity flow deposits in lacustrine basins (2), Rongomātāne C (Level 1), January 30, 2026, 11:00 AM - 12:30 PM

Common rock types in shale include carbonate shale, felsic shale, clay shale, and transitional shale. The current research and exploration and development work mainly focuses on carbonate mud shale, but felsic mud shale is also a very large proportion of the rock types in the continental lake basin mud shale. Analyzing its sedimentation and determining its depositional model will help the next step of shale oil exploration and development. Based on conventional experimental methods such as core observation, thin section observation, X-ray diffraction, and argon ion polishing scanning electron microscopy analysis, using self-developed mineral rock thin section image recognition technology, quantitative analysis of parameters such as area, inclination, and roundness of mineral particles in different felsic mudstone lithofacies was conducted. It was believed that turbidity current deposition in felsic mudstone was an important sedimentary genesis type. The felsic shale has a clear "dual structure" in composition, which is manifested on the core as a pure siltstone layer overlying a rich felsic calcareous mudstone layer. The area and number of mineral particles in the thin section do not show significant vertical grain-order bedding, presenting a stable massive sedimentation. The felsic minerals in the overlying rock layer are dispersed in the matrix of micrite calcareous minerals and clay minerals. The specific sedimentation process is that the pre-delta sediments deposited on the edge of the lake basin are transported forward along the edge of the lake basin under the action of external forces such as earthquakes, and continuously accelerated under the action of gravity, forming a block flow. During the forward migration process, the block flow interacts with the lake water, causing the location of fine clasts such as silt to be stripped from the block and mixed with the water to form turbidity currents. The turbidity currents migrate down the slope to the flat area at the bottom of the lake basin, where they begin to slow down and unload, thus forming a stable siltstone layer; As the kinetic energy of the fluid diminishes further, the sediment carried decreases, and the felsic minerals and clay minerals dispersed in the water body deposit under gravity to form a layer of felsic-rich calcareous mudstone.

Formation of Internal Delta in Minibasin: Insight from Horizontal 2D Numerical Experiments

Mr Seiya Fujishima¹, Professor Hajime Naruse¹

¹Kyoto University, Kitashirakawa Oiwake-cho, Sakyo-ku, Kyoto, Japan

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Facies models of submarine fans typically comprise three key elements: submarine canyons, leveed channels, and lobes. These models are well suited to large basins. However, recent observations of deltaic topography in minibasins, common in tectonically active regions, suggested that their depositional features may differ significantly. One key difference may be ponding, a process unique to minibasins, where turbidity currents enter the basin and fill it with suspended sediments. This leads to hydraulic jumps at basin margins, strongly shaping basin geomorphology. To investigate this, we conducted 2D horizontal numerical simulations of turbidity currents using the four-equation model with water detrainment. The model domain was 6.7 m wide and 3.5 m long, forming an artificial minibasin with 10% surrounding slopes. The inlet flow had a velocity and thickness of 0.05 m/s and 0.05 m, respectively. Suspended sediment consisted of 20 and 40 μm particles, each at a concentration of 0.005. Simulations ran for 86,400 seconds. A control experiment was also conducted on a flat abyssal plain. The numerical experimental results demonstrated that ponding in the minibasin produced an internal delta with distinct topset, foreset, and bottomset beds, and a sharp reduction in coarse sediment at the hydraulic jump. In contrast, no deltaic topography or ponding occurred in the abyssal plain, and coarse sediment decreased gradually downstream. These results support the hypothesis. Further experiments will help refine a facies model specific to minibasins.

Characteristics of Three Deltas Systems along an Arid Coastline of Western Pangea: Case Study from the Lower Triassic Montney Formation, Canada

Dr Carolyn Furlong¹, Rebecca Cruickshank¹, Dr Patricia E. Fraino², Dr Omid H. Ardakani^{3,4}, Dr Per K. Pedersen⁴

¹MacEwan University, Edmonton, Canada, ²Manitoba Geological Survey, Winnipeg, Canada, ³Natural Resources Canada, Geological Survey of Canada, Calgary, Canada, ⁴University of Calgary, Calgary, Canada

1C: Coastal to shelf environments across time and space (1), Tāwhirimātea E (Level 2), January 26, 2026, 10:15 AM - 11:45 AM

Deltas along arid coastlines settings are poorly preserved in the rock record due to their episodic discharge and extensive sediment reworking during fair-weather conditions. While some studies have examined the relationship between aeolian to shallow-marine depositional environments, the aeolian component is often absent from preserved successions, thus requiring inferences from the shallow-marine deposits. One such example is the Lower Triassic Montney Formation, which was deposited along the western margin of Pangea at a paleolatitude of ~32–34°N under arid paleoclimatic conditions. Based on variations in clay content, total organic carbon (TOC) content, and sedimentary structures, three delta types were identified in proximal settings, suggesting complex marginal marine processes than solely wind-blown input into the basin.

This study compares sedimentological characteristics and organic content within an ephemeral delta, wave- and fluvial-dominated delta to evaluate their respective contributions to offshore sediment delivery. The ephemeral delta deposits exhibit coarsening-upward succession (up to 15 m thick) of silty shale, siltstone and very fine-grained sandstone with occasional syneresis cracks, low-diversity Cruziana ichnofacies, and soft sediment deformation reflecting ephemeral deltaic input. Total clay ranges from 10-35% and < 1%. TOC. The fluvial-dominated deltaic succession (10-20 m thick) is made up of fining-upward beds (10-50 cm in thickness) of fine- to medium-grained sandstone at the base that are capped by organic and clay-rich beds (total clay <46% and <2% TOC). Sandstone beds are massive, planar through trough-crossed stratified with frequent soft sediment deformation. Wave-dominated deltaic deposits are similar but generally thinner (5-10 m thick succession), with sandstone beds less than 10 cm thick, lower total clay (<15%) and similar TOC (<2%). Wave-dominated structures are also more abundant. Through facies analysis and mapping, the extent and evolution of these depositional environments can be constructed to understand the dynamic nature of the marginal marine systems along arid coastlines.

Origin, Preservation, and Recognition of Volcanic Ashfalls in Uranium Bearing Paleocene-Eocene Strata with Implications to insitu Leaching Recovery, Chu Sarisu Basin, Kazakhstan

Dr. Milovan Fustic¹, Mr. Bekzhan Smagambetov, Mr. Yergun Bolpakh, Mr. Mark Vais, Mr. Abaidildin Abildakhanov, Dr. Pavel Smirnov

¹Nazarbayev University, Astana, Kazakhstan

6E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (3), Rongomātāne B (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

The uranium-bearing Paleocene – Eocene sedimentary strata in Chu Sarisu basin represent a complex succession of continental (fluvial) and paralic deposits. Despite significant coeval volcanism, literature documenting ashfalls in sedimentary records is limited. This study investigates the origin, preservation, recognition, and implications of poorly documented whitish-colored, powdery facies on In-Situ Leaching (ISL), a technology that employs a dense network of closely spaced (~40 m apart) injection and production wells to carry mobilized uranium to the surface. The leaching solution flow and associated uranium recovery are controlled by reservoir facies and architecture. Core and outcrop observations coupled with X-ray diffraction (XRD) and SEM EDX studies suggest that up to 1.5 meters thick kaolinite-dominated clays on floodplains and dispersed smectite-rich clays within point bar sand facies are linked to volcanic ashfalls. Different clay mineralogy is a function of sub-aerial substrates, water chemistry, and volcanic ash composition. Mixed clay-sand facies within point bar deposits are likely products of volcanic ashfall reactions with fresh water in rivers, followed by clay flocculation and mixing of floccules with detrital sand grains in bedload transport. The high suspended sediment concentration caused by ashfalls, coupled with syn- and post-depositional diagenetic processes have reduced porosity and permeability, which negatively impact ISL recovery processes. Recognition of these intervals in open hole resistivity (Ks) and gamma-ray (GR) logs is challenging. Elemental ratios of volcanic source proxies identified by handheld XRF in cores allow for confirming volcanic origin and measuring vertical continuity (thickness) of these low-permeable strata. Provenance studies are expected to confirm the Kopet Dag (Iran) volcanic arc as a source, and its inferred transport by Westerly winds. This study is logistically and financially supported by KATCO JV LLP.

Machine Learning Helping High-Frequency Stratigraphy in Mesoproterozoic Fluvial-Aeolian Deposits

Ph.D. Ezequiel Galvão¹, Msc Jean Toledo², Msc Gabriel Scheffer², Professor Claiton Scherer², PhD Italo Gonçalves¹

¹Federal University of Pampa, Caçapava do Sul, Brazil, ²Federal University of Rio Grande do Sul, Porto Alegre, Brazil

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Tombador Formation (Espinhaço Supergroup) corresponds to a First Order stratigraphic sequence where changes in the tectonic setting of the sag basin are recorded. It is divided into two second-order sequences by an angular unconformity that separates fluvial-estuarine deposits from alluvial fan deposits. Below the angular unconformity, the third-order sequence records fluvial to estuarine deposition and is divided into five third-order sequences (A-E). Fourth-order sequences are easily recognized within third-order transgressive systems tracts by distinct facies associations, composed of fluvial deposits bounded by fine-grained or tidal influenced intervals. Fine-grained intervals are the most reliable to map in fourth-order sequences because of their broad, laterally extensive sheet-like external geometry. Above the angular unconformity, the third-order sequence exhibits continental alluvial successions composed of conglomerates overlain by fluvial and eolian strata (F-G) divided, in “G” unit, into five facies associations: (i) dunes, (ii) interdunes, (iii) sheet floods, (iv) hybrid sand sheets, and (v) aeolian sand sheets. However, the fourth-order sequences are difficult to recognize and trace due to intercalation and similarity of fluvial and eolian strata. To help identify these fourth-order surfaces and higher-frequency cycles, a U-Net model was trained under a simplified classification of patches on a reference orthophotomosaic, consolidating the facies associations into two labels: (i) aeolian dunes and (ii) sheet floods. The U-Net model predicted the most likely facies over all available orthophotomosaics, and results were cross-validated against established reference data. This approach facilitated the identification of deflation surfaces and, consequently, enabled the delineation of fourth-order boundaries within fluvial-aeolian deposits, greatly reducing the amount of manual labour required to interpret the data. The criteria applied to assign sequence hierarchies are easy to apply and can be used as a baseline for the study of sequence stratigraphy in Precambrian and Phanerozoic basins placed in similar tectonic settings.

Microorganism-Induced Structures in Interdune Deposits and Wet Sand Sheets, Mangabeira Formation, Mesoproterozoic

Undergraduate Student Amanda Feitosa², **Ph.D. Ezequiel Galvão¹**, PhD Adriano Reis³, PhD Manoela Bállico², PhD. Elder Yokoyama³, PhD Amanda Leite³, PhD. Claiton Scherer⁴, Sebastião Willian da Silva⁵, Alexandre Silva Santos⁵

¹Federal University of Pampa, Caçapava do Sul, Brazil, ²Federal University of Santa Catarina, Florianópolis, Brazil, ³University of Brasília, Brasília, Brazil, ⁴Federal University of Rio Grande do Sul, Porto Alegre, Brazil, ⁵Optical Spectroscopy Laboratory, Institute of Physics, University of Brasília, Brasília, Federal District, Brazil

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Microbial activity represents the earliest form of life on Earth, initially emerging in marine and aquatic settings. Evidence of this primitive life is preserved in Microbially Induced Sedimentary Structures (MISS). Over time, microbes colonized continental environments, though records from these settings - especially from the Precambrian - are rare due to poor preservation. However, the study area provides a notable exception, with well-preserved interdune and wet sand sheet deposits that allow for clear identification of lithological textures and structures. This study reports the rare occurrence of MISS in continental aeolian deposits of the Mesoproterozoic Mangabeira Formation (Espinhaço Supergroup). Methods included stratigraphic analysis, outcrop panel construction, petrographic examination (12 thin sections), Raman spectroscopy, and confocal fluorescence microscopy. Observed features include centimeter-scale structures were observed in the form of mud drapes with concave morphologies, wavy surfaces with dispersive tails, bifurcated and crenulated forms, structures draping ripples, and features arranged in spaced sub-horizontal laminations, either oriented or chaotic. These occur on well-preserved surfaces, suggesting intermittent subaerial exposure. Microbial mats exhibit cohesion inconsistent with standard sedimentary mixtures, forming flexible fragments upon erosion. Petrographic analysis revealed microbial mats with shallow depressions in underlying clay, wrinkled structures, disoriented micas trapped by microbial filaments, and frayed microbial fragments linked to erosion and transport. Authigenic minerals and pyrite reflect organic matter decomposition. Raman spectroscopy detected peaks at 1369.45, 1588.12, and 1612.08 cm⁻¹, consistent with carbon and Amides I and II. Confocal fluorescence microscopy showed strong red fluorescence, weak green, and no blue, suggesting the presence of microbial-derived compounds. These findings support the identification of MISS in the Mangabeira Formation, contributing to our understanding of microbe-sediment interactions and microbial adaptation in early terrestrial ecosystems.

Sedimentary Characteristics of a Special Dual-Source Mixed System of Saline Lacustrine Fine-Grained Volcanic Ash and Carbonate

Prof Gang Gao^{1,2}, Dr Yu Miao^{1,2}, Dr Wu Xinsong, Dr Fan Keting^{1,2}, Dr Zhang Youjing^{1,2}

¹School of Earth Sciences, China University of Petroleum Beijing, Beijing, China, ²State Key Laboratory of Petroleum Resources and Prospecting, China University of Petroleum Beijing, Beijing, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Lucaogou Formation in the middle Permian of northern Xinjiang, China is extensively sedimentary, and the Lucaogou Formation in the Santanghu Basin is divided into three subsections according to the differences in lithology and assemblage characteristics, among which the long-distance volcanic periodic activity around the lake periphery during the Luer Formation sedimentary period, the overall climate is hot and arid, and the terrestrial supply is extremely limited, so the sediments in the lake basin are mainly fine-grained volcanic ash and autogenous carbonates, forming a special dual-source mixed sediment. Due to the strong evaporation in the basin, volcanic activity provides abundant trace elements such as magnesium ions, and the carbonate has undergone multiple stages of dolomitization, resulting in the lithology of the second member of the Lu Member, which is mainly tuff, dolomitic tuff, tuff dolomite and dolomite. Comprehensive analysis of petrology, mineralogy, trace elements, organic petrology and biomarkers shows that in addition to the formation of lithology with different mineral compositions, the periodic activity of volcanoes also has obvious sedimentary differences in the periodic changes of organic matter source enrichment. The climate during the volcanic eruption period is relatively warm and humid, the salinity of the water body is relatively low, and cyanobacteria develop, while the climate is hot and dry, the salinity is high, and green algae develops during the intermittent period of volcanic activity, resulting in the development of cyanobacteria and green algae in different degrees of different lithologies, and cyanobacteria mainly develop in tuff and dolomitic tuff, while green algae mainly develop in tuff dolomite and dolomite.

Keywords: Saltwater lake; Volcanic ash; Carbonate; Dual sources; Mixed deposition

Tectonic Tales from Detrital Zircons in the Lower Cambrian Hawker to Lake Frome Groups, Arrowie Basin, South Australia

Ms Rose Gates¹, Associate Professor Justin Payne², Ms Stacey Curtis², Ms Suwijai Jatupohnkhongchai¹, Professor Glenn Brock³, Professor John Paterson¹, Dr Marissa Betts¹

¹University of New England, Armidale, ARMIDALE, Australia, ²University of South Australia, ADELAIDE, Australia, ³Macquarie University, SYDNEY, Australia

1C: Coastal to shelf environments across time and space (1), Tāwhirimātea E (Level 2), January 26, 2026, 10:15 AM - 11:45 AM

In the Arrowie Basin, South Australia the lower Cambrian Hawker Group and overlying Lake Frome Group (and intervening Billy Creek Formation and Wirrealpa Limestone) represent a sedimentary succession that formed in response to regional tectonic evolution from a rifting/passive setting to a convergent regime that ultimately resulted in the Delamerian Orogen—a key phase of Gondwanan amalgamation. Dramatic sedimentological shifts, from a relatively stable carbonate shelf (lagoons, reefs, ramps and slopes) with richly diverse faunas to immature red-beds and sabkhas with depauperate faunas characterise these deposits, and interleaved ashfall tuffs demonstrate the initiation of regional volcanism and synchronous faunal overturn.

In South Australia, the Precambrian-Cambrian boundary is obscured by an unconformity. Precambrian units that underlie this level consist of thick packages of siliciclastics that have been the focus of previous detrital zircon studies. In contrast, little detrital zircon analyses have been undertaken on the well-developed lower Cambrian intervals, and as such the impacts of the onset of convergent margin tectonics, commencing with the far-field Ross Orogen in Antarctica, on these key sedimentary regimes has not been quantified.

This study integrates new geochronological and Hf isotope data from detrital zircons in siliciclastic units in the Hawker to Lake Frome groups with the well-resolved biostratigraphic and chemostratigraphic framework for the Arrowie Basin (calibrated by CA-TIMS depositional dates from volcanics). This work characterises the tectonically influenced sediment routing systems and associated geomorphological evolution represented in the lower Cambrian succession of the Arrowie Basin in South Australia—one of the world's best-preserved Cambrian terranes and a key element of East Gondwana.

The Mechanism of Organic Matter Enrichments in Black Shales of the Wufeng to Longmaxi Formations during the Late Ordovician-Early Silurian Period in Sichuan Basin

Xiangying Ge¹, Chuanlong Mou, Xin Men

¹Chengdu Center, China Geological Survey (Geosciences Innovation Center of Southwest China), Chengdu, China

6C: Sedimentology of Black Shales through Phanerozoic (1), Tāwhirimātea E (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

Black shales of the Wufeng to Longmaxi Formations during the Late Ordovician to the Early Silurian Period are the main target strata for exploration of shale-type gas in South China. Research on the mechanisms of organic matter accumulation and the sedimentary environment of black shales remains a key focus and major challenge in this field. Based on geochemical analyses of black shales and bentonites from Well Huadi-1 and the Huangying section in Wulong area, our results reveal a distinct high-low-high TOC variation pattern from the Wufeng to Longmaxi formations, and the redox indices ($V/V + Ni$, V/Cr , Ni /Co) imply that the water experienced an anoxic-oxic-anoxic process. The productivity (Cu , $Babio$, $Sibio$) and terrigenous inputs indices indicate that black shales of the Wufeng and Longmaxi Formations are with higher productivity and terrigenous inputs, compared with those of Guanyinqiao Formation. The correlations between the TOC in the sediments and redox indexes, productivity and terrigenous inputs show that the enrichment process of organic materials in black shales is controlled by the redox indexes, the productivity and terrigenous inputs. Redox conditions were the dominant factor, while paleoproductivity and terrigenous inputs were of secondary importance. Our results indicate that frequent volcanic activities may exert dual effects on organic-rich shale formation. Firstly, volcanic ash deposition provides abundant nutrients, stimulating marine productivity. Secondly, the ash layer attenuates sunlight penetration, reducing photosynthetic activity. This combination promotes an intensely anoxic environment that enhances organic matter preservation through increased biological mortality and reduced oxidative degradation.

Geochemical Characteristics and Indicative Significance of Rare Earth Rich Sediments in the Central Indian Ocean Basin

Professor Chendong Ge¹

¹School of Geography and Ocean Science, Nanjing University, Nanjing, China

10C: Mapping marine sediments in the world (2), Tāwhirimātea E (Level 2), January 30, 2026, 11:00 AM - 12:30 PM

REY-rich deep-sea sediments, as another hotspot of marine geology research after crust and hydrothermal sulphide, have received more and more attention recently. Based on analysis of the element geochemistry in the sediments of core GC18 in the Central Indian Ocean Basin (CIOB), the evolutionary history of the sedimentary environment in this area has been reconstructed. The characteristics of the rare earth-rich sediments and its indicating significance have been discussed. The results have shown that the surface layer is dominated by calcareous clay, with siliceous clay in the main part and both calcareous and siliceous composition at the bottom. CCD has experienced a process of deep-shallow-deep-shallow-deep trend since the Miocene. The variation of CCD affects the composition of sediments. It is rich in rare earth deposits ($\sum \text{REY} > 400\text{ppm}$), accounting for 92.8% in the core, which has obvious negative Ce anomaly and positive Y and Eu anomalies. As the core GC18 is with a thin calcareous ooze above the CCD, it is also an ideal area for searching for rare earth rich sediments.

Key Words: Enrichment in Rare Earth Elements, Carbonate Compensation Depth Change, Miocene, Central Indian Ocean Basin

Dynamics and Environmental Context of the South Island Fjords' Marine Inundation

Lukas Gegg¹, Laura Jacob¹, Chris M. Moy²

¹University of Freiburg, Freiburg, Germany, ²University of Otago, Dunedin, New Zealand

9E: Fjord sediments: Archives of climate and tectonics through time, Rongomātāne B (Level 1),
January 29, 2026, 4:25 PM - 5:55 PM

The fjords of New Zealand originated from deeply but irregularly incised glacial valleys. After the last glacial maximum, the ice masses decayed and meltwater lakes developed within sub-basins that, as the sea level continued to rise over the following millennia, were inundated by the ocean. This drastically altered both sediment input and depositional processes, and the corresponding changeover from lacustrine to marine sedimentation is readily identified in drill cores. and conveniently, by comparison of the elevation of relevant bedrock swells along the fjord axis with the global sea level curve, this changeover can be assigned an approximate age.

We are investigating in detail the transition zone from lacustrine to marine deposits recovered in drill cores from several fjords with the aim of reconstructing the process of inundation – i.e. its rate, potential fluctuations, associated sediment dynamics, and evidence of extreme events – and the associated depositional and environmental conditions. In addition, seismic data are used to characterise the larger-scale morphology of the bedrock trough as well as the lacustrine-marine transition zone in the sediment fill. This project allows for new insights into the environmental history of a region that is of outstanding importance not only as a carbon sink, but also as an indicator of the climatic development of the entire southern hemisphere.

Drilling Overdeepened Alpine Valleys: a Synthesis of Phase 1

Lukas Gegg¹, Flavio S. Anselmetti², Markus Fiebig³, Gerald Gabriel⁴, Frank Preusser¹, ICDP DOVE Scientific Team

¹University of Freiburg, Freiburg, Germany, ²University of Bern, Bern, Switzerland, ³BOKU University, Vienna, Austria, ⁴LIAG Institute for Applied Geophysics, Hannover, Germany

2F: Earth's sedimentary record of glaciation (2) & Sedimentation in polar ice sheet margins, Rongomātāne C (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

The glaciations of the Pleistocene had severe geomorphic impacts on the mountain regions of the world that include the incision of closed 'overdeepened' basins into the glacier bed. In these basins, glacially derived deposits have the chance to be preserved over several glacial cycles, which is otherwise usually not the case. They are therefore the best archives to directly investigate (pre-LGM) glaciations, their timing, associated erosional and depositional processes, and the resulting landscape change.

In the ICDP (International Continental Scientific Drilling Program) project 'Drilling Overdeepened Alpine Valleys' (DOVE), we are investigating overdeepened basins and their sedimentary fills all around the (European) Alps. Phase 1 of the project, targeting the northern Alpine fringe and comprising six scientific drillings in Switzerland, Germany, and Austria, is currently nearing completion. Phase 2 will consist of a second set of drillings around the southern and western margins of the mountain range, and complete our pan-Alpine approach.

Here, we present a summary of the results achieved in DOVE Phase 1 including geophysical (primarily seismic, including cross-hole experiments), sedimentological (focusing especially on diamicts and their data-driven interpretation), sequence- (identification of recurring genetic units) and chronostratigraphic (primarily by single-grain luminescence dating) analyses. These have led to significant methodical advances as well as new discoveries regarding the regional Quaternary stratigraphy, the patterns of overdeepened basin formation and infilling, and the magnitude of landscape modification by glaciers.

Reconstructing Platform Architecture and Evolution of Pennsylvanian–Permian Mixed Carbonate–Siliciclastic Systems, NE Thailand

Professor Annette George¹, Dr Kaylee Anderson¹

¹University of Western Australia, Perth, Australia

3B: Carbonate systems and processes (2), Tāwhirimātea C (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

Pennsylvanian to Mid Permian tropical marine conditions along the (now) western margin of Indochina led to major phases of carbonate accumulation recorded in the subsurface beneath the Khorat Plateau and exposed in the Loei-Phetchabun Foldbelt in NE Thailand. Slicing and dicing of these extensive platforms through the Permo–Triassic Indosinian Orogeny, and subsequent Himalayan Orogeny, has required an integrated approach using a range of techniques to reconstruct stratal architecture and evolution of major platforms such as the Pha Nok Khao platform. The platforms are parts of large mixed carbonate-siliciclastic systems developed in tectonic environments with extensive magmatic activity. Siliciclastic influxes, with mixed provenance including significant volcanic input, have helped define phases of platform development using detrital zircon geochronology. Through facies mapping, more extensive framework-builders have been identified in the foldbelt. Pennsylvanian (~Bashkirian–Moscovian) ramps feature carbonate shoals, with coral, sponge and/or algal biostromes and low-relief bioherms. A wide variety of patch reef/mound constructors/encrusters are recognized in Late Moscovian–Gzhelian and earliest Permian deposits interpreted as platform margin to upper slope environments. These include typical Phylloid and other algae as well as a variety of microbial limestones, typically seen in slope debris. Widespread carbonate–siliciclastic slope facies are associated with this phase and carbonate facies have yielded age-diagnostic conodonts that have also aided correlation and timing of tectonic activity. Carbonate deposition dominated through the Early Permian with development of the thickest and most extensive platforms until Middle Permian demise via drowning and major siliciclastic deposition. The distribution of platform margin to inner platform carbonate facies and coarse siliciclastic facies along the (now) western and northwestern margins of the foldbelt indicates where higher energy oceanographic conditions prevailed and that overall topography was controlled by major tectonic structures located to the east–southeast.

The Subsurface of Rome as Urban Geoheritage: Stratigraphic Complexity and Local Seismic Response Implications in the Eternal City

PhD Silvia Giallini¹, Dr. Marco Mancini¹, Prof. Alessandro Pagliaroli², Dr. Daniel Tentori¹, Dr. Iolanda Gaudiosi¹, Dr. Maurizio Simionato¹, Dr. Chiara Varone¹, Dr. Pietro Sirianni, Dr. Carolina Fortunato, Dr. Maria Chiara Caciolli, Dr. Roberto Razzano, Dr. Francesco Stigliano¹, Dr. Federica Polpetta¹, Dr. Massimiliano Moscatelli¹

¹Institute of Environmental Geology and Geoengineering of the National Research Council (IGAG-CNR), Rome, Italy, ²University G. d'Annunzio (Ud'A-INGEO), Chieti-Pescara, Italy

3E: Geoheritage and geodiversity of the sedimentary record & Open Science in Sedimentology, Rongomātāne B (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

The subsurface of Rome preserves a complex stratigraphic archive shaped by fluvio-lacustrine, volcanic, and anthropogenic processes that reflect its long Quaternary geological and urban history. This intricate sedimentary architecture constitutes a unique example of urban geodiversity and represents a valuable component of the city's geoheritage, with direct implications for seismic hazard assessment and mitigation strategies.

In this study, we integrate newly acquired geophysical and geotechnical data from the Urbisit project with previously unpublished subsurface investigations in the San Lorenzo area. Our goal is twofold: to update shear-wave velocity (Vs) profiles for key Quaternary and volcanic formations—resolving discrepancies among existing models—and to reconstruct the geometry of the seismic bedrock across central and southeastern Rome, where lateral facies variability and inherited topographies strongly affect wave propagation.

We develop representative 2D geological cross-sections and perform numerical simulations of seismic response, particularly in areas near the Alban Hills volcanic complex. The results reveal that stratigraphic heterogeneity, including buried paleosurfaces and variable sediment thicknesses, plays a key role in shaping local seismic amplification patterns.

By framing these findings within the broader context of geoheritage, this study emphasizes the importance of recognizing and preserving subsurface geodiversity—not only as a scientific resource but also as a foundation for resilient urban planning and public awareness of geohazards.

Late Holocene Carbon Burial in Fiordland – Where, What, and How Much?

Greer Gilmer¹, Marcus Vandergoes², Christopher Moy³, Christina Riesselman³

¹GNS Science, Dunedin, New Zealand, ²GNS Science, Lower Hutt, New Zealand, ³University of Otago, Dunedin, New Zealand

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Fjords are recognised as globally significant locations for trapping and storing organic carbon but the spatial and temporal distribution of organic carbon in Fiordland's numerous basins is poorly understood. In Fiordland, organic matter is primarily derived from the terrestrial environment. Its transport of organic carbon from the landscape to the fjord basins over time is influenced by the steep topography, high rainfall, landslides, and earthquake-induced shaking in this tectonically active region. The highly dynamic nature of the Fiordland environment makes it difficult to determine how – or even if – different transport mechanisms affect carbon burial over centennial to multi-millennial timescales.

To investigate this, we examine sediment records collected from multiple deep basins in Fiordland that span varying basin and catchment sizes, topography, and levels of anthropogenic influence.

Using age-depth modelling, high-resolution core imagery, geochemical proxies, and grainsize analysis we reconstruct the late Holocene depositional history of multiple fjord basins. This provides new insights into carbon burial rates under 'typical' sedimentation compared to deposition driven by landslides, earthquakes, and rainfall events; the impact of anthropogenic intervention on carbon burial and the sedimentary system; and temporal patterns of organic carbon burial in diverse basin types.

Exploring the Composition of Carbon Sequestered along Tamatea Dusky Sound

Dr Catherine Ginnane¹, Ms Lucy Davidson², Dr Jocelyn Turnbull¹, Dr Sebastian Naeher^{3,1}, Prof Gesine Mollenhauer⁴, Dr Jens Hefter⁴, Dr Hendrik Grotheer⁴, Dr Greer Gilmer⁵, Dr Marcus Vandergoes¹, Prof Chris Moy², Prof Gary Wilson⁶

¹GNS Science, Lower Hutt, New Zealand, ²University of Otago, Dunedin, New Zealand, ³Victoria University of Wellington, Wellington, New Zealand, ⁴Alfred Wegener Institute, Bremerhaven, Germany, ⁵GNS Science, Dunedin, New Zealand, ⁶University of Waikato, Hamilton, New Zealand

9E: Fjord sediments: Archives of climate and tectonics through time, Rongomātāne B (Level 1), January 29, 2026, 4:25 PM - 5:55 PM

In the fjords of Aotearoa New Zealand, principal sources of sequestered carbon include primary productivity in the water column, lateral transport of resuspended matter, and eroded terrestrial organic matter. As a result of earthquake-driven landslides, heavy rainfall, gullying, and mass wasting processes, land-derived material composed of a mixture of modern plant debris, soil mixtures of composite ages, and ancient rock sediment is a significant source of carbon transported and sequestered in the coastal waters of New Zealand. Characterisation of organic carbon sequestered under different depositional conditions along the fjords allows us to gain insight into the processes that drive transport and sequestration of carbon into the sediment.

We have applied a combination of techniques including ramped pyrolysis oxidation radiocarbon (RPO-AMS), lipid biomarker, pyrolysis-gas chromatography-mass spectrometry (Py-GC-MS), and compound specific radiocarbon analysis (CSRA) to develop a fingerprint of sequestered organic carbon through Tamatea Dusky Sound. Biomarkers and CSRA inform the age, provenance, and chemical characteristics of a few isolated compounds in the sediment matrix. RPO-AMS and Py-GC-MS complement this by supplying a more holistic representation of all pyrolysable compound classes present in the sediment, including a comprehensive age profile and source discrimination.

We have analysed the chemical fingerprint of sequestered carbon in the surface sediment at the head and mouth of the fjord to provide a paradigm of carbon composition under contemporary prevailing conditions along the channel. Additionally, we have examined the carbon fingerprint through two mass wasting event deposits to examine source changes, and resultant chemical compositional changes, during event-driven sedimentation. The rapid rate of sedimentation results in burial of laterally sourced carbon, including increased concentrations of bulk organic matter. Characterising the differences in chemical composition of sequestered carbon under modern conventional and event-driven sedimentation regimes supports refinement of the contribution of fjords to the New Zealand carbon budget.

Sedimentary Structures and Geotechnical Properties of Pyroclastic Deposits in the Tephra Layered Shallow Landslides

Prof. Satoshi Goto¹

¹University of Yamanashi, Kofu, Japan

6E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (3),
Rongomātāne B (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

A 6.6-Mw earthquake struck the Iburi region of Hokkaido, Japan, in 2018, triggering massive tephra layered landslides. Most of these landslides were shallow and occurred mostly in the Atsuma and Abira towns. Ta-c and Ta-d tephra layers have been found in the Towa landslide at Atsuma from the Tarumai volcano, while Ta-d, En-a, and Spfa-1 tephra layers have been found in the Mizuho landslide at Abira from the Tarumai and Eniwa volcanos, as well as the Shikotsu caldera. Field observations revealed that the sliding layers were located in the Ta-d and En-a layers at the Towa and Mizuho landslides, respectively.

This study investigated the characteristics of physical properties, saturated permeability properties, and content of clay minerals on sliding and surrounding tephra layers. Results from this study revealed that the physical properties of sliding layers from two landslides demonstrated the same characteristics: non-plastic soil with a low density of soil particles, void ratio, and dry density; these characteristics could influence earthquake-induced landslides.

We also investigated the mechanical properties of sliding and surrounding tephra layers by using constant volume cyclic direct shear tests at different locations from the collected samples of Ta-d fine grains and En-a loam. There are very few studies that compare the physical properties and shear properties of the same tephra layer at different locations. We could demonstrate a distribution of safety factors for slope stability (wide-area slope stability analysis), evaluating the physical properties and shear properties of the same tephra layer at different locations.

Tracing Subduction-Type Metamorphism Using Detrital Minerals in Modern Sediments: Preliminary Insights from the Western Alps

Mr Nuno Grácio¹, Dr. Inês Pereira¹, Dr. Pedro Dinis²

¹University of Coimbra, Geoscience Center, Coimbra, Portugal, ²University of Coimbra, MARE, Coimbra, Portugal

1A: Next Generation Sediment Provenance (1), Tāwhirimātea A (Level 2), January 26, 2026, 10:15 AM - 11:45 AM

Subduction zones are critical settings for understanding plate tectonics, but their metamorphic record—especially high-pressure, low-temperature (HP–LT)—becomes increasingly scarce deeper in geological time, likely due to erosion and preservation bias. Detrital heavy minerals (HM) in modern sediments provide an alternative archive for tracking this metamorphic record. This study investigates how effectively detrital titanite, rutile, and garnet, minerals commonly found in HP-LT rocks, preserve this evidence, using stream sediments.

Sixteen samples from the Isère, Arc, Orco and Po rivers (Western Alps), were processed across three grain-size fractions (500–250 µm, 250–150 µm, and 150–63 µm; HMf), totaling 48 HMf. The sampled rivers drain distinct segments of the Alps, from external domains to exhumed HP metamorphic units in internal zones, offering a natural cross-section through an active orogen. Drainage basins vary, the Po and Orco have large and lithologically diverse catchments, draining major sections of the Austroalpine and Piemontese units, whereas the Arc and Isère primarily reflect restricted or mixed metamorphic and sedimentary sources. HM recovery varied from <1% to over 20%, with the Po showing higher concentrations across all grain-size fractions. Fine fractions exhibit the highest HM%, reflecting expected grain-size enrichment trends.

Titanite occurs in 13 out of 16 HMf, typically as composite grains with epidote, amphibole, or chlorite. Rutile is found in 16 HMf, occurring as individual grains and as inclusions in titanite, amphibole, garnet, or epidote. Garnet appears in 15 HMf, exhibiting compositions between almandine and grossular. Titanite, rutile and garnet occur across all HMf of the same samples, except one.

Titanite in the composite grains and rutile inclusions in metamorphic minerals are indicative of metamorphic sources. Further integration of mineral chemistry and inclusion assemblages will enable full discrimination, assess transport-induced sorting and test whether their signatures in more distal samples are comparable to those closer to the HP source areas.

Hypogenic Karstification: a so far Unrecognized Stage in the Evolution of Travertine Buildups – Pilot Results

Professor Michał Gradziński¹, Dr Wojciech Wróblewski¹, Dr Pavel Bella²

¹Jagiellonian University, Kraków, Poland, ²Slovak Caves Administration, Liptovský Mikuláš, Slovakia

4D: The continental sedimentary successions and their ability in understanding the present and forecasting the future of the Earth's surface (1), Rongomātāne A (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

Travertine deposition has been extensively studied in recent decades, hence the environmental factors that control their growth are already quite well known, as is also the imprint of tectonic processes on travertine accumulation. Strikingly less known are the processes that affect travertines after their deposition.

Results of pilot studies in Slovakia suggest that subsurface parts of travertine buildups are internally karstified to a significant degree. A part of the dissolution voids is completely or partly filled with secondary carbonates laid down in phreatic conditions. Compelling is thus a hypothesis that subsurface dissolution of travertine buildups is an important, though not yet studied, stage in their life. As the origin of travertines is related to deep circulation of water, coupled with an ascending flow of endogenous CO₂, it is justified to attribute the observed dissolution to hypogenic karstification.

Hitherto available observations and analyses, together with literature data allow us to propose two hypothetical scenarios for hypogenic karstification of travertine buildups. The first scenario assumes dissolution by rising thermal water; presumably the same water that feeds the growing travertine buildup. The decisive factor in making the water chemically more aggressive would be its cooling that would allow it to absorb more dissolved CO₂. The other scenario is focused on the extremely fast dissolution of inactive travertine buildups in the zone where exhaling endogenous CO₂ is mixed with meteoric waters. This process has been recently documented and thoroughly interpreted by Wróblewski et al. (2024, STOTEN, 936: 173347). The model postulates the presence of a dissolution front progressively moving from the ground surface down. The scenarios do not exclude one another; possible is even sequential operation of one of them after another.

The study is financed by NCN project 2024/55/B/ST10/02455.

Orbital Variability of the Greenland Ice Sheet During the Miocene Epoch

Dr. Georgia Grant^{1,2}, Nina Quinn², Prof. Rob McKay², Jasmine Cassidy², Asst. Prof. Raquel Bryant³, Asst. Prof. Sandrine Le Houedec⁴, Mei Nelissen⁵, Prof Paul Knutz⁶, IODP Expedition 400 Science Party⁷

¹GNS Science, Wellington, New Zealand, ²Victoria University of Wellington - Antarctic Research Centre, Wellington, New Zealand, ³Wesleyan University, Middletown, USA, ⁴University of Lyon, Lyon, France, ⁵Utrecht University, Utrecht, Netherlands, ⁶Geological Survey of Denmark and Greenland, Copenhagen, Denmark, ⁷International Ocean Discovery Program, USA

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Accelerating contribution of the Greenland Ice Sheet (GrIS) and Antarctic Ice Sheets (AIS) to global sea-level in response to anthropogenic climate warming retreat poses the question of how these polar ice sheets interact to stabilise or destabilise retreat, and how this impacts the pattern of sea-level rise in far-field regions. While the AIS evolution is well-documented through several proximal geologic records circumnavigating the continent, the inception of the GrIS has been reconstructed by more distal glacio-marine records that contain influence of other potential ice sources.

During the recent International Ocean Discovery Program (IODP) Expedition 400 to Northwest Greenland, Site U1607 was cored on the inner continental shelf to recover ~980 m of glacio-marine sediments spanning the Late Oligocene to Miocene. Alternating muds with dispersed clasts (Ice-berg Rafted Detritus; IBRD) to bioturbated or weakly stratified muds and sands, represent a shallowing sequence down-core with reduced glaciogenic influence. An integrated age model is in development by the Expedition Science Party utilising magnetostratigraphy, biostratigraphy and Sr87/Sr86 dating of calcium carbonate preserved in the core, for further refinement with orbital tuning.

This study employs methods successfully applied on Antarctic sediment cores to develop lithofacies from shipboard physical descriptions and continuous core scan logs (density, magnetic susceptibility, natural gamma and color reflectance), supplemented by geochemical analysis (X-ray fluorescence), grain size distribution and counts of oversized grains from Computed Tomography. Depositional environments determined for the derived lithofacies will provide an ice sheet history of the Northwest GrIS and identification of continuous and high-resolution environmental proxies appropriate for orbital analysis.

Orbital variability enables identification of proto-GrIS orbital drivers and sensitivities during the Miocene under warmer -than-present climates. These results will then be used to test synchronicity between Antarctic and Greenland ice sheet variability for understanding of bi-polar interactions during deglaciations.

Bridging the Gap between Cohesive and Non-cohesive Regimes: a Unified Continuum for Subaqueous Sedimentary Density Flows

Dr Romain Grime^{1,2}, Dr Philippe Sorrel², Dr Kévin Boulesteix³, Dr Yvonne Spsychala⁴, Dr Séverine Russo⁵, Dr Thierry Mulder⁵

¹Petrolia Noco AS, Bergen, Norway, ²Univ Lyon, UCBL, ENSL, UJM, CNRS, LGL-TPE, Villeurbanne, France, ³Department of Earth and Environmental Sciences, University of Manchester, Manchester, United Kingdom, ⁴Geological Institute, RWTH Aachen University, Aix-la-Chapelle, Germany, ⁵Université de Bordeaux (UMR EPOC – OASU CNRS 5805), Bordeaux, France

7A: Applications of Sedimentology for the Green Energy Transition & The role of subaqueous sediment gravity flows in carbon sequestration, Tāwhirimātea A (Level 2), January 29, 2026, 10:15 AM - 11:45 AM

Subaqueous sedimentary density flows (SSDFs) are key drivers of sediment and organic-carbon transport in deep-marine and lacustrine settings. Conventional paradigms segregate cohesive flows (debris and mud-flows) from non-cohesive turbidity currents, each framed by its own stratigraphic model. Yet field, core, and laboratory evidence increasingly demonstrate that these flow types evolve along a continuous spectrum.

We review six decades of research—spanning classic turbidite sequences to recent experimental studies—to show that SSDFs traverse a seamless range of rheological behaviors. Key controls on this continuum include sediment concentration, grain size, flow rheology, slope gradient, degree of confinement, among other parameters. Primary and secondary sedimentary structures—such as traction carpets, parallel laminations, flame structures, and convolute bedding—clearly illustrate the natural transitions across these regimes.

Our unified framework combines established depositional models with process-based insights to provide a predictive tool for interpreting complex stratigraphies across the full depositional gradient—from coarse-grained proximal deltas to fine-grained distal turbidite lobes. This approach pinpoints where organic-rich muds accumulate and how multi-lithologic beds form and preserve carbon in submarine fan and slope systems.

Adopting a continuum paradigm is crucial for accurately quantifying natural carbon burial and for improving models of global carbon cycling. Moving beyond binary classifications toward an integrated view of SSDF dynamics will enhance our ability to predict carbon-sequestration patterns in subaqueous environments.

From Turbulence to Deposition: Plunge Pool Formation and Infill in a Deep-Water Syn-Rift System (Wollaston Forland Group, NE Greenland)

Dr. Sten-andreas Grundvåg¹, Dr. Gijs Henstra², Prof. Atle Rotevatn³, Dr. Eric Salomon⁴, Dr. Thomas Berg Kristensen⁵

¹UiT The Arctic University of Norway, Tromsø, Norway, ²AkerBP, Fornebu, Norway, ³University of Bergen, Norway, ⁴University of Erlangen-Nuremberg, Germany, ⁵Equinor, Bergen, Norway

3D: Controls on sedimentation at submarine active margins (3), Rongomātāne A (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

When supercritical high-density turbidity currents—commonly associated with steep submarine slopes—encounter the base-of-slope break, they often transition to subcritical flow through hydraulic jumps, causing significant slope base erosion. One resulting feature is large spoon-shaped scours, or plunge pools, increasingly recognized in modern deep-water settings. However, the infill, preservation, and sedimentological expression of plunge pools in the rock record remain poorly understood. This study examines Upper Jurassic–Lower Cretaceous sediment gravity flow deposits from a deep-water syn-rift succession in NE Greenland. These deposits accumulated on a steep slope down-dip of a coarse-grained fan delta, forming a conglomerate- and sandstone-rich submarine fan perched on the basin-bounding fault scarp. The upper slope, with minimal scouring, is dominated by breccia and conglomerates from debris falls and non-cohesive debris flows. In contrast, the slope base features extensive scouring and complex scour-and-fill elements. This includes a wide range of composite conglomerate–sandstone beds, often displaying cross-cutting relationships and variable grading patterns, suggesting hydraulic jump-related erosion and scour infill by stratified, supercritical high-density turbidity currents. Conglomerate-filled scours dominate the slope base, while the basin floor is sandstone-rich with sparse conglomerates. Initial turbulent flows carved scours and bypassed sand to the basin floor, while slower, gravel-laden laminar flows later filled the slope base scours. Potential cyclic steps, indicative of supercritical flows, are expressed as asymmetric conglomerate-filled scour arrays, occasionally exhibiting inclined cross-stratification. This study highlights the role of supercritical turbidity currents and hydraulic jumps in shaping the seafloor and controlling deep-water depositional architecture.

Braid Deltas of Contrasting Process Regimes – Examples from the Neoproterozoic of North Norway

Dr. Sten-andreas Grundvåg¹

¹UiT The Arctic University of Norway, Tromsø, Norway

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Neoproterozoic succession of the Varanger Peninsula, North Norway, includes several >100 m thick sandstone-dominated, cross-bedded units of braided stream origin. These units are renowned for their spectacular recumbently folded cross-bedding, offering insights into pre-vegetation braidplain systems. Intercalated with these sandstone units are thinner, mudstone-rich deposits that have traditionally received less attention, leaving their origin, processes, and depositional settings poorly understood. This study examines two such units, the Klubbnasen (Tonian?) and Andersby (Tonian–Cryogenian?) formations of the Vadsø Group. Both form large-scale coarsening-upward cycles, transitioning from mudstone-dominated offshore deposits to heterolithic, sandstone-rich prodelta and delta front deposits. These are capped by cross-bedded sandstone units of braidplain affinity, collectively forming two vertically stacked fluvio-deltaic couplets. The prodelta to basin floor deposits of the older, up to 50 m thick Klubbnasen Formation contain diverse event beds, including hummocky cross-stratified tempestites and wave-modified turbidites, reflecting braid delta progradation into a shallow, storm-influenced basin. In contrast, the younger, 25–40 m thick Andersby Formation lacks evidence of storm wave influence and locally contains massive “turbidite-like” sandstone beds in its otherwise mudstone-rich lower half. The upper half consists of stacks of 2–5 m thick, gently basinward sloping sandstone sheets separated by mudstone units. Internally, the sheet sandstones exhibit down-dip facies transitions from cross-bedded into convolute-bedded and distorted sandstones. This suggests a fluvially dominated braid delta characterized by frequent lobe switching where strong river effluents enabled dunes to migrate onto the prodelta slope. There, the non-cohesive sand underwent liquefaction, collapsed, and triggered liquefied sand flows and turbidity currents that transported sand to the basin floor in front of the prograding delta. This study provides a rare record of ancient braid deltas formed under contrasting physiographic conditions and process regimes, thus highlighting the interplay of fluvial and deltaic processes in a shallow, pericratonic basin.

Impact of Faults on Shale Reservoir Deposition and Hydrocarbon Accumulation: A Case Study of the Wufeng-longmaxi Formations in the Z Well Block, Southern Sichuan Basin

先生 **Mingao Gu**¹

¹China University of petroleum, Qingdao, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The southern Sichuan Basin, having undergone multiple phases of tectonic activity, exhibits a complex fault system, including major basement faults and numerous small- to medium-scale faults within its deep shale gas reservoirs. Utilizing newly acquired high-quality 3D seismic data, this study investigates the influence of these faults on shale reservoir deposition and hydrocarbon enrichment.

We quantitatively analyzed parameters (attitude, throw, length) of basement faults and assessed their lateral distribution variations within the Z block. This was coupled with an analysis of the Wufeng Formation shale reservoir distribution to elucidate the control exerted by basement faults on sedimentation. Through techniques including dip attribute analysis, edge detection, and ant-tracking, we precisely characterized the small- to medium-scale faults in the deep shale gas reservoirs. Integrating the regional tectonic setting, we comprehensively analyzed fault intersections and orientations to determine the chronology of fault development. Topological analysis was applied to lower-order faults in the Wufeng Formation to evaluate their network structure and modification potential. By synthesizing fault development chronology and modification capacity with well production data and reservoir porosity, we quantitatively evaluated the impact of later-stage faults on reservoir modification and hydrocarbon accumulation.

The results indicate that multiple NW-SE trending basement faults in the southern Sichuan Basin controlled the pre-depositional paleo-topographic highs and lows prior to the sedimentation of the Wufeng-Longmaxi Formations, thereby governing the distribution of favorable sedimentary reservoir zones. Shale gas test production shows a clear correlation with fault characteristics and density. Production initially increases and then decreases with increasing intensity of fault-related modification. A moderately developed fault system with intermediate activity intensity effectively enhances shale reservoir permeability and is crucial for high shale gas productivity. The spatial distribution pattern and modification degree of faults exert a significant control on shale gas enrichment. These findings provide a critical geological basis for the exploration and development of deep shale gas in the southern Sichuan Basin.

Lamina-Count Analysis on Cross-Strata of Inferred Tidal Bedforms does not Allow Reconstructions of Earth-Moon Dynamics since the Palaeoarchean

Professor Marcello Gugliotta¹, Prof David De Vleeschouwer², Dennis Schreiber¹, Nina Wichern²

¹Institute of Geosciences and Geography, Martin-Luther University Halle-Wittenberg, 06120 Halle (Saale), Germany, ²Institute of Geology and Paleontology, University of Münster, 48149 Münster, Germany

1C: Coastal to shelf environments across time and space (1), Tāwhirimātea E (Level 2), January 26, 2026, 10:15 AM - 11:45 AM

Tidal systems exhibit complex dynamics, yet their sedimentary records are often interpreted assuming that a tidal phase produces a single sediment layer. Couplets (made of a sand and a mud layer) and their cyclicities are used to reconstruct past tides and Earth-Moon conditions. This approach was previously carried out on a ~1.2-m-thick cross-bedded interval known as “Eriksson's Dune” (~3.2 Ga Moodies Group, South Africa), resulting in the oldest data point for an estimated Earth-Moon distance.

Here, we tested this approach by combining new statistical measurements at Eriksson's Dune with sedimentological analysis. We found that the supposed couplets contained little mudstone and were instead due to variations of the sandstone, challenging earlier interpretations as true couplets. New time-series analyses carried out on the thickness of the previously inferred couplets reveal a bundling pattern of 13–18 per cycle, partly in line with previous studies. However, the considerable variability in these empirical results casts doubt on the reliability for reconstructing the Earth-Moon conditions. Even ignoring all other issues raised herein, our dataset leads to an estimated distance ranging from 0.6 to 1 of its present-day value, which renders the data ineffective due to the broad range.

Furthermore, the literature from Holocene tidal systems challenges the assumption that there is a one-to-one correspondence between the numbers of laminae and tidal phases. Dune migration rates from modern analogues are also inconsistent with the ones implied by previous models for the studied palaeodune. Other processes, such as bedform superimposition and grain avalanching, may better explain the rhythmic and cyclic patterns within these cross strata.

The results presented herein highlight the significant limitations of using lamina counts, especially from bedforms, for reconstructing past tides and Earth-Moon conditions. Future studies should better incorporate comprehensive sedimentological analyses and prioritize larger-scale climate cycles.

The (Un)Reliability of “Tidal Indicators” as Diagnostic Features of Past Depositional Processes and Environments

Professor Marcello Gugliotta¹, Massimiliano Ghinassi², Marta Cosma³, Anna van Yperen⁴, Valentin Zuchuat⁵

¹Institute of Geosciences and Geography, Martin-Luther University, Halle-Wittenberg, 06120 Halle (Saale), Germany, ²Department of Geoscience, University of Padova, 35131 Padova, Italy, ³Institute of Geosciences and Earth Resources, National Research Council, 35127 Padova, Italy, ⁴Department of Geosciences, University of Oslo, 0316 Oslo, Norway, ⁵CSIRO Mineral Resources, Kensington, WA 6155, Australia

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Tidal indicators — such as mud drapes, flaser and lenticular bedding, herringbone cross-stratification, rhythmites and bundles — are sedimentary structures traditionally used to identify tidal processes in the geological record. These features have played a central role in facies modelling and palaeoenvironmental reconstructions due to their presumed diagnostic value. However, a growing body of research reveals that these structures can form under a wider range of depositional conditions than previously recognized.

This study reevaluates the interpretation of sedimentary features historically regarded as tidal indicators by analysing their occurrence and variability in modern tidal and non-tidal environments to assess the range of conditions under which they can develop. The review investigates how these features form under various controls, including hydrodynamic variability, bedform self-organization, sediment supply, and the interactions among processes. Results show that most commonly used tidal indicators are not uniquely tied to tidal environments, limiting their reliability as standalone diagnostic tools.

The study suggests caution when using a subset of sedimentary structures to infer past tidal conditions or process regimes and concludes that a more holistic approach to palaeoenvironmental interpretation is necessary to improve accuracy. This approach should better integrate analyses of larger-scale architectural elements, facies stacking patterns, sediment textures, bedset thicknesses, and other sedimentological data. Ultimately, this work encourages a critical yet constructive reassessment of traditional sedimentological tools to support more robust interpretations of tidal and coastal deposits in the stratigraphic record.

Record of Palaeoseismic Events in the Middle Jurassic Upper Shaximiao Formation in the North Sichuan Basin, China and its Implications for Dinosaur Taphonomy

Miss Yao Guo¹, Professor Hui Ouyang¹, Xia Wang¹, Yu Zhou¹

¹Chengdu University of Technology, Chengdu, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Integrated field and stratigraphic investigations in the Wangcang region reveal five distinct seismite successions within the Middle Jurassic Upper Shaximiao Formation, representing the first documented evidence of syndepositional seismicity in this continental basin. Characteristic features including seismic fractures, liquefaction veins, slump breccias, and vertical sequences of undisturbed layer-fractured layer-liquefied layer provide conclusive evidence for paleoseismic activities during the Early Yanshanian (170~160 Ma) tectonic activity along reactivated basement faults in the Micangshan-Dabashan thrust belt. The spatiotemporal correlation between seismite horizons and concentrated dinosaur bone beds establishes a catastrophic burial mechanism: Seismically triggered sediment failures generated high-density sediment gravity flows that entrained dinosaur carcasses from proximal floodplains. Subsequent flow transformation processes deposited allochthonous fossil assemblages within delta-front heteroliths (bluish-gray silty rhythmities) and lacustrine shoreline facies (purplish-red laminated argillaceous siltstones). This tectonically driven taphonomic model fundamentally advances our understanding of Sichuan Basin's dinosaur fossil record by demonstrating: (1) Earthquake-induced mass mortality mechanisms superseding gradual attrition processes; (2) Fault-controlled sediment routing systems governing fossil distribution and bone modification features; (3) Seismic shock features as stratigraphic markers for taphonomic event beds. The proposed seismo-taphonomic framework provides new criteria for identifying tectonic controls on both soft-sediment deformation features and exceptional fossil preservation in continental rift basins. These findings necessitate revision of current depositional models for the Sichuan Basin's Jurassic red beds, emphasizing tectonic pulsing rather than solely climatic controls on sedimentary architectures and biostratigraphic patterns.

Genesis and Distribution of Mud Clasts in the Chang 7 Member Massive Sandstones, Ordos Basin: Implications for Sandy Debris Flow-Turbidite Depositional Mechanisms and Evolution

Dr Liulinbo Guo^{1,2}, Dr Gang Gao^{1,2}, Dr Xinsong Wu^{1,2}, Master Mingyu Liu^{1,2}, Master Xinying Zhao^{1,2}

¹School of Earth Sciences, China University of Petroleum Beijing, Changping District, China, ²State Key Laboratory of Petroleum Resources and Prospecting, China University of Petroleum Beijing, Changping District, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

In the Middle–Late Triassic Chang 7 Member massive sandstones of the Yanchang Formation in the Ordos Basin, China, the genesis and distribution of mud clasts and mud-coated clasts are key criteria for distinguishing sandy debris flows from turbidite deposits. Through petrography, X-ray diffraction (XRD), trace element analysis, and coupled genetic-architectural analysis, this study establishes a provenance-vertical zonation framework. Three mud clast types are identified: (1) Extra-basin oxidized clasts (yellowish-brown, high $\text{Fe}^{3+}/\text{Fe}^{2+}$, elevated Mn), indicating proximal transport of oxidized external materials; (2) Intra-basin reduced clasts (black, $\text{Fe}^{3+}/\text{Fe}^{2+} \approx 0.6$, $\text{Mn} \approx 180$ ppm, illite-smectite = $55\% \pm 5\%$), inheriting geochemical-mineralogical features of underlying mudstones, reflecting near-source tearing; (3) Transitional clasts (yellowish-brown with black coatings), with higher illite than intra-basin mudstones, documenting dynamic mixing of extra-basin and intra-basin materials. Vertically, mud clasts show distinct zonation: Basal zones contain coarse, disordered intra-basin clasts, representing low-energy lag deposits; Middle zones feature aligned extra-basin clasts with oxidized signatures and matrix-supported fabrics, marking debris flow "freeze-transport"; Upper zones display fine intra-basin clasts matching underlying mudstones, reflecting turbidity current sorting. The color, geochemistry ($\text{Fe}^{3+}/\text{Fe}^{2+}$, Mn), mineralogy, and spatial distribution (basal lag, middle alignment, upper sorting) of clasts differentiate matrix-supported debris flows (middle) from graded turbidites (upper). These features record fluid transitions (debris flow to turbidity current) and "extra-basin oxidized-intra-basin reduced" provenance superposition, providing key insights into lacustrine gravity-flow mechanisms and provenance-process coupling.

Keywords: Sandy debris flow; Turbidite; Mud clasts; Provenance attributes; Lacustrine gravity flow.

Development of Mid-Late Holocene Reef Systems in French Polynesia

Dr Nadine Hallmann¹, Gilbert Camoin¹, Anton Eisenhauer², Elias Samankassou³, Claude Vella¹, Albéric Botella⁴, Glenn Milne⁴, Marc Humblet⁵, Juan Carlos Braga⁶, Jan Fietzke², Tyler Goepfert⁷

¹CNRS-CEREGE, Aix-en-Provence, France, ²GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel, Kiel, Germany, ³University of Geneva, Geneva, Switzerland, ⁴University of Ottawa, Ottawa, Canada, ⁵Nagoya University, Nagoya, Japan, ⁶Universidad de Granada, Granada, Spain, ⁷Arizona State University, Tempe, United States of America

5B: Carbonate systems and processes (4), Tāwhirimātea C (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

The detailed reconstruction of reef geometry, composition and evolution during the mid-late Holocene brings valuable information regarding coral reef dynamics and coastal processes during periods of higher sea level and wave energy regimes.

This study provides a high-resolution reconstruction of the reef growth history in French Polynesia and reef response to low-amplitude, high-frequency relative sea-level (RSL) changes and associated environmental changes over the past 6,000 years. The interpretation is based on data acquired from coral microatoll fields and short drill cores (up to 2 m) along transects on reef flats of several islands. After sea level stabilisation at its present position, the new development of reef systems was initiated by the creation of accommodation space due to a glacio-eustatic sea-level rise from 6.0 to 4.1 kyr BP. A single, short-lived sea-level highstand of less than one metre between 4.1 and 3.4 kyr BP is documented preceding a fall in sea level between 3.6 and 1.2 kyr BP.

Regionally, the persistence of stable and optimal depositional conditions over the last 6,000 years is demonstrated by the constant overall composition and diversity of reef communities and the almost continuous widespread development of microatoll fields and reef flat units. The facies distribution as well as the lateral extension and shift of facies belts have been governed by variations in accommodation space, which are controlled by RSL changes and antecedent topography. The recurrent sea-level stillstands that punctuated the mid-late Holocene sea-level history have played a significant role in the development of dense reef frameworks.

The widespread development of mid-late Holocene reef deposits in coastal areas, especially reef flat units and storm conglomerate deposits, suggests that they have been pivotal in the formation and shaping of modern islands and islets, creating significant topographic features that formed the foundations of these islands.

Response of the Varved Shale to El Niño-Southern Oscillation in the Middle Eocene Shahejie Formation, Bohai Bay Basin Lake (E China)

Dr Yu Han¹, Professor Chao Liang¹, Professor Yingchang Cao¹

¹China University of Petroleum (East China), Qingdao, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The behavior of the global climate system on scales from years to centuries is related to several mechanisms, including solar forcing and the El Niño-Southern Oscillation (ENSO). Pre-Quaternary archives are rare, however, due to limited stratigraphic resolution and the accuracy of datings. A middle Eocene lacustrine shale in the Bohai Bay Basin (E China) shows annual laminae that allow establishing its astronomical and varve chronology. Principal component analysis of the sediments in the cored material, their magnetic susceptibility and grayscale scans as well as analysis of the varve thickness in thin sections jointly reveal variations between a warm/dry and a cold/wet climate on the scale of centuries (~200–240 years, ~350 years), probably corresponding with cycles in solar activity. In situ $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values of the light carbonate laminae show, in combination with varve-thickness data, that algal blooming and carbonate production show ~2.1–8.7 year cycles that could be ascribed to ENSO activity. The data also suggest that ENSO variations will continue to exist during global warming periods.

Genesis and Reservoir-Controlling Mechanisms of SmallScale Dome Structures Between Strike Slip Fault Zones Within Cratons —taking Tarim Basin in Northwest China as an Example

Dr Jun Han^{1,2}, Professor Yingchang Cao¹, Professor Zicheng Cao², Dr Wei Gong², Dr Jibiao Zhang³, Dr Cheng Huang², Dr Qingxiu Meng²

¹China University of Petroleum (east China), Qingdao, China, ²Sinopec Northwest Oilfield Company, Urumqi, China, ³Sinopec Petroleum Exploration and Production Research Institute, Beijing, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Small-sized strike slip fault zones are developed in the carbonate platform within the craton of the Tarim Basin. In recent years, the proven oil and gas reserves have exceeded 1 billion tons of oil equivalent, becoming an important field of oil and gas exploration and development. The small scale dome structures, extensively situated between major strike-slip faults in the Tarim Basin, represent a new and significant type of reservoir in Ordovician carbonates. This study integrates 3D seismic data, well logs, and rock mechanics experiments to reveal the genesis of these dome structures and their reservoir-controlling mechanisms. The findings reveal that the domes are not products of classic vertical tectonics (e.g., diapirism) but are formed by multi-phase, non-coaxial transpression related to far-field orogenic events. Their development is critically enabled by vertical strain partitioning within a mechanically layered carbonate sequence. The primary control on reservoir quality is the differential mechanical behavior of Ordovician carbonates. The more brittle dolomitic intervals of the Penglaiba and Lower Yingshan Formations tend to form dense, interconnected, multi-angled fracture networks under stress, resulting in high-quality, relatively isotropic reservoirs. In contrast, the overlying limestones develop systematic, high-angle, strike-concentrated fractures, resulting in anisotropic reservoirs of comparatively lower quality. This differential fracturing behavior is quantitatively confirmed by both formation imaging logs and CT-scanned uniaxial compression experiments, which demonstrate the superior brittleness and mesh-fracturing tendency of dolomite under stress. This integrated tectono-stratigraphic model provides a powerful predictive tool for exploration, shifting the focus from simply targeting structural highs to specifically targeting the brittle dolomitic facies within them. This understanding has significant implications for de-risking exploration in similar intracratonic strike-slip settings globally.

Outburst Flood-Generated Mud Facies in Southern Norway. Implication for the Sedimentation, Distribution and Properties of Fjord-Marine Clays

Dr Louise Hansen¹, Dr Geogios Tassis¹, MSc Fredrik Høgaas¹, Dr Jasmin Schoenenberger¹, Dr Lars Olsen¹

¹Geological Survey of Norway (NGU), Trondheim, Norway

1B: Transport of Mud and Deposition of Mudstones, Tāwhirimātea C (Level 2), January 26, 2026, 10:15 AM - 11:45 AM

The decay of the Scandinavian Ice Sheet at the end of the last Ice Age was associated with major glacial-lake outburst floods (GLOF). These catastrophic drainage events are generally associated with large-scale bedforms and coarse-grained deposits. The present study focuses on clay and silt deposits from the Early Holocene Nedre Glomsjø outburst flood in the Glomma valley in southern Norway. The investigations involved the mapping of landforms using airborne LiDAR data, fieldwork including sedimentological description of sections, borehole drilling, geophysical profiling (GPR, ERT), the study of thin sections, and laboratory work.

The study finds that a variety of fine-grained facies settled laterally to the main flood tract and in the tail of the declining, and at times hyperconcentrated, flood. Facies are characterised by stratified to structureless clay and silt, locally with micro-scale dish and load structures or seams of fine sand. The finer fractions are dominated by illite/muscovite, quartz and feldspars. Sedimentary processes involve turbulent to slurry-like flow, mud flow, suspension settling, deformation, and late stage hydrofracturing.

The findings imply that GLOFs, and likely other glacial high-discharge events, on occasions delivered dense suspensions to the downstream fjord basins. Such dense effluents, combined with reduced salinities, likely increased the activity of hyperpycnal flow that, together with hypopycnal plumes, helped an efficient transport of fines into the fjord. Together, this gave rise to exceptional suspension-sedimentation rates of clay and silt in sheltered locations of the fjord. The resulting mud developed loose grain structures, high water-contents, a poor fossil fauna and possibly lowered porewater salinities. Thus, high-discharge events are likely responsible for intervals in fjord-marine deposits, now exposed onshore due to glacio-isostatic emergence, showing geotechnical properties (e.g sensitivity) differing from those of the surrounding clays.

Morphosedimentary Traces of Holocene Tsunamis in the Fjord Valleys near Alta in Northern Norway

Dr Louise Hansen¹, Dr Anders Romundset¹, MSc Daniel Wiberg¹, Dr Georgios Tassis¹

¹Geological Survey of Norway (NGU), Trondheim, Norway

8D: Sedimentary evidence of geohazards – past and present (1), Rongomātāne A (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

Traces of palaeotsunamis have been discovered on plains and terraces near Alta in northern Norway. The region is characterised by mountain plateaus dissected by numerous steep-sided fjords and fjord valleys. The fjord valleys emerged from the sea due to glacio-isostatic uplift of the crust following the last deglaciation of the Scandinavian Ice Sheet. The valley fills are thus dominated by glaciofluvial, marine and fluvial deposits. The area was recently mapped using LiDAR-derived elevation models in combination with field surveys, sedimentary description of sections and collection of geophysical data (ground-penetrating radar). Results show that some observed deposits and landforms in the valleys and on marine terraces were likely not formed by ‘normal’ fluvial or beach processes. Instead, they are suggested to originate from the impact of tsunamis. The observed features are 1) imbricated cobbles and large-scale cross bedding reflecting up-valley directed flow of water, 2) sandy beds with ‘floating’ clasts and intraclasts of silt suggesting high-energetic and sudden events, 3) soft-sediment deformation structures, 4) conspicuous bar forms showing characteristics of both river and beach bars, and 5) chevron-like sand dunes. The study indicates that processes associated with tsunamis have contributed to the shaping of the fjord-valley plains. Sources of the tsunamis are likely landslides and/or neotectonic activity associated with the fjord. Radiocarbon dating of plant remains from the interpreted tsunami deposits reveals at least two major events during the mid and late Holocene but there are traces from older events as well. The discovered record of tsunamis near Alta is important for understanding the geological and archaeological history of the area, as well as for geohazard evaluations. The findings also imply that traces of tsunamis probably are more common along the Norwegian coast, including the inner fjord-valleys and bay regions, than earlier viewed.

Effect of Hydrothermal Fluid on Cambrian Dolomite Reservoir in Northwestern Tarim Basin

先生 Junyi Hao^{1,2}, 先生 Qilu Xu^{1,2}, 先生 Fang Hao^{1,2}

¹National Key Laboratory of Deep Oil and Gas, China University of Petroleum (East China), China,

²School of Geosciences, China University of Petroleum (East China), China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Under the background of extensive sources of hydrothermal fluids in superposition basins, the hydrothermal transformation of carbonate rocks has become a new research field, but the research on the pore-forming mechanism of dolomite is relatively scarce. The accurate determination of the types and sources of hydrothermal fluids is not only related to the analysis of fluid-rock interaction mechanism, but also the key basis for the prediction of deep oil and gas reservoir distribution and migration channels.

The comprehensive analysis of hydrothermal minerals in the northwestern Tarim Basin was carried out by means of mineral petrology, in-situ major and trace element tests and in-situ U-Pb dating. The study determined that the activity and distribution of hydrothermal fluids in Cambrian strata in northwestern Tarim Basin are related to deep faults, and the fluid types are mainly magmatic hydrothermal and deep hot brine. It is found that fluorite, quartz and other minerals are typical magmatic hydrothermal minerals, with obvious enrichment of light rare earth elements, positive Eu anomaly and low Th/U value (< 0.45). The deep hot brine is characterized by barite and siderite, with weak Eu anomaly and high $^{87}\text{Sr}/^{86}\text{Sr}$ value (> 0.709). The hydrothermal fluids in the study area have two-sidedness in the transformation of Cambrian reservoirs. The constructive effect is mainly concentrated in the vicinity of large intrusions near deep faults, mainly hydrothermal dissolution and hydrothermal dolomitization, hydrothermal dissolution pores and hydrothermal dolomite intergranular pores are developed. The destructive effects are widely distributed in the far end of the heat source area, mainly hydrothermal filling and hydrothermal recrystallization, and the dissolution pores are filled with saddle dolomite and calcite. This study has important theoretical and practical significance for revealing the hydrothermal transformation mechanism of deep dolomite reservoirs.

Refining Models for the Spatiotemporal Evolution of Mixed Siliciclastic-Carbonate Systems on a Heterogeneous Ramp in an Icehouse World: Pennsylvanian Upper Strawn Group, Texas, USA

Kelly Hattori¹, Peter Flaig¹

¹University of Texas at Austin - Bureau of Economic Geology, Austin, United States

10D: Marine Carbonate-Siliciclastic sedimentary systems, Rongomātāne A (Level 1), January 30, 2026, 11:00 AM - 12:30 PM

The Pennsylvanian Strawn Group of the Eastern Shelf of the Permian Basin, Texas, USA comprises a highly heterogeneous mosaic of siliciclastic and carbonate facies representing purely carbonate systems (e.g., “reefs”/buildups), purely siliciclastic systems (e.g., deltas), and a variety of mixed systems. Depositional environments range from intertidal/exposed to basinal deepwater settings. Because of rapid glacioeustatic fluctuations associated with this peak icehouse time, facies associated with any environment may be juxtaposed (laterally or vertically) with one another. Consequently, in the subsurface stratal relationships are difficult to resolve, and correlation becomes problematic. To highlight these challenges, we present a case study integrating core and wireline log data from three oil/gas fields along a 35 km transect in King County, TX. Bateman Ranch field (north) is composed of highly cyclic phylloid-algal boundstones, shallow-water wackestones, and deeper-water mudstones bounded by subaerial exposure surfaces. Katz field (south) contains tidally-modified deltaic deposits. Anne Tandy field (center) is characterized by interfingering siliciclastic- and carbonate-dominated deposits attributed to shoals, deltas, and deeper subtidal settings. Although biostratigraphic analyses indicate that the fields are broadly temporally correlative, they did not develop contemporaneously under the same depositional conditions. Traditional mixed-system models fail to adequately explain the distribution and spatiotemporal relationships of facies, which are strongly impacted by glacioeustatic fluctuations, tectonic activity, and the presence of a clastic point source. Thus, we propose a new icehouse carbonate-clastic evolution (ICCE) model that builds upon previous models but gives extra consideration to the effects of high-frequency, high-amplitude sea level fluctuations and resultant underfilled accommodation on the evolution of a mixed-system ramp in an icehouse setting. Incorporation of this icehouse climatic context illuminates the potential for preservation and recurrent reactivation of topographic features, which contributes significantly to a rugose bathymetric profile and development of extremely complex facies mosaics such as those observed on the Eastern Shelf.

The Coupling Relationship between the Deposition of Lacustrine Dark Shale in Sichuan Basin and the Oceanic Anoxic Event in Early Jurassic

Prof. Jianglin He¹, Professor Zhengjiang Wang¹, Senior Engineer Ankun Zhao¹

¹Chengdu Center, China Geological Survey (geosciences Innovation Center of Southwest China), Chengdu City, Tianfu New District, China

7C: Sedimentology of Black Shales through Phanerozoic (2), Tāwhirimātea E (Level 2), January 29, 2026, 10:15 AM - 11:45 AM

The Pliensbachian-Toarcian lacustrine shale in the Sichuan Basin is characterized by two organic matter-rich layers (Dongyuemiao and Da'anzhai members) interlayered with an organic matter-poor layer (Ma'anshan member). Both the organic-rich layers are promising target layers for shale oil and gas in China, meanwhile, they are a terrestrial sedimentary record for the Toarcian Oceanic Anoxic Event (T-OAE). What factors dominated the enrichment of the organic matter in them? It is not only a benefit to the exploration of shale gas and oil, but also to probing the way to carbon complement. Based on the paleo-environment analysis and the correlation with organic matter accumulation in the Pliensbachian-Toarcian lacustrine shale on the subaqueous paleo-uplift in the Sichuan Basin according to lithofacies and geochemical proxies. We concluded that lake stratification and oxygen deficiency were gradually strengthened in an upward sequence from Pliensbachian Dongyuemiao member to late Toarcian Da'anzhai member. However, primary productivity was reduced. Chemical weathering was strongest during the early Toarcian stage (Ma'anshan member). The organic matter accumulation in these lacustrine shales is closely related to environmental changes caused by tectono-sedimentary evolution and depositional conditions of the Sichuan Basin. The Pliensbachian Dongyuemiao member was dominated by high primary productivity and low terrigenous detrital input. In the case of the deposition of the early Toarcian Ma'anshan member, the organic matter was difficult to preserve due to the high sedimentation rate and the lack of anoxic water conditions. However, the late Toarcian Da'anzhai member was primarily composed of chemical precipitation that was closely correlated with the climate changes during T-OAE. The organic matter accumulation in this member was positively correlated with salinity-induced stratification and elevated CO₂ concentration.

Formation and Distribution of Black Shales and Differential Enrichment Effect of Oil and Gas under the Control of Multi-Sphere Interaction in the Tethys Domain

教授 **Zhiliang He**¹, 教授 **Yuying Zhang**²

¹China University of Geosciences, Wuhan, China, ²Northeastern University, Shenyang, China

8C: Sedimentology of Black Shales through Phanerozoic (3), Tāwhirimātea E (Level 2), January 29, 2026, 1:40 PM - 3:10 PM

The Tethys domain is characterized by zonal distribution from north to south and segmental distribution from east to west, with a rich variety of oil and gas basins and abundant resources. However, the sedimentary filling process and subsequent modification in the Tethys domain are quite different, resulting in significant regional and stratigraphic variations in oil and gas resources and an uneven distribution. Against the backdrop of the waxing and waning of the Proto-, Paleo-, and Neo-Tethys in the plate tectonic evolution and the macroscopic changes in climate and sea level during the Phanerozoic, the differences in the Tethys domain's basement and the plate movement patterns created semi-enclosed topographic conditions in various basin prototypes. Coupled with rapid sea level rise, this led to a stable undercompensated environment. Favorable climate and abundant nutrients fostered vigorous productivity, while sulfidation and anoxic conditions due to water stratification effectively preserved organic matter. In the sedimentary environment influenced by paleogeology, paleoclimate, paleohydrology, and paleobiology, the coupling of multiple geological events and multiple spheres jointly controlled the formation and distribution of large-scale black shales. These high-quality source rocks laid the material foundation for giant oil and gas accumulation areas and shaped the global distribution pattern of black shales and the differential oil and gas enrichment effect.

Microbial Dolomite Structures and Growth Patterns in the Ediacaran Dengying Formation, Central Sichuan Basin

Mr Puwei He¹

¹Petrochina Southwest Oil&gasfield Company, Chengdu, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Ediacaran Dengying Formation in the central Sichuan Basin is characterized by widespread development of cyanobacteria-mediated microbial dolomite. Detailed examination of drill cores and thin sections reveals distinct structural differences from modern stromatolitic forms, including domal, columnar, and laminated structures.

The microbial dolomite exhibits a well-defined vertical succession comprising laminated structures passing upward into clotted structures, then bound structures, followed by escape and burial cementation structures, and finally brecciated structures. This structural evolution reflects changing hydrodynamic conditions and variable rates of dolomite cementation. Isotopic analyses demonstrate that micritic dolomite in laminated structures yields $\delta^{13}\text{C}$ values of 1.48‰ to 2.52‰ and $\delta^{18}\text{O}$ values of -3.32‰ to -4.61‰, while fibrous and bladed dolomite in clotted and bound structures shows $\delta^{13}\text{C}$ of 0.75‰ to 1.53‰ and $\delta^{18}\text{O}$ of -4.87‰ to -6.48‰. Escape and burial cementation structures contain crystalline dolomite with $\delta^{13}\text{C}$ of 1.31‰ to 1.66‰ and $\delta^{18}\text{O}$ of -6.0‰ to -8.11‰.

The vertical structural progression records a complex interplay between microbial growth and carbonate precipitation, evolving from: (1) cyanobacteria-dominated deposition in subtidal settings forming laminated structures, through (2) mixed microbial and cement influences in intertidal environments producing clotted and bound structures, to (3) cement-dominated supratidal zones generating escape structures, and finally (4) syndiagenetic brecciation during subaerial exposure. Brecciated structures, being predominantly secondary in origin, provide limited information about original depositional conditions.

Field observations of outcrop profiles demonstrate that these microbial carbonates form 5-10 m thick shallowing-upward cycles, controlled by high-frequency sea-level fluctuations. Laterally, variations in tidal flat hydrodynamics and cementation rates produce mound-like growth geometries with significant topographic relief. Integration of 3D seismic data with well logs reveals that these microbial buildups exhibit distinctive mound-shaped seismic facies characterized by rapid lateral migration, providing compelling evidence for the growth dynamics of Ediacaran microbial carbonates in this region.

The study documents a complete spectrum of microbial carbonate structures developed in a terminal Proterozoic epeiric sea, offering new insights into the environmental controls on microbialite formation during this critical period of Earth history. The findings have significant implications for understanding ancient carbonate reservoirs and the evolution of microbial ecosystems in response to changing paleoenvironmental conditions.

Genetic Mechanisms of Calcite Cements in the Upper Miocene Huangliu Formation Reservoir in the Eastern Margin of Yinggehai Basin

先生 **Xinkun He**¹, Jinqiang Tian¹, Fang Hao¹, Xuezhe Li¹

¹China University of Petroleum (east China), Qingdao, Shandong, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Genetic mechanisms of calcite cements fundamentally controls on reservoir heterogeneity and hydrocarbon accumulation within the high-temperature and overpressured Upper Miocene Huangliu Formation sandstones in the eastern margin of the Yinggehai Basin, South China Sea. Integrated analyses of cast thin section microscopy, cathodoluminescence imaging, carbon-oxygen-strontium isotopes, and rare earth elements reveal the material sources, temporal evolution, and genetic mechanisms of calcite cements in the study area. Two calcite cement generations (Cal- I , Cal- II) in the slope belt exhibit hydrothermal signatures, including anomalously high fluid inclusion homogenization temperatures, LREE-enriched patterns, and Yb/Ca-Yb/La cross-plot clustering within the hydrothermal field, confirming sustained hydrothermal control on their precipitation. The Cal- I exhibits dull-yellow cathodoluminescence, $\delta^{13}\text{C}$ values of -15.5‰ to -14.53‰ , and $^{87}\text{Sr}/^{86}\text{Sr}$ ratios consistent with coeval seawater and bioclastic components of the Huangliu Formation. During late-stage deposition of the Huangliu Formation, hydrothermal activity triggered hydrocarbon generation thresholds in Sanya Formation source rocks at 3000 m burial depth within the sag zone. Fault-driven migration of organic CO_2 originates from organic acid decarboxylation within Sanya Formation source rocks provided the primary material source for Cal- I calcite cementation. Cal- II cement exhibits bright-yellow cathodoluminescence, $\delta^{13}\text{C}$ values of -12.57‰ to -6.1‰ , and elevated $^{87}\text{Sr}/^{86}\text{Sr}$ ratios relative to coeval seawater and bioclastic components of the Huangliu Formation. During the late Yinggehai sedimentation, diapiric thermal baking decomposed carbonate minerals in Sanya Formation source rocks, producing abundant inorganic CO_2 . This combined with organic CO_2 from organic acid decarboxylation in Meishan Formation source rocks, and both migrated into reservoirs, jointly supplying material sources for Cal- II .

Continental-Scale Carbonate Turnover across the Devonian–Carboniferous in North America: Tectonic or Climate Forcing?

Dr. Makram Hedhli¹

¹Geological Survey of Canada, Calgary, Canada

7B: Carbonate depositional systems from platform, slope to basin (1), Tāwhirimātea C (Level 2),
January 29, 2026, 10:15 AM - 11:45 AM

The Devonian–Carboniferous (DC) transition was marked by climatic cooling, widespread anoxia, the collapse of low-latitude carbonate platforms, and a turnover from warm- to cool-water carbonate factories. In western Laurentia (present-day North America), this shift coincided with tectonically driven palaeogeographic changes. To evaluate the relative influence of climate versus tectonics, a sedimentological and geochemical study was conducted on (12) stratigraphic sections spanning from Alberta (Canada) to southern Nevada (USA). Microfacies analysis shows a transition from [i] a Famennian warm-water carbonate ramp: lime mud-rich, with low sedimentation rates, mesotrophic conditions, and tabular geometry to [ii] a Tournaisian- Viséan cool-water ramp dominated by grainstones, low lime mud, high sedimentation rates, oligotrophic conditions, and a pronounced slope. Positive excursions in $\delta^{18}\text{O}$ (+2‰ V-PDB) and $\delta^{13}\text{C}$ (+4‰ V-PDB) in Lower Carboniferous carbonates likely reflect the onset of Carboniferous–Permian Ice-house and drawdown of atmospheric CO_2 following black shale deposition at the DC transition. However, the late Tournaisian reappearance and persistence of photozoan elements into the Viséan indicate warmer surface waters, suggesting a decoupling between atmospheric and oceanic conditions. Thermocline shoaling was likely triggered by enhanced cold-water upwelling along the western margin following the tectonic collapse of the Antler orogen, which no longer restricted offshore circulation as an oceanographic barrier. This study shows that carbonate platforms are more susceptible to regional changes than global shifts.

Are Carbonate Concretions Subsurface Microbialites?

Dr James Hendry^{1,2}

¹Iapetus Geoscience Limited, Talaton, United Kingdom, ²School of Earth Sciences, University College Dublin, Dublin, Ireland

8A: Deep time biogeomorphology (1), Tāwhirimātea A (Level 2), January 29, 2026, 1:40 PM - 3:10 PM

Septarian calcite concretions contain arrays of curved, outward-tapering cracks that demonstrate internal shrinkage that must have occurred as they formed. These cracks are commonly lined by brown calcite cements.

A hypothesis for septarian concretion formation involves synchronous CaCO_3 mineralisation and rupture of a microbially bound, waterlogged shallow sediment volume, whereby degradation of EPS allowed for shrinkage, dewatering and pervasive calcite nucleation. Cracks may have opened before the surrounding body would even have been recognisable as a concretion. The amount of crack opening depended on the relative rates of EPS degradation and calcite crystal growth, as the latter developed a rigid physical framework that prevented further shrinkage. Once that situation was attained further cementation passively occluded the remaining intercrystalline porosity, effectively the “pervasive” growth model.

Non-septarian concretions either nucleated and grew crystals too rapidly to allow for shrinkage or formed from the chemical products of bacterial processes, controlled by solute diffusion gradients rather than directly controlled by bacterial activity.

A consequence of the hypothesis is that the crack lining cements that formed synchronously with the concretion body but in open space may have preferentially trapped partly degraded EPS. In Jurassic examples from Scotland these cements contain a photoluminescent, high molecular weight (polar) gelatinous phase that can be extracted after decarbonation. Despite solvent evaporation artefacts, the desiccated extract shows possible biological structures in SEM. Is it 150 My-old EPS?

Geomicrobiological technologies now exist to properly test the hypothesis. Confocal laser fluorescence microscopy can determine the habitat of organic material in the cements. Critical point drying of decarbonated extract should help preserve any primary textures, and biochemical characterisation could investigate its EPS origin. This would change our understanding of bacterial biomass distribution in the shallow subsurface and reveal some concretions to be analogous to surface microbialites, albeit produced by entirely heterotrophic consortia.

Improving the Efficacy of Clastic Reservoir Characterisation Using Multivariate Analysis of Geochemical and Mineralogical Metrics.

Mr Tim Hicks¹

¹James Cook University, Townsville, Australia

2E: Student Research Forum (2), Rongomātāne B (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

Geological modelling of clastic reservoir systems relies on robust fine-resolution correlations between wells, fields, and outcrops. Those correlations are necessary to constrain the interpretation of the spatial and temporal distributions of critical geological architectural components.

During the field appraisal phase, it is beneficial to limit the interpretive freedoms concerning reservoir architecture described in the static and dynamic reservoir models. Similar drivers exist across the span of reservoir development sub-disciplines - i.e. hydrocarbon development, helium extraction, CO₂ sequestration, and sediment-hosted REE exploration projects.

To facilitate the construction of efficient reservoir models, it is necessary for geologists to confidently define their interpretations using the oftentimes limited datasets available in greenfield settings.

The research underway at James Cook University explores quantitative chemostratigraphic techniques for bolstering the correlatable attributes of reservoir architecture. By interrogating the element-geochemical and mineralogical compositions of sediment samples, we can explore whether competing non-unique correlation solutions might be clarified through multivariate analysis and clustering techniques in the context of chemostratigraphic indicators.

Early results determined from two separate test case studies (Permian age Northern Perth Basin, and the Mesozoic age Cabora Bassa Basin), indicate that incorporating the chemostratigraphic support frameworks not only compliments contemporary stratigraphic interpretation, but can also bring improvements to resolution and objective repeatability for continental and coastal successions which exhibit sparsity of biostratigraphic markers.

Improving the Resolution of the Cabora Bassa Basin Stratigraphy – a Chemostratigraphic Test Case Described through Multivariate Analysis of ICP-MS Element-Geochemical, and LIBS Mineral-Model Frameworks

Mr Tim Hicks¹

¹James Cook University, Townsville, Australia

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Stratigraphic partitioning within clastic continental rift systems can be difficult to implement at fine scales, due in-part to the sparsity of traditional biostratigraphic material, the isolation from connectivity into global marker events commonly utilised in marine system analysis, and the difficulties associated with localised subsidence activity within sub-basins.

The research underway at James Cook University explores quantitative chemostratigraphic techniques to assist interpretation of the correlatable aspects of the Mesozoic section of the Cabora Bassa Basin, a sub-part of the Zambezi section of the extensive East African Rift System.

Mesozoic age sediment samples acquired from two deep exploration wells were analysed using ICP-MS for element-geochemical data and LIBS for mineralogical composition. Those datasets were applied in driving refinements to the priori stratigraphic framework of the Cabora Bassa through scaffolding with chemostratigraphic indicators.

Initial results determined from the test case studies of the Cabora Bassa Basin, support further developing the multivariate data scaffold that not only compliment the contemporary stratigraphic interpretation, but which may also point at zones of improved resolution potential for the Mesozoic continental succession.

Heeding Parawhenuamea – Being a Good Ancestor

Daniel Hikuroa¹

¹Waipapa Taumata Rau - University of Auckland

Keynote: Assoc. Prof. Dan Hikuroa, Tāwhirimātea A (Level 2), January 26, 2026, 9:05 AM - 9:45 AM

Parawhenuamea – literally "muddy-soil-of-Mother-Earth" - is the Māori goddess, atua (deity) and source and embodiment of all water that emerges from the land, including streams and rivers, and parent of oneparahua and onepū, which are the silts and sands that are deposited from water flow. Parawhenuamea is also associated with the destructive (erosion of sediment) and constructive (deposition of sediment) forces of floods and personifies the connection between land and sea. Parawhenuamea and her associated relationships are (at least in part) the way Māori made sense of the hydrological cycle, of floods and associated erosion and deposition, of the fate of sediments, and demonstrate a sophisticated understanding of the interplay of these processes in space and time, codified according to a Māori world view.

Being a Good Ancestor is a deeply rooted concept in te ao Māori that emphasizes intergenerational responsibility, environmental guardianship, and spiritual connection to the natural world. In te ao Māori, humans are not separate from nature but part of it, bound by whakapapa to everything, and are guided by the fundamental, intertwined concepts of tika (truth, justice), pono (honesty, validity), and aroha (love, compassion). Together, they represent a relational, holistic understanding of the world, where one acts with truthfulness, integrity, and love towards others and the natural environment, fostering responsible and respectful relationships.

Heeding Parawhenuamea means weaving scientific and indigenous knowledge with long-term responsibility, cultural awareness, and environmental guardianship, and is a way to embody and enact being a good ancestor. This isn't just a philosophy—it's a call to action. It asks us to think beyond our lifetimes and act with care, humility, and responsibility toward the Earth and all who will inherit it, drawing from all knowledge available to us.

Time & Temperature: Redefining the Base Nukumaruan Stage Boundary (Base Pleistocene) in Shallow Marine Cyclothem Strata, New Zealand

Dr Benjamin Hines^{1,2}, Dr Cliff Atkins¹, Dr Bruce Charlier¹, Associate Professor Michael Hannah¹, Dr Chris Clowes¹, Miss Jasmine Casidy¹, Professor James Crampton, Dr Jenni Hopkins¹, Mr Dene Carroll¹, Dr Kyle Bland³, Dr Katie Collins⁴

¹Victoria University of Wellington, Wellington, New Zealand, ²Insight Geoscience, Te Aroha West, New Zealand, ³GNS Science, Lower Hutt, New Zealand, ⁴Natural History Museum of London, London, United Kingdom

8E: Deciphering climate and environmental records in shallow marine environments across space and time (2), Rongomātāne B (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

Isolated in the Southwest Pacific since detaching from Gondwana at ~82 Ma, New Zealand has long held an endemic fauna that has hindered biostratigraphic correlation with the Northern Hemisphere, necessitating a reliance on local geological stages. One of these, the early Pleistocene Nukumaruan local stage, has never had its boundary dated directly. The base Nukumaruan Stage has been inferred to be 2.4 Ma, interpolated between the first occurrence of the cold-water pecten *Zygochlamys delicatula* in the informal boundary stratotype in the Hautawa Shellbed, Whanganui Basin (western North Island), and the lowest occurrence of the planktonic foraminifera *Truncorotalia crassula*, marginally above base Chron C2r (2.581 Ma) in offshore marine cores (ODP1123). However, correlation of this stage outside of the Whanganui Basin is complicated by the typically shallow marine setting of this interval through onshore sections, containing coarse lithologies, multiple unconformities, and further compounded by the long temporal ranges of macrofaunal taxa. We apply 87/86Sr isotope stratigraphy to reliably date the Hautawa Shellbed and correlative units spanning the Pliocene-Pleistocene transition in several sections across central New Zealand.

87/86Sr isotope stratigraphy identifies the timing of the first occurrence of *Z. delicatula* in the studied sections, and determines a numerical age for the base Nukumaruan Stage in the Hautawa Shellbed. Previously, the widespread occurrence of *Z. delicatula* in New Zealand was assumed to be isochronous; however, we demonstrate that there are several discrete northward migration events of *Z. delicatula*, with marine water temperatures, rather than time, being the ultimate control on the distribution of *Z. delicatula*. Samples from the informal chronostratotype section (basal Hautawa Shellbed) place the base Nukumaruan local stage at 2.46 ± 0.15 Ma, post-dating the Piacenzian–Gelasian stage boundary at 2.58 Ma in the European sequence.

Drift Pumice Layers in Coastal Sediments at Shimokita Peninsula, Amami-Oshima, and Ishigaki Islands, Japan

Dr Reona Hiramine¹, Dr Daisuke Ishimura²

¹National Museum of Japanese History, Sakura City, Japan, ²Chiba University, Chiba City, Japan

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Pumice clasts with low density can float and travel long distances. The 2021 eruption of Fukutoku-Oka-no-Ba (FOB), a submarine volcano in the Izu-Ogasawara arc, released large volumes of pumice that drifted to the coasts of the Nansei Islands, disrupting coastal activity. Drift pumice preserved in coastal sediments can provide valuable records of past volcanic eruptions and transport processes. It also has implications for hazard and paleoenvironmental assessment. This study reports concentrated drift pumice deposits interbedded within coastal sediments at Shiriyazaki (Shimokita Peninsula), Tebiro beach (Amami-Oshima Island), and Akaishi beach (Ishigaki Island), Japan. To clarify the source volcanoes, major element compositions of volcanic glass shards were analyzed using an electron probe microanalyzer. As a result, the pumice at Shiriyazaki was correlated to the Us-b tephra from the 1663 eruption of Usu volcano in Hokkaido. The pumice at Tebiro beach was similar in composition to that from the FOB eruption. Although some 2021 FOB pumice clasts drifted ashore at Tebiro beach, the area where the concentrated pumice layer was found lies slightly inland, and it is likely that the 2021 pumice did not reach that far at the time of the survey. Therefore, the pumice layer is attributed to the 1986 FOB eruption, the last large-scale drift pumice event before 2021. The pumice at Akaishi beach was correlated to that from the 1924 eruption of the submarine volcano north-northeast of Iriomote Island. The shape, sorting, and horizontal continuity of the pumice clasts in three layers suggest large-volume drift pumice depositional events on these beaches. These drift pumice layers are laterally continuous and well preserved, especially in low-energy backshore settings. They also enable reconstruction of past volcanic events accompanied by drift pumice along the Japanese coast. Consequently, coastal drift pumice layers serve as useful archives of eruptions and depositional environments.

Connecting Outcrop Geology to Seismic: Exploring Subsurface Complexity through Rapid and Flexible Seismic Modelling

Mr Daniel Holden¹, Professor Andrew Hurst¹, Professor Isabelle Lecomte²

¹University of Aberdeen, Aberdeen, United Kingdom, ²University of Bergen, Bergen, Norway

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Seismic reflection images provide enhanced understanding and characterisation of subsurface geological processes and structures. Seismic imaging is widely used yet its effectiveness and adaptability is constrained by limitations in resolution and detectability. The interpretation of large-scale features ($>1/4$ wavelength) is common practice, but features below this threshold are commonly referred to as sub-seismic and their geological significance are overlooked (Widess 1973). Furthermore, thin and steep features such as faults and hydrofractures, may be easily misinterpreted or ignored due to weak seismic amplitudes. Understanding the level at which geological features impact seismic data is essential for effective seismic interpretation and subsurface characterisation.

Detailed geological outcrop models of sandstone intrusions are used as input for point-spread function seismic modelling, generating seismic models comparable to pre-stack depth-migrated data (Lecomte et al. 2015). The geological outcrop models exhibit a wide range of sandstone geometries, with intrusion thickness extending from millimetre- to decametre-scale and dips from horizontal to vertical. The highly detailed seismic models allow for direct comparison with actual geology, which allows a deeper understanding of the seismic response of specific geological features.

Comparing input geology and seismic models reveal that geological features are commonly misrepresented in seismic images. Many sandstone intrusions that may be considered seismically resolvable interact with surrounding geology resulting in disturbed reflectors. Thin intrusions that may otherwise be ignored create unique seismic responses that give indications of their presence, while steeply dipping features form variations in amplitude. The capacity to link outcrop models with their expected seismic response generates opportunities to unravel how features manifest in seismic that may lead to improvement of seismic interpretation (Holden et al. 2025). Seismic modelling of geological outcrops can be applied across a wide range of scales enhancing subsurface understanding and providing more accurate constraints on geological processes and enhancing resource evaluation.

A Mid-Snowball Cap Carbonate?: Evidence for a Dynamic Cryogenian Glaciation from South Australia

Dr. Ashleigh Hood¹, Dr Malcolm Wallace¹, Ms Sameena Pavri¹, Ms Caitlin Kelly¹

¹University of Melbourne, Parkville, Australia

1F: Earth's sedimentary record of glaciation (1), Rongomātāne C (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

The Cryogenian ‘snowball Earth’ glaciations are likely the most extreme ice age in Earth’s history, with evidence for global ice coverage. Despite many years of research into these glaciations, relatively little work has focused on the sedimentology of these deposits and what it can inform as to the severity of this ice age. The Sturtian glacial succession of the Flinders Ranges, South Australia is exceptionally preserved and hosts up to several kilometres of glacial stratigraphy, providing a window into Cryogenian glacio-marine environments. In the Southern Flinders Ranges, newly measured sections record several intervals of glaciation and at least one significant unconformity, supporting a dynamic ice age. The lower Pualco Tillite records a dominantly ice-proximal sequence of dolomitic diamictite representing an early phase of Sturtian glaciation that is elsewhere, rarely preserved. This unit is transitionally overlain by the Holowilena Ironstone, which includes iron- and phosphorus-rich siltstones with rare dropstones and a network of unusual carbonate-filled sedimentary dykes. In the middle of the glacial succession, the Warcowie Dolomite Member of the Wilyerpa Formation is a laminated dolomite or dropstone-rich dolomite unit which strongly resembles a post-glacial ‘cap carbonate’. Where preserved, the sediments which overlie this unit may include several hundred metres of siltstones with no evidence for glaciation, which onlap antiformal structures in the Holowilena Ironstone. New work on these siltstones demonstrates a cyclic pattern in their geochemical composition, particularly in carbonate-content. We interpret this Warcowie-Wilyerpa interval as an extensive interglacial episode within the Sturtian ice age, with areas of open ocean. Cyclicity may have been driven by distal ice volume changes due to orbital forcing in this deep-marine setting. This research adds to growing evidence for a dynamic and complex Sturtian glaciation with a significant mid-Sturtian ice-free interval.

Changing Neoproterozoic Environments and Ecosystems Recorded in the ~2.63 Ga Carawine Dolomite (Hamersley Basin, Pilbara Craton, Western Australia)

Miss Vera Hoogland¹, Dr David Flannery¹, Dr Heidi Allen², Dr David Martin²

¹School of Earth and Atmospheric Sciences, Queensland University of Technology, Brisbane, Australia,

²Geological Survey of Western Australia, Department of Energy, Mines, Industry Regulation and Safety, Mineral House, Perth, Australia

7E: Deciphering climate and environmental records in shallow marine environments across space and time (1), Rongomātāne B (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

The ~ 2.63 Ga Carawine Dolomite (Hamersley Group) preserves one of the oldest substantial carbonate platforms on Earth and records evidence for a major bolide impact event, manifested by an impact spherule-bearing megabreccia. It was deposited just prior to the onset of the rise of free atmospheric oxygen and the first banded iron-formation (BIF) in the Hamersley Basin. Metamorphic grades do not exceed greenschist-facies, preserving a primary sedimentary record and thus, providing a rare opportunity to investigate changing sea water chemistry and early microbial ecosystems. The aim of this study is to construct a detailed chemostratigraphy representing a continuous transect through the Carawine Dolomite, using field observations, petrography, and stable isotope and trace element geochemistry.

Planar-laminated carbonate was deposited in a basinal setting and contains the bolide impact deposit. Fe-rich units appearing above the impact layer may record renewed deepening and the lateral equivalent Hamersley Group BIFs. Several shallowing-upward cycles overlying the deeper-water deposits feature three main depositional facies and associated microbialite assemblages: 1) deep subtidal depositional facies with interbedded tented microbialites and pseudomorphed aragonite crystal fans (ACFs); 2) sub-tidal storm-event facies, containing oncolytic grainstones, wave-ripples, intraclasts, and erosion surfaces; 3) peritidal facies containing microbialites with a clotted texture, domal stromatolites, ooids, tepee-structures, carbonate growth cavities filled with herringbone calcite and ACFs. Preliminary trace element data show REE-patterns, Y/Ho ratios and Ce-anomalies varying with facies. Field observations in combination with high resolution trace element data, and stable carbon and oxygen isotope data will enable a reconstruction of the sedimentary and geochemical evolution of the Carawine Dolomite carbonate platform and Neoproterozoic microbial ecosystems.

Influence of Hydrothermal Activity and Marine Transgressional Events on Organic-Rich Shale and Shale Oil Enrichment in Huanghekou Depression, Bohai Bay Basin, China

Prof. Dujie Hou¹, Dr. Zhenjie Jia¹, Dr. Xiong Cheng¹

¹China University of Geosciences (Beijing), Beijing, China

8C: Sedimentology of Black Shales through Phanerozoic (3), Tāwhirimātea E (Level 2), January 29, 2026, 1:40 PM - 3:10 PM

The Shahejie Formation within the Huanghekou Depression represents a critical stratigraphic unit for hydrocarbon exploration. There are 3 members (Es3u, Es3m, Es3l) and 1 member (Es1) of Shahejie Formation. The abundance of organic matter is lower in the Es1 than that in the Es3, while it is relatively higher in the Es3m-l. The source material was predominantly composed of algae in the Es3u-l, with contributions from terrestrial higher plants, and dinoflagellates showed limited distribution in the Es3u, dinoflagellates and marine pelagophyte/chrysophyte algae were more developed in the Es3m than those of the Es3l. However, It is identified that the sedimentary period of the Shahejie Formation was influenced by hydrothermal activity. The intensified hydrothermal activities provided abundant nutrients, thereby enhancing the primary productivity of the lake ecosystem and promoting the enrichment of organic matter during the Es3 period. In contrast, the relatively limited hydrothermal activity in the Es1 had a minimal effect on the enrichment of organic matter. Moreover, biomarkers such as 24-n-propylcholestanes, dinosteranes, and triaromatic dinosteranes, along with fossils of *Sentusidinium* and *Bohaidina* identified in the Es1 and Es3, indicate that seawater intrusions occurred during the deposition of the Shahejie Formation. These geological events are closely related to the organic-rich shale formation. The enrichment mechanism of shale oil was analyzed and evaluation criteria for sweet spots has been also established. The Shahejie Formation predominantly comprises quartz, clay, and calcite minerals, along with various types of pores and fractures. It has been clarified that the proportion of free oil is higher in the Es3m-l, as well as in sandy interlayer type, laminated type, felsic shale, and mixed shale. The shale oil is mainly enriched in Es3m-l, that intercalated shale oil is mainly developed in the fore-delta and subaqueous fan terminus end and local platform, that laminated shale oil is mainly developed in the fore-delta and semi-deep lake and local platform, and that matrix shale oil is mainly developed between deep lake and semi-deep lake, and different shale oil source and reservoir combinations and enrichment models are established.

Construction and Application of a Lithofacies Paleogeography Knowledge Graph Based on Large Language Models

Prof Mingcai Hou¹, Yuping Chen², Han Cheng¹, Dr. Haipeng Li¹, Professor Chengshan Wang²

¹Chengdu University of Technology, Chengdu, China, ²China University of Geosciences (Beijing), Beijing, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

This study introduces a data-driven methodology that integrates Large Language Model (LLM) agents with knowledge graph technology to automate the extraction and synthesis of sedimentological information from vast, unstructured scientific literature. The system systematically identifies and extracts key geological entities, such as lithology and fossil assemblages, and maps their complex interrelationships to construct a large-scale, structured knowledge graph.

We successfully applied this framework to the fields of carbonate microfacies and fluvial depositional systems. The application resulted in the automated identification of sedimentary facies and the intelligent reconstruction of relative sea-level curves, demonstrating a significant enhancement in both the efficiency of knowledge integration and the precision of geological interpretation. The resulting knowledge graph serves as a robust foundation for advanced applications, including the development of intelligent paleogeographic mapping systems, the enforcement of semantic consistency across disparate databases, and sophisticated semantic search capabilities. This approach provides a powerful new tool for resolving complex geological problems, accelerating the transition of sedimentology toward a more knowledge-intensive and intelligently-driven research paradigm.

Advancing Turbidite Paleoseismology on the Hikurangi Margin: Current Insights and Future Directions

Assoc. Prof. Jamie Howarth¹, Dr Charlotte Pizer², Ms Stephanie Tickle¹, Dr Aisling O'Kane¹, Dr Alan Orpin³, Dr Kate Clark⁴

¹Te Herenga Waka - Victoria University of Wellington, Wellington, New Zealand, ²University of Innsbruck, Innsbruck, Austria, ³NIWA, Wellington, New Zealand, ⁴GNS Science, Lower Hutt, New Zealand

7D: Shaking across the land-to-sea boundary, Rongomātāne A (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

Subduction zones are often segmented into regions of contrasting inter-seismic plate coupling, raising critical questions about the extent and frequency with which megathrust earthquakes propagate across such boundaries. Along the Hikurangi margin, Aotearoa New Zealand, geodetic data reveal a pronounced gradient in coupling, from a weakly coupled central segment to a locked southern margin. This segmentation pattern provides a natural laboratory to investigate controls on rupture extent and recurrence at subduction zones. We present a ~2000-year turbidite paleoseismology record from seven discrete sedimentary systems that span a ~500 km length of the Hikurangi margin, across the geodetically defined coupling transition. By combining novel ichnofacies analysis to distinguish multi-pulsed turbidites from turbidite stacks, radiocarbon dating, and probabilistic event correlation, we quantify the spatial extent and synchronicity of turbidite emplacement. Earthquake sources for widespread deposition events are inferred using turbidity current triggering thresholds—calibrated from the 2016 Kaikōura earthquake—and a probabilistic ground-motion modelling approach. Our results demonstrate that earthquake-triggered turbidites can preserve a broad spectrum of rupture scenarios, including: single- and multi-segment interface ruptures, multi-fault ruptures, and earthquake sequences. Some interface earthquakes are also shown to span the coupling transition. The study emphasises the potential of turbidite paleoseismology to clarify complex rupture behaviours at segmented subduction zones. However, multi-millennial paleoseismic records are necessary to fully utilise the Hikurangi margin as a natural experiment for understanding how inter-seismic coupling influences rupture segmentation. We outline future opportunities for extending these records using turbidite-based methods in concert with International Ocean Discovery Program (IODP) mission-specific platforms capable of retrieving long and continuous cores from selected deep slope-basin sequences.

Quantifying the Seismic Hazardscape from Lake and Marine Sedimentary Records

Assoc. Prof. Jamie Howarth¹

¹Te Herenga Waka – Victoria University of Wellington, Aotearoa-New Zealand

Keynote: Assoc. Prof. Jamie Howarth, Tāwhirimātea A (Level 2), January 29, 2026, 9:00 AM - 9:45 AM

Sedimentary archives in lake and marine basins preserve records of earthquakes and their cascading consequences — such as landslides, tsunamis, and sediment redistribution—that together define the seismic hazardscape. Although decades of research have characterised the signatures of these phenomena, transforming them into quantitative reconstructions that inform hazard models and resilience planning remains a major challenge. This keynote demonstrates how integrating sedimentary reconstructions with numerical modelling of earthquake dynamics, ground motions, tsunami generation, and sediment transport provides unprecedented insights into the seismic hazardscape.

Four case studies from Aotearoa-New Zealand illustrate this emerging capability. The first shows how lacustrine and marine turbidite records constrain the spatio-temporal earthquake behaviour of transform (Alpine Fault) and subduction (Hikurangi interface) plate-boundary faults, which in turn inform seismic hazard and validate leading-edge multi-cycle earthquake simulations. The second demonstrates how lakes act as natural seismometers that, when combined with physics-based ground-motion models, reveal the dynamics of paleo-earthquakes, including hypocentre location and rupture direction. These data show that the Alpine Fault exhibits a preferential rupture direction, with substantial implications for future ground-motion hazard. The third highlights how numerical modelling of earthquake-induced landslides, tsunamis, and associated sediment transport informs new approaches to reconstructing the magnitude and frequency of these events from the sediment record, providing a framework for probabilistic tsunami-hazard assessment. Finally, reconstructions of sediment yield from Southern Alps catchments, integrated with sediment-transport models, quantify the density of co-seismic landsliding and the duration and magnitude of elevated sediment fluxes following great earthquakes.

Together, these approaches place sedimentology at the forefront of quantifying and forecasting the seismic hazardscape, advancing both earthquake science and societal resilience to future large earthquakes.

Investigation of Quaternary Sea-Level and Climate Fluctuations in Shelf and Slope Sediments by Analysis of Seismic Profiles and Core Samples in Canterbury Basin, New Zealand

Professor Koichi Hoyanagi¹

¹Shinshu University, Matsumoto, Japan

8E: Deciphering climate and environmental records in shallow marine environments across space and time (2), Rongomātāne B (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

Considering the relationship between strata formation and sea level changes, it is important to analyze discontinuities in strata identified in seismic profiles for shelf and slope sediments. However, to determine the actual age and sedimentary environment of such strata, it is necessary to obtain sediment samples. A dense grid of shelf and slope seismic profile data is available for the offshore region east of South Island, New Zealand, and IODP Expedition 317 collected cores from three sites on the shelf and one site on the upper slope.

In the present study, we traced sequence boundaries in the seismic data, and correlated them with discontinuities in the strata observed in core samples. We also established an age model for the cores from the upper slope drill site (U1352) based on a comparison between the measured oxygen isotope ratio variations in benthic foraminifera from the slope cores and the LR04 stack curve.

The oxygen isotope variations in the cores indicated that the sequence boundaries may have formed at the lowest sea level positions. Changes in the stable carbon isotope ratio for marine organic matter in the cores from the upper slope were found to be synchronized with those in the oxygen isotope ratio. This synchronicity is thought to be due to changes in sea-surface temperature in this region caused by global climate change. However, we found some spikes in the oxygen isotope ratio that exhibited small time lags compared to those in the stable organic carbon isotope ratio.

These results suggest that temperature changes may have occurred earlier than sea level changes. Interaction of the Southland Water on the shelf and the Sub-Antarctic Water offshore from the shelf influences sea water temperature in this region.

Impact of a Tropical Arc-Continent Collision on Carbon Sequestration

Dr. Amy Hsieh¹, Dr Romain Vaucher², Dr Thierry Adatte¹, Dr Brahimsamba Bomou¹, Dr Samuel Jaccard¹

¹Institute of Earth Sciences, University of Lausanne, Lausanne, Switzerland, ²College of Science and Engineering, James Cook University, Townsville, Australia

2D: Controls on sedimentation at submarine active margins (2), Rongomātāne A (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

Since its emergence in the early Pliocene, Taiwan has been characterized by exceptionally high denudation rates. Evidence of Taiwan-sourced sediment is preserved in deep-sea sediment records >1000 km away in the South China Sea (SCS), as hyperpycnal flows triggered by intense precipitation can efficiently disperse heavy sediment loads to the deep-sea. In low-latitude regions, tropical cyclones and monsoons are the two dominant mechanisms that erode and disperse elevated sediment loads through high volumes of precipitation. Thus, during greenhouse conditions, corresponding increases in humidity and precipitation probably resulted in not only enhanced chemical weathering of silicate rocks which results in the removal of atmospheric CO₂, but also increased terrestrial production and nutrient export.

Our study of the late-Miocene to early Pleistocene strata of the Taiwan Western Foreland Basin and time-equivalent sediment records from the SCS shows a significant increase in total organic carbon and mass accumulation rates as Taiwan emerged from the Pacific Ocean, suggesting that the enhanced carbon burial is related to sediment export from Taiwan. Decreasing magnetic susceptibility since Taiwan's emergence and geochemical proxies in SCS records support sediment export from Taiwan through intensified physical weathering. C/N and $\delta^{13}\text{C}$ data show no dilution of marine organic matter with increasing sedimentation from Taiwan, implying that Taiwan-derived sediment and corresponding nutrient may have triggered enhanced primary marine production. The findings of our research demonstrate different mechanisms through which carbon is sequestered as a result of low-latitude arc-continent collisions, including elevated sediment discharge to the surrounding seas, providing bioessential nutrients that would stimulate marine productivity, which has not yet been effectively demonstrated. Enhanced understanding of dynamics that influence carbon sequestration will ultimately provide better constraints for existing and predictive carbon budget models.

Geotechnical Characteristics of Submarine Sediments in Continental Margins Offshore SW Taiwan

Associate Professor Huai-Houh Hsu¹, Professor Jia-Jyun Dong², graduate student Chen-Hsun Hsieh¹, graduate student Chia-Chi Chang¹, graduate student Tsung-Yi He¹

¹National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan, ²National Central University, Taoyuan, Taiwan

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Evidence shows that the southwest (SW) off Taiwan distributes abundant gas hydrate reservoirs. The gas hydrate resources were systematically surveyed using geological, geophysical, and geochemical methods, which mainly emphasized the storage potential evaluation. However, the geotechnical characteristics of submarine sediments are unclear and need to be studied. Two surveyed sites (Fangliao Canyon and Palm Ridge), which are located in the active and passive continental margins off SW Taiwan, respectively, are selected to study the geotechnical characteristics of submarine sediments. Field and laboratory tests were carried out to obtain the engineering properties of the study sites. Data from P-waves and S-waves generated by P–S conversion on reflection from airgun shots recorded along one line of ocean bottom seismometers (OBS) were used to construct 2-D shear wave velocity (Vs) sections. The gravity cores obtained from the study sites were used for laboratory tests. The physical property test, lab vane shear test (VST), bender element method, small-strain cyclic triaxial test, isotropically consolidated undrained (CIU) triaxial test, and unconsolidated undrained (UU) triaxial test were performed. Lab test results established physical properties, dynamic characteristics (maximum shear modulus (Gmax) and shear modulus degradation curve), and shear strength parameters. The geotechnical characteristics of submarine sediments of selected sites in continental margins are discussed in this paper to present test results, assess liquefaction potential, correlate the relationship between field and lab test outputs, and establish the velocity structure profiles.

Multiphase Growth and Basin Control of Main Faults on Northern Sub-Basin, Beibuwan Basin, Northwestern South China Sea

Chen Hu¹, Jianye Ren¹, Dianjun Tong¹, Yancheng Xu¹, Zheng Wang^{1,2}

¹College of Marine Science and Technology, China University of Geosciences, Wuhan, China, ²Key Laboratory of Submarine Geosciences, Second Institute of Oceanography, Ministry of Natural Resources, Hangzhou, China

1E: Student Research Forum (1), Rongomātāne B (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

The basement-involved faults and multiphase extension control the three-dimensional (3D) fault geometries and kinematics, producing different fault growth models in continental rift basins. In this paper, we apply qualitative and quantitative fault analysis techniques to 3D high-resolution seismic data from the Northern sub-basin of Beibuwan basin, building the tectonic-stratigraphic framework and proposing the evolutionary mechanisms of main normal faults. The results suggest that extensional stress changed from NW-SE direction during Paleocene-Middle Eocene to N-S direction in Late Eocene-Oligocene, leading to the ENE or E-W directed propagation of fault networks together with lateral and vertical linkage of fault segments. This includes three conceptual models: (1) F1 originated from propagation, interaction, linkage and failure of initial seven ENE-directed isolated faults, and grows following isolated fault growth model; (2) F2 nucleated as a normal fault before buried in Late Eocene, and reactivated as dextral strike-slip fault in Oligocene, therefore experienced vertical segmentation and linkage; (3) F3 activated as a long-term constant-length fault with generally increased displacement in Paleogene. Our study proposes that the T83 interface (the top of the second member of the Liushagang Formation) is a tectonic stress transition interface, while the T60 interface is both a tectonic inversion interface and a post-rift unconformity interface. Furthermore, the growth of extensional faults commonly accompanied single breached, transfer-fault breached or double breached relay ramps and fault-related folds, thereby exerting a significant influence on the basin architecture and sediment distribution.

The Yarlung Tsangpo Gorge Sediment Factory

Professor Xiumian Hu¹, Mr Xiaolong Dong¹, Dr. Prof. Eduardo Garzanti²

¹Nanjing University, Nanjing, China, ²University of Milan-Bicocca, Nanjing, China

2A: Next Generation Sediment Provenance (2), Tāwhirimātea A (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

Yarlung Tsangpo Gorge, the deepest gorge on Earth, plays a crucial role in sediment supply to the Brahmaputra River. While previous studies have established that the Namche Barwa Syntaxis contribute 30-50% sediments to the Brahmaputra, the specific sources and controlling factors of sediment production remain poorly constrained. To address this, we analyzed 43 bedload sand samples and 242 suspended sediment samples collected around the gorge, combining grain-size, petrographic, heavy mineral, and zircon U-Pb geochronological analyses to quantify sediment sources and fluxes.

The bedload results show that 89% of the Yarlung River sediments downstream of the Namche Barwa Syntaxis originate from the Yarlung and Parlung gorges. Over a ~250 km stretch, the annual sediment flux increases 20-fold, from ~10 Mt/a upstream of the Namche Barwa Syntaxis to ~200 Mt/a downstream. Remarkably, these two gorges—covering just ~1% of the Yarlung-Brahmaputra catchment—supply 74% of the Brahmaputra's total sediment load.

The five-year (2020–2024) time-series suspended sediment data reveal nonlinear erosion patterns both in time and in space. Over 90% of sediment transport occurs during the summer monsoon (June–September) via pulsed sediment input events, while the Westerlies season (March–May) contributes local sediments from precipitation and snowmelt. The Upper Yarlung Tsangpo Gorge (Namche Barwa region) accounted for 60% of suspended sediments, while the area only counts 1% of the total drainage. Whereas the Lower Gorge, Parlung Tsangpo, and upper Yarlung Tsangpo contributed 20%, 15%, and 5%, respectively.

We suggested that the extreme erosion in the Yarlung Tsangpo Gorge is driven by high channel steepness (ksn values up to 800–1800), high stream power and extreme events including frequent earthquakes and landslides. Our studies had significant implications for the deep-time sedimentary provenance analysis.

Persistent Natural Dominance vs Recent Soaring of Human Interference on China's Largest Freshwater Lake throughout the 700-Yr History

Professor Yong Hu¹, Professor Zhisheng An¹

¹Institute of Earth Environment, Chinese Academy of Sciences, Xi'an, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The World's lakes are declining. As China's largest freshwater lake, the Poyang Lake is one of the most rapid lakes experiencing a 25.6% decrease during the satellite era. But how decadal changes compare to centennial time scales is poorly known, especially in regions that have had active human impacts for many centuries. and how did the balance between natural and human forces change? To answer these questions, we quantify the relative human and natural contributors to modern lake volume decline against a reconstructed 700 years record by compiling and analyzing sediment cores, historical documents, human water use data, in situ measurements, bathymetric and hydroclimatic records, and modern satellite observations. Surprisingly, despite decades of decline, the current water volume in Poyang Lake is still high compared with the past seven centuries. The "natural" impacts linked to precipitation, evaporation, discharge have been persistently dominant during the whole studied period, explaining over 80% of lake volume change. In contrast, the impacts from human interference (i.e. irrigation water use, domestic and industrial water use and policy interventions) just began to soar 40 years ago, contributing 18% of the lake volume reduction during 1986-2022, compared with the 6% contribution during 1350-1986. Such discrepancies in lake volume dynamics between short- and long-term trends are common globally, e.g., Lake Titicaca and Namco. Our findings highlight the need to consider both long- and short-term lake water volume changes and their dominant drivers before applying targeted human interventions or natural restoration.

Sequence Stratigraphy of the Upper–Middle Miocene Deposits on the Northern South China Sea Shelf: Subaqueous Deltas Controlled By Paleoceanographic Conditions

Mr Shuqin Huang¹, PhD Haiteng Zhuo¹

¹School of Marine Sciences, Sun Yat-sen University, Zhuhai city, China

2C: Coastal to shelf environments across time and space (2), Tāwhirimātea E (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

Numerous subaqueous deltas have been reported on modern shelves around the world, but ancient examples are few and their controlling paleoceanographic factors remain unclear. Based on high-resolution three-dimensional seismic data, well logs, and cores, this study identified four types of shoreline trajectory and five primary stratigraphic surfaces to subdivide Upper–Middle Miocene deposits on the northern South China Sea into 13 sequences (SQ1-SQ13) with standard systems tracts (LST, TST, HST, and FSST). Characterized by low-angle clinoform foresets, shore-detached offlap breaks, and mud-rich lithology, compound deltas can merely be identified in the LST and HST of the SQ5-SQ9. According to the occurrence of subaqueous deltas, relief of subaqueous deltas, and isopach map characteristics of strata units, this study subdivided the interest interval sequence stratigraphy into five stages: (1) (SB1-SB5): No subaqueous deltas, subaerial deltas show NE-SW distribution; (2) (SB5-MRS7): Subaqueous deltas begin developing, strictly parallel to the paleo-uplift and located on its SW side, showing high relief; (3) (MRS7-MRS8): Subaqueous deltas remain on the SW side but become less parallel to the uplift, with reduced relief; (4) (MRS8-MRS9): Subaqueous deltas become parallel to the shoreline like subaerial deltas, with thinner sediments over structural highs due to uplift submergence; (5) (MRS9-SB13): Subaqueous deltas cease development, only subaerial deltas occur. Seismic geomorphological analysis of interest intervals reveals widespread beach ridges widening southwestward and shore-attached bars with SW patterns, indicating significant SW-oriented longshore currents. In addition, tidal sedimentary structures (such as rhythmic lamination, mud drapes, and bidirectional cross-bedding) can be observed in cores which indicate the existence of tidal current.

We propose that subaqueous deltas developed due to active SW-oriented hydrodynamics (including longshore current and tidal current) through a "narrow strait" when the shoreline approached the paleo-uplift. Progressive uplift submergence gradually widened this strait, weakening paleocurrents and reducing their control on development of subaqueous deltas, including variations in distribution and relief, ultimately terminating subaqueous deltas formation after complete uplift inundation in stage 5.

Towards Integrated Microfacies Identification: Combining Multi-Parameter CT Analysis and XRF-CS Clustering in Sediment Cores

Professor Jyh-jaan Steven Huang¹, Ms. Yen-Hsi Wu¹, Ms. Mishelle Muthre², Dr. Ken Ikehara³, Prof. Michael Strasser²

¹National Taiwan University, Taipei City, Taiwan, ²University of Innsbruck, Innsbruck, Austria,

³Geological Survey of Japan (AIST), Tsukuba, Japan

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Event deposits in the Japan Trench preserve key evidence of megathrust earthquake shaking, yet their internal complexity and lateral variability remain challenging for stratigraphic correlation and facies analysis. While X-ray fluorescence core scanning (XRF-CS) has proven effective for chemostratigraphic clustering and correlation, and X-ray computed tomography (CT) is widely used for visualizing internal sedimentary structures, most CT applications remain qualitative. This study aims to bridge that gap by applying a quantitative, region-of-interest (ROI)-based CT framework to Japan Trench cores, and integrating the results with XRF-CS-based clustering to enhance microfacies identification and core correlation. In this work, we extract CT intensity statistics and morphological descriptors from user-defined ROIs to capture downcore variations in internal sedimentary textures. These parameters are co-registered with high-resolution XRF-CS clusters and subjected to multivariate statistical analysis. Preliminary results suggest that certain CT-based ROIs correspond systematically with specific geochemical clusters, reflecting compositional–textural associations that help distinguish between event types (e.g. turbidites vs. homogenites) and depositional conditions (e.g. energetic pulses vs. suspension settling). By applying this integrated framework to hadal trench sediments, we aim to better resolve fine-scale facies changes, improve stratigraphic correlation across core sites, and support interpretation of flow dynamics, source heterogeneity, and basin physiography. The approach is particularly suited to the high-resolution and high-throughput demands of ongoing research in paleoseismology, offering a reproducible and scalable workflow that links physical structure with chemical signature in complex deep-marine settings.

The Diagenetic Fluid Evolution in Tight Sandstone Reservoirs: A Case Study of Cretaceous Bashijiqike Formation in Kelasu Tectonic Belt, Kuqa Depression, Tarim Basin, NW China

Professor Zhilong Huang¹, Ms Rui Wang¹, Dr Tao Mo², Dr Xinsong Wu¹

¹College of Geosciences, China University of Petroleum (Beijing), Beijing, China, ²PetroChina Tarim Oilfield Company, Korla, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Cretaceous Bashijiqike Formation in the Kelasu Structural Belt of the Kuqa Depression, Tarim Basin, Xinjiang, represents a typical deep to ultra-deep tight sandstone reservoir characterized by a complex origin and evolution process of diagenetic fluids. Based on the analysis of formation water chemistry, coupled with carbon and oxygen isotopes and rare earth elements (REE) of carbonate cements, homogenization temperatures, and salinity of fluid inclusions, the sources and genesis of diagenetic fluids were investigated, and a diagenetic fluid evolution model was established. The Cretaceous formation water is highly mineralized CaCl_2 -type water, enriched in Na^+ and Ca^{2+} , depleted in Mg^{2+} , enriched in $\delta^{18}\text{O}$, with high $^{87}\text{Sr}/^{86}\text{Sr}$ ratios and low $1/\text{Sr}$ values. Hydrochemical parameters indicate that the formation water has undergone intense metamorphism, and the formation exhibits good sealing conditions favorable for hydrocarbon preservation. Carbon and oxygen isotopes and REE characteristics of carbonate cements reveal two distinct diagenetic stages: Early-stage carbonate cements, related to reservoir diagenesis, show middle rare earth element (MREE) enrichment, significant negative δCe anomalies, positive δEu and δLa anomalies, and a Y/Ho ratio averaging 31.02. These features suggest that the early diagenetic fluids originated from a mixture of highly oxidative meteoric water and seawater/salt lake water. Late-stage carbonate cements, associated with organic matter decarboxylation, exhibit MREE enrichment, positive δCe and δEu anomalies, negative δLa anomalies, and an average Y/Ho ratio of 29.6. The formation temperatures of late-stage cements coincide with the temperature of salinity dilution in fluid inclusions caused by late hydrocarbon charging, indicating that the late diagenetic fluids were derived from low-salinity, highly reducing acidic fluids. Integrated with analyses of burial history, hydrocarbon charging history, and tectonic evolution, the diagenetic fluid evolution of the Cretaceous reservoir can be divided into four main stages: (1) the original sedimentary water of Bashijiqike Formation in the early sedimentary period; (2) Atmospheric precipitation intrusion and mixing at the end of Cretaceous deposition; (3) Transgression/infiltration of salt lake water; (4) Source rock desalinated water intrusion; The water-rock reaction during burial always affects the chemical properties of formation water.

The Inskip Slide, a 'Whole-of-Slope' Submarine Landslide from South-Eastern Australia's K'gari Continental Margin: An Example of Downslope Redeposition of Hemipelagic Carbonates

Assoc. Prof. Tom Hubble¹, Associate Professor Hannah Power³, Professor David Airey², Dr Mike Kinsela³, Professor Jody Webster¹, Dr Phyllis Yu¹, Ms Melissa Fletcher¹, Dr Samantha Clarke¹, Ms Bronwyn Davies⁴, Mr Robert de Lastic⁴

¹School of Geosciences - The University of Sydney, Sydney, Australia, ²School of Civil Engineering - The University of Sydney, Sydney, Australia, ³School of Environmental and Life Sciences - The University of Newcastle, Newcastle, Australia, ⁴The Rawson Institute, Sydney, Australia

8B: Carbonate depositional systems from platform, slope to basin (2), Tāwhirimātea C (Level 2),
January 29, 2026, 1:40 PM - 3:10 PM

Multichannel seismic reflection profiles acquired in 2022 aboard the RV Investigator (IN2022-V05) constrained by regional bathymetry and dated sediment samples collected from the RV Southern Surveyor (SS2013-V01) in 2013 enable the characteristics of large-scale, mass failures present on the continental slope offshore east Australia's K'Gari (Fraser Island) to be investigated. This particularly steep continental margin (5–10°) presents numerous submarine landslides, including two 'whole-of-slope' features (the Wide Bay Canyon, and Inskip Slides) that are developed in strongly-compacted but unlithified hemipelagic carbonate muds of Neogene age. The geotechnical properties of the fine-grained carbonate sediments are a contributing factor to the slope failure on this continental margin as is the structure and orientation of the continental basement. Sections of the slope where the primary sediment layering is inclined more steeply downslope, and the geological basement layer is located at deeper levels than is the case on adjacent sections of the slope apparently present the larger whole of slope failures. Several lines of evidence suggest that the several hundred metre thick Inskip Slide block was probably displaced downslope as a largely intact mass during the late Pliocene or early Pleistocene. It presents a folded and distorted internal structure that has been incised by a submarine channel subsequent to the displacement of the slope mass. The speed and mechanism of downslope motion of the Inskip slide mass cannot be confidently determined but it is strongly suspected that distance of total displacement was relatively short, that gravity-driven creep was the likely mechanism and that the slide mass moved downslope slowly and in small increments over an extended period of time.

The Laminated Monoman Formation Muds of the Lower Murray River's "Floodplain": Characteristics and Origins

Assoc. Prof. Tom Hubble¹, Dr Anna Helfensdorfer¹, Associate Professor Hannah Power², Dr Sara Moron Polanco²

¹School of Geosciences - The University of Sydney, Sydney, Australia, ²School of Environmental and Life Sciences - The University of Newcastle, Newcastle, Australia

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Geochemical and sedimentological data are presented for samples taken from a ten-metre long core section of fine-grained, finely-laminated muds. The core site is located 100 km upstream from the mouth of the Murray River at Monteith in South Australia and it was recovered from beneath the present-day riverine floodplain at a site located 800 metres to the east of the present-day river channel. The Monteith core's mud sequence presents delicately interlayered, alternating laminae consisting of light-greenish-grey, finer-grained, clay to very fine silt; and coarser-grained, dark-grey, fine to medium silt. The two similar but contrasting materials were apparently deposited as a continuous sequence between ~8,500 ka and ~6,500 ka at a relatively rapid, average rate of approximately 5.5 mm per year. A valley-wide transect of regularly-spaced, cone-pentrometer soundings indicates that the Monteith core's mud sequence is representative of a laterally continuous, 20-metre thick layer of mud, known as the Monoman Formation, that spans the entire width of the bedrock valley in which the mud layer was deposited. The CPT transect data in combination with the sedimentologic characteristics of mud laminae are interpreted to indicate that the entire width of the lower Murray Valley at Monteith was occupied by large body of relatively still water at the time when the laminated mud sequence formed, and which enabled the deposition of this very fine-grained, essentially varved material. The geochemical characteristics of the laminated muds indicate that the light-coloured muds are probably dominantly derived from the Darling River Catchment while the dark-coloured silts are probably dominantly derived from Murray River catchment. Relatively high total sulphur contents of both the light-coloured and dark-coloured laminae indicate that the muds were deposited in slightly to moderately saline conditions typically encountered in the landward portion of an estuarine, central basin environment.

Unraveling Fluvial Oncoid Formation in Jamaican Tufa Systems

Dr Antun Husinec¹, Audrey Bowman¹

¹St. Lawrence University, Canton, United States

3B: Carbonate systems and processes (2), Tāwhirimātea C (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

Oncoids, sand- to pebble-sized carbonate grains, form in a variety of aquatic environments, yet their development in fluvial systems remains relatively understudied compared to marine and lacustrine settings. This study examines modern fluvial oncoids from Dunn's River near Ocho Rios, Jamaica, a dynamic tufa-depositing system characterized by cascading waterfalls and stepped pools over Miocene and Pleistocene limestones. The oncoïd-bearing sediment was collected from seven pools below the falls. The oncoids were analyzed for size, shape, and internal structure using granulometric and petrographic methods. Selected samples were microdrilled and powdered for radiocarbon dating, stable isotope analysis, and X-ray diffraction.

The oncoids are spherical or ellipsoidal, with shapes influenced by the nuclei, primarily low-Mg calcite, and occasionally chert or volcanic rock. Internally, the oncoids display concentric lamination of alternating light and dark bands, which are often poorly developed, discontinuous, and variable in thickness, with finer, indistinct laminae nested within. Irregular morphologies and fewer lamina sets in some grains suggest substantial mechanical abrasion in high-energy, shallow-water pools. Stable carbon isotope values (mean -9.97 ‰VPDB) suggest strong soil-zone CO₂ contribution. Radiocarbon dating indicates conventional ages between 3095 and 3225 BP, with outer lamina sets 55 to 80 years older than inner sets, suggesting a freshwater reservoir effect from older tufa deposits. The findings challenge the reliability of fluvial oncoids as paleoclimatic indicators, offering new insights into their formation and significance.

Tracking Past Slip-to-the-Trench Events in the Trench-Fill Deposits in the Central Japan Trench Basin

Dr Ken Ikehara¹, Prof Michael Strasser², Dr Charlotte Pizer², Dr Yasuyuki Nakamura³, Dr Lena Maeda³,
IODP3 Expedition 503 Science Team

¹Geological Survey of Japan, National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan, ²University of Innsbruck, Innsbruck, Austria, ³Japan Agency for Marine-Earth Science and Technology, Yokosuka, Japan

7D: Shaking across the land-to-sea boundary, Rongomātāne A (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

A large shallow slip (>40 m) on the megathrust fault during the 2011 Tohoku-oki earthquake contributed to the unexpected large tsunami that devastated the Japan coastline. Coseismic slip propagated to the trench axis created deformation of trench-fill sediments at the central Japan Trench (JT). Understanding of the recurrence of “slip-to-the-trench” style earthquakes is essential for diagnosing future hazard at the JT and other subduction zones. Results of IODP Expedition 386 indicated that numerous event deposits of a few centimeters to a few meters in thickness are intercalated in the bioturbated silty clay in the JT. Thick, muddy event deposits (turbidite-homogenite sequence) are possible records of the past megathrust earthquakes. Seismic reflection and sub-bottom profiler records image several stratigraphic horizons of imbricate thrust wedge formation and paleo-seafloor uplift in the trench-fill sequence of a JT basin. The uplifted paleo-seafloor topography is overlapped by a thick acoustically transparent layer, which is correlated to thick event deposits. The youngest coseismic deformation is correlative with the 869 Jogan earthquake. However, due to the high sedimentation rate (>5-6 m/ky), it is impossible to date the older hypothesized slip-to-the-trench events by the cores obtained during Expedition 386. IODP3 Expedition 503 plans to drill the trench basin to recover the whole trench-fill sequence for dating and establishing event-stratigraphy for paleoseismic interpretations. Combining stratigraphy and chronology of thick event deposits and core-to-seismic correlation to paleo-slip-to-the-trench events, we would like to clarify how often the slip-to-the-trench events have occurred. Unravelling the complete trench-fill sedimentary sequence record and geochemical profiles of sediments and pore-water will significantly advance our understanding of the nature and recurrence of hadal trench tsunamigenic slip, the underlying megathrust earthquakes and related geohazards, as well as the effects on enhancing carbon accumulation in the hadal trench that may stimulate carbon transformation and eventual export into the subduction zone.

Reconsideration of Sedimentary Processes of the 2011 Tohoku-oki Tsunami Deposits Through Meter-scale Stratigraphic Observation and Numerical Modeling

Mr Haruki Imura¹, Dr Kazuhisa Goto¹, Dr Miwa Yokokawa²

¹The University of Tokyo, Tokyo, Japan, ²Osaka Institute of Technology, Osaka, Japan

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Tsunami deposits are important for understanding the frequency and size of past tsunamis (e.g. Costa et al., 2020). Many surveys were conducted to reveal the characteristics of tsunami deposits formed by recent events such as the 2011 Tohoku-oki tsunami. Some of the geological studies of the tsunami aimed to reconstruct tsunami flow characteristics based on the sedimentological features of tsunami deposits (e.g. Naruse et al., 2012). However, most surveys were conducted using point-based methods such as pits with less than ten-centimeter widths, and there are few cases where deposits have been examined over continuous distances with meter widths.

We reinvestigated sedimentary processes of tsunami deposits formed by the 2011 Tohoku-oki tsunami at the Takaose site in the Sendai Plain, Japan, where a peel with few-meter widths was obtained and preserved (Board of Education, Iwanuma City, 2017). In this study, numerical tsunami modeling was also performed to compare the observed sedimentary structures of the sample with the hydraulic conditions inferred from the model results.

Observation of the peel sample revealed the presence of parallel lamination, commonly reported in previous studies (e.g. Richmond et al., 2012). However, antidunes were also identified when the sample was examined with meter widths (Imura et al., 2024).

This suggests that limited-scale excavations may fail to capture key sedimentary structures such as antidune cross-stratification, which could result in a misinterpretation of the depositional processes or an underestimation of the size of tsunami events. Furthermore, the result of numerical modeling suggests that tsunami deposits are quickly formed during the very initial stage of tsunami inundation. Therefore, we infer that the formation of tsunami deposits proceeds in two stages: an initial rapid deposition followed by the gradual settling of suspended sediments. These results emphasize the necessity of observation with sufficient width of tsunami deposits.

Coastal to Shelf Environments across Time and Space – Quaternary Time, NW Black Sea

Phd Gabriel Ion¹, Mr. Constantin Lazăr¹, Mr. Vlad Apotrosoaei¹, Dr. Adrian Popa¹, Dr. Mihaela Melinte Dobrinescu¹

¹National Institute of Marine Geology and Geo-ecology, Bucuresti, Romania

3C: Coastal to shelf environments across time and space (3), Tāwhirimātea E (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

Quaternary time has as major characteristics the development of successive cycles of glacial and interglacial periods, with corresponding sea level variations. For the Black Sea basin, data from many authors allowed the compilation of 19 graphs regarding the sea level changes for the last 20000 years. These 19 graphs are quite controversial, but in general is agreed that an important low level (between 100 and 150m lower than today) of the sea was recorded about 9.5-8.5 ky BP; many other smaller (with amplitudes between 10-40m) sea level variations have been traced in different parts of the Black Sea Basin. The largest regression/transgression variation was between 14 ky BP to 7.5 ky BP, with the starting regressive point at about -40m present sea level (psl), maximum regression at -150m psl and about -8m psl at the end of the transgressive period. Going more in the past and taking into account during the Eemian time (MIS 5e) the Black Sea was about 10m higher than psl we can conclude that up to and after Neoeuxinian the entire present NW shelf of the basin was swept by waters. The sea level variation graphs suggest the NW shelf area was the subject of the development of different environmental settings as: lakes, marshes, coastal areas, fluvio-deltaic sedimentary bodies, variable network of rivers. The NW shelf of the Black Sea is the widest and thus is the perfect place to study the palimpsestic character of sedimentary records, corresponding to successive sea level variations. Our very high resolution seismo-acoustic data, together with coring information, bring new insights regarding the evolution during Quaternary of the NW Black Sea, from coast to shelf.

Repeated Observations of Drift Pumice along the Coasts of the Southwest Islands, Japan: Implications for Depositional Processes of Drift Pumice on Beaches

Dr Daisuke Ishimura¹, Dr Reona Hiramine²

¹Chiba University, Chiba, Japan, ²National Museum of Japanese History, Sakura, Japan

5E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (2), Rongomātāne B (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

Recent eruptions from submarine volcanoes in Japan have produced pumice clasts that entered the ocean, resulting in the formation of drift pumice and pumice rafts. In particular, the 2021 eruption of the active submarine volcano Fukutoku-Oka-no-Ba generated a large amount of drift pumice and formed extensive pumice rafts in the Pacific Ocean. These pumice clasts reached the Southwest Islands of Japan and caused disruptions to ship navigation, fisheries, and tourism. We collected drift pumice clasts along the Japanese coast starting in autumn 2021 and found that the pumice was transported to coastlines across Japan within one year after the eruption. In this presentation, we report repeated observations of drift pumice along the coasts of the Southwest Islands. We conducted three additional surveys (May–June 2022, October 2023, and October 2024) following the initial observations in October–December 2021. During these surveys, we measured the mass, size, roundness, and attached marine organisms on the pumice clasts. These four indicators showed varying trends over the three-year period. Among them, the size, defined as the average major axis length of the 20 largest pumice clasts on each beach, showed the strongest correlation with time. Roundness also exhibited a time-dependent trend, gradually converging to a certain mean value. The mass per square meter varied significantly between sites, likely reflecting the influence of local factors such as coastal topography and weather. The number of attached marine organisms fluctuated over time, suggesting repeated drifting and re-stranding events of the pumice clasts. These results contribute not only to a better understanding of the transport and depositional processes of drift pumice, but also provide insights into interpreting drift pumice found in sedimentary records.

Grain Size Matters: Late Quaternary Dynamics of a Sediment-Routing System in Canterbury Basin, South Island New Zealand

Dr John Jaeger¹, Dr. Tania Villaseñor², Dr. Kathleen Marsaglia³, Jasmyn Nolasco³, Carrie Bender-Whitaker³, Claire Bailey³

¹University of Florida, Gainesville, United States, ²Departamento de Ecosistemas y Medio Ambientes & Instituto de Geografía, Pontificia Universidad Católica de Chile, Santiago, Chile, ³Department of Geological Sciences, California State University Northridge, Northridge, United States

1A: Next Generation Sediment Provenance (1), Tāwhirimātea A (Level 2), January 26, 2026, 10:15 AM - 11:45 AM

The adjustment of sediment-routing systems to Quaternary environmental variations and the transmission of resultant sedimentary signals to the depositional sink is a matter of intense debate because of the potential for loss of the signal due to autogenic processes. We analyze the provenance of three different grain-size fractions from continental-shelf strata to reconstruct the dynamics of the southern Canterbury sediment-routing system (SRS), South Island of New Zealand, during the late Quaternary. We use the distinctive bedrock mineralogy in the system to reveal differing dispersal SRS pathways for each fraction. Mineralogical characterization of the sand-, silt-, and clay-size fractions from IODP Site U1353 indicates variations in sediment provenance at different timescales, reflecting the various processes of sediment generation and transport to the continental shelf that change over time. Sand-size sediment shows a marked change in composition around 340 ka (MIS 10/9) that resulted from a shift in the dominant mode of fine-sand dispersal from marine along-shore to fluvial-regressive. This may be related to decreased fluvial storage capacity leading to enhanced sand dispersal to the coast via advective suspended-load transport. The composition of silt and clay fractions fluctuates at glacial - interglacial timescales indicating supply of sediment from different areas of the proximal Waitaki River Basin, related to i) changing onland storage capacity and sediment fluxes during glacial cycles, and ii) modulation of along-margin sediment dispersal due to changes in continental-shelf accommodation during sea-level cycles. Finally, we use observations of modern sediment transport rates of the three size fractions to quantitatively explore the relative abilities to buffer, record, and shred externally (climate) forced signals of sediment flux. This study shows the importance of considering various grain-size fractions in the study of sediment-routing systems as they can reflect earth-surface dynamics at different timescales.

Fingerprinting Volcanics within the Lower Cambrian Sedimentary Basins along the Eastern Australia Margin, East Gondwana

Ms Suwijai Jatupohnkhongchai¹, Ms Stacey Curtis², Ms Rose Gates¹, Mr Jack Castle-Jones³, Assoc. Prof. Justin Payne², Professor John R. Paterson¹, Professor Glenn A. Brock³, Dr Luke Milan¹, Dr Marissa J. Betts¹

¹University of New England, Armidale, Australia, ²STEM, University of South Australia, Adelaide, Australia, ³School of Natural Sciences, Macquarie University, Sydney, Australia

6E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (3), Rongomātāne B (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

During the early Cambrian, tectonics of eastern Australia were characterised by a convergent margin between the Australian craton and the Palaeo-Pacific Ocean. Marginal and epeiric basins of South Australia (SA) and western New South Wales (NSW) preserve shallow marine carbonate platforms to deeper slopes and bathyal deposits that are rich archives of early animal evolution. In SA, Cambrian units in the Arrowie and Stansbury basins also contain distal volcanic ash layers at multiple levels within carbonate and siliciclastic packages that are petrographically characterised by fine-grained volcanic glass. In contrast, the neighbouring eastern Warburton Basin and the Gnalta Shelf contain proximal volcanic deposits that have coarse-grained pumice, K-feldspar and plagioclase.

Geochemically, tuffs in the Mernmerna Formation, Edeowie Limestone, Billy Creek Formation, and Cymbric Vale Formation have calc-alkaline compositions ranging from andesite/basaltic andesite to rhyolite/dacite. Whole-rock compositions show enrichment in LILEs and depletion in HFSEs with negative Nb, Ta, Ti anomalies—characteristic signatures for a volcanic arc setting. CA-TIMS radiometric dates also reveal three discrete volcanic intervals that encompass proximal and distal equivalents (implicating multiple nearby volcanic sources) that correspond with profound changes in sedimentary regime (e.g. from a dynamic and fossil-rich carbonate setting to a restricted, siliciclastic-dominated system).

Volcanic deposits sandwiched in sedimentary successions provide essential geochemical data and chronological calibration. However, this is the first time the lower Cambrian volcanics of SA and NSW have been the focus of any study. When synthesised with petrographic analyses, and shelly fossil and trilobite biostratigraphic data, these deposits become critical for refining regional tectonic models for this part of East Gondwana, and for characterising the relationship between evolving tectonic setting, volcanism and shifts in sedimentary regime. This study demonstrates the power of multi-proxy studies (geochemistry, stratigraphy, sedimentology and palaeontology) to provide novel insights into tectono-sedimentary and regional palaeogeographic evolution.

Riddles in the Dark: Unlocking Sub-Millennial Climate Records in Paleocene Coal from Svalbard

Dr Mads Jelby¹, Dr Maria A. Jensen², Dr Rhodri M. Jerrett³, Dr Kresten Anderskov⁴, Dr Nicolas Thibault⁴, MSc Malte Jochmann², Dr Gregory D. Price⁵, Dr William Helland-Hansen⁶, Dr Stéphane Bodin¹

¹Aarhus University, Aarhus, Denmark, ²The University Centre in Svalbard, Longyearbyen, Svalbard, Norway, ³University of Manchester, Manchester, UK, ⁴University of Copenhagen, Copenhagen, Denmark, ⁵University of Plymouth, Plymouth, UK, ⁶University of Bergen, Bergen, Norway

5D: The continental sedimentary successions and their ability in understanding the present and forecasting the future of the Earth's surface (2), Rongomātāne A (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

Quaternary ice cores provide archives of climate change at unparalleled temporal (sub-millennial) resolution, with atmospheric mineral dust (AMD) being a key proxy. AMD consists of minor (< ~100 µm) rock-derived particles suspended in the atmosphere with major impact on Earth's energy budget. However, no methods exist to retrieve paleoclimatic and/or AMD records of similar resolution past the Quaternary, which prohibits simulations of anthropogenically driven climate change from thorough testing by deep-time data. Coal may hold the key to unlock such records!

The precursor to coal is peat, which grows in a sensitive balance with climate, and by maintaining a position above hydrological base level, peat stores AMD. Thus, coal seams contain unique terrestrial records of biosphere–hydrosphere–atmosphere interactions, making them climate archives of extraordinary potential. In addition, recently calculated rates of carbon accumulation in peat have shown that the time represented by coal seams has been underestimated by an order of magnitude, thereby capturing climate and AMD deposition in an ultra-high-resolution (potentially sub-millennial) manner analogous to Quaternary ice cores.

In this study, we test the use of 'coal as ice' from an integrated analysis of AMD depositional rates, wildfire maceral constituents and atmospheric carbon cycling in Paleocene coal seams from Svalbard. The Paleocene (66–56 Ma) is optimal as a near-future analog, as it represents higher-than-modern (but comparable) atmospheric CO₂ concentrations (500>400 ppm) and temperatures (20>14°C). Utilizing a novel approach of combining handheld X-Ray Fluorescence (XRF), micro-XRF scanning, and micro-XRF elemental mapping data, we parameterize the temporal limitation to which paleoclimatic and AMD data can be retrieved in coal, and we contextualize the methodological powers and pitfalls. This study thereby serves as a benchmark for unlocking sub-millennial climate records in pre-Quaternary sediments – potentially to as far back as ca. 350 Ma when the first coal was formed.

Cool-water Carbonate and Clastic Turbidites of the Solander Trough, Aotearoa-New Zealand

Dr Matthew Jeromson¹, Dr Lorna Strachan², Dr Bruce Hayward³, Dr Helen Bostock⁴

¹Australian Centre for Excellence in Antarctic Science, University of Canberra, Bruce, Australia,

²Faculty of Science, School of Environment, University of Auckland, Auckland, New Zealand,

³Geomarine Research, 19 Debron Ave, Remuera, Auckland, New Zealand, ⁴Faculty of Science, School of Environment, University of Queensland, Brisbane, Australia

10D: Marine Carbonate-Siliciclastic sedimentary systems, Rongomātāne A (Level 1), January 30, 2026, 11:00 AM - 12:30 PM

Pleistocene cool-water carbonate (CWC) turbidite systems are rare in the current literature, and mixed terrigenous-CWC input systems apparently absent. Here we present a mixed terrigenous-CWC turbidite system from Solander Trough, a confined north-south subpolar marine basin south of New Zealand. Solander Trough is flanked to the north by the South Island of New Zealand which supplies clastic sediment, to the west is the volcanic Macquarie Ridge and to the east is the carbonate dominated Campbell Plateau. Sediment gravity cores (1.5-5 m) were collected from six locations along a north-south transect in the Solander Trough (core depths = 2544–3816 m). The cores display a series of turbidites with a sharp basal contact and are normally graded from sand beds to silt hemipelagites. We used a series of physical, fossil, and geochemical proxies to identify four distinct turbidites 1) rich in terrigenous sediment, low in carbonate (sourced from the South Island), 2) rich in mafic minerals, low in carbonate (northern section Macquarie ridge), 3) extremely high planktic foraminifera (southern section Macquarie Ridge), and 4) low in terrigenous sediment, high in skeletal carbonates (Western Campbell Plateau). The morphology of the basin has led to the interbedding of different types of turbidites in each core, that represent the different sources from the north – terrigenous; west – volcanic; and east – CWC. All the turbidity currents occur during lowstands, which is likely driven by increased river-canyon connections and in the case of carbonate rich Campbell Plateau the lowering of the wave base shifting sediments to the shelf edge or disturbing active shelf edge biota.

Architectures of the Turbidite Channel in the Head Area of a Slope-Parallel Directional Submarine Turbidite Channel System

Deleqiaty Jianatayi¹

¹China University of Geosciences, Beijing, Beijing, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Turbidite channel systems, crucial conduits for sediment transport from shelves to abyssal plains, develop complex architectures in their head regions through dynamic processes like erosion, incision, and sedimentation, though rapid topographic variability limits understanding of stacking patterns. This study focuses on the Central Canyon Area (CCA) in the Qiongdongnan Basin, combining >200 m of core samples and high-resolution 3D seismic data to analyze lithofacies, flow regimes, and geomorphological evolution. Core analysis identified nine lithofacies, tracing turbidity flow transitions from coarse-grained equilibrium flows (high-energy transport) to fine-grained equilibrium, depositional, and erosional regimes. Quantitative geomorphic parameters—including aspect ratio, cross-sectional asymmetry, channel-complex growth trajectory angles, and stratigraphic mobility numbers—were derived from seismic interpretations, enabling calculation of Froude numbers via empirical flow velocity correlations. The system's architectural evolution was categorized into three stages: (1) Initial deposition dominated by vertical accretion, with upstream zones exhibiting high aspect ratios (3.5–5.0) and asymmetry (0.6–0.8), transitioning to lower aspect ratios (1.5–2.5) midstream, characterized by layer-filled, cut-stack, and MTD-interbedded deposits; (2) Rapid accumulation marked by lateral accretion patterns, reduced aspect ratios (1.0–2.0), and asymmetry (0.4–0.6), featuring layered filling and lateral stacking; (3) MTD reworking with abrupt aspect ratio shifts (0.8–1.5), dominated by lateral accretion channels interbedded with MTDs. Statistical analysis revealed topographic slope and turbidity current intensity as primary controls during early stages, while sediment deposition rates became critical during MTD reworking. This work provides a hierarchical framework linking flow dynamics, morphology, and sedimentation rates to architectural development, offering novel insights into slope-parallel channel head evolution and enhancing predictive models for deep-sea turbidite systems.

A New Modeling Method for the Sandbody Architecture of Braided River Reservoirs: A Case Study from Hg Formation, N Gas Field

Dr. Lei Jiang¹

¹China University of Geosciences Beijing, 北京, China

2E: Student Research Forum (2), Rongomātāne B (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

A new modeling method is proposed to address the shortcomings of conventional geological modeling methods in simultaneously characterizing the geometry, stacking patterns, and well data of the channel bar in braided rivers. The channel bar model is reconstructed based on the target body, which is defined by the channel bar's geometric parameters points, lines, and surfaces. In the simulation process, the distributions of sandstone and mudstone are simulated first. Then, the channel bars at the well are simulated based on the channel bars identified on the well and the thickness of the sandstone, the a priori geometries, and sizes of the channel bars. It is judged whether the proportion of the simulated channel bars has reached the global proportion. If not, a randomly selected point between wells is used as a virtual well, and the sandstone thickness is used to determine whether it is a single or composite channel bar. The process is repeated until the proportion of channel bars reaches the set proportion. Take the N gas field as an example. The analysis of the geometry, variance function, thickness distribution histogram, and volume distribution histogram of the simulation results shows that the new method can better characterize the channel bar's geometry, sizes, and stacking patterns than the multipoint geostatistical modeling method Snesim.

High-resolution Seabed Substrate Mapping in the Geologically Complex Philippine Sea

Dr Lina Jin¹, Dr Xuefa Shi¹, Dr Shuqing Qiao¹, Dr Jie Sheng¹

¹First Institute of Oceanography, Ministry of Natural Resources, Qingdao, China

10C: Mapping marine sediments in the world (2), Tāwhirimātea E (Level 2), January 30, 2026, 11:00 AM - 12:30 PM

The Philippine Sea, the largest marginal basin in the Western Pacific, presents significant challenges for seabed substrate characterization due to its complex geological setting. Traditional classification systems prove inadequate in capturing key sediment types in this region. This study develops a novel hybrid classification approach based on analysis of over 2,400 sediment samples to address these limitations.

The basin's geomorphological complexity, featuring ridges, island arcs, trenches, and basins, coupled with active volcanism from plate subduction, creates highly heterogeneous substrate patterns. Our methodology integrates Folk (1970) and Dean (1958) classification schemes with specialized categories for volcanoclastics and authigenic minerals. This approach successfully identified transitional facies in the Okinawa Trough, including siliceous and calcareous muds, while improving representation of depositional patterns through incorporation of volcanoclastic materials and Fe-Mn authigenic minerals.

Three distinct substrate zones were delineated: (1) clay-dominated deep basins, (2) calcareous biogenic sediments in shallow island arc regions, and (3) a prominent Fe-Mn enrichment zone along the Kyushu-Palau Ridge (15°N). This work provides two major contributions: the most comprehensive substrate map of the Philippine Sea to date, and a flexible methodological framework applicable to other complex marine environments. These advances significantly enhance understanding of sediment distribution in geologically complex marginal seas and establish a valuable baseline for future geological and ecological research in the region.

Revisiting the Carnian Pluvial Episode (Late Triassic) in the Northwestern Sichuan Basin: New Insights from Sedimentology and High-Resolution Carbon Isotope Records

Prof. Xin Jin¹, Dr. Zhiqiang Shi¹

¹Chengdu University of Technology, Chengdu, China

7E: Deciphering climate and environmental records in shallow marine environments across space and time (1), Rongomātāne B (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

The Carnian Pluvial Episode (CPE, ~234 Ma) is recognized as one of the most significant climatic perturbations of the Triassic. It is characterized by intensified humidity and increased terrestrial clastic input, which likely contributed to a widespread carbonate production crisis across the Tethyan realm. The CPE is further marked by at least four negative carbon isotope excursions, marine anoxia, lake expansion, and major biotic turnover. The northwestern Sichuan Basin, located along the eastern margin of the Tethys, preserves key sedimentary archives of this event. Since 2009, the presence of the CPE in this region has been proposed, primarily based on a sharp lithological transition from carbonate to mudstone/shale observed in the middle part of the Ma'antang Formation (e.g., Hanwang and Jushui sections). However, the lack of precise age constraints has led to continued debate regarding the occurrence and stratigraphic placement of the CPE in this area. In this study, we present new data from the Ma'antang and Hanzeng sections, including refined biostratigraphic frameworks, CA-ID-TIMS U-Pb zircon dating, and high-resolution carbonate carbon isotope records. These integrated datasets reveal a eustatic sea-level fall during Julian time, followed by a transgressive phase. Comparative facies analysis and sequence stratigraphic interpretation of Carnian carbonate successions in the Sichuan Basin (eastern Tethys) and the Dolomites (western Tethys) indicate a Tethys-wide similarity in the evolution of shallow-marine carbonate systems during this interval. Additionally, four negative carbonate carbon isotope excursions are identified within the Julian 2 interval. While two are likely of diagenetic origin, the remaining two are considered reliable and correlate well with global CPE records. Together, these findings provide robust evidence for the expression of the Carnian Pluvial Episode in the northwestern Sichuan Basin and highlight its profound influence on the shallow-marine carbonate systems and carbon cycling within the Tethys.

3D Coastal Mapping Project: Mapping New Zealand's Nearshore Marine Sediment

Dr Alysha Johnson¹, Stuart Caie¹, Bradley Cooper¹

¹Toitū Te Whenua Land Information New Zealand, Wellington, New Zealand

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The nearshore of New Zealand is dynamic, with many regions of migratory marine sediments. Understanding the location and short-term movement of these sediments is vital for safe navigation in shallow waters, and to better understand coastal sediment dynamics. However, studying nearshore regions can be challenging as they are often too shallow to be mapped by traditional hydrographic methods, leading to disjointed datasets. Toitū Te Whenua Land Information New Zealand (LINZ) is leading an effort to map 40% of New Zealand coastline, equating to over 10,000 km². From January 2025, high resolution Airborne Laser Bathymetry (ALB) has been collected along the coastal zone from 200 m inland of the Mean High Water Spring coastline, across the nearshore region, and seaward to 25 m water depth. The use of ALB at a national scale has uncovered high-resolution bathymetry along coastlines that were previously unfeasible and unsafe to be mapped with traditional acoustic technology. Within this data, bedforms, barriers, deltas and current-induced channels can be seen in high-resolution. In some locations, sediment movement has been identified and quantified. For example, sand waves are detected south of Tiwai Point, Bluff migrating westward at a rate of 15 m/yr. The detailed mapping of shallow marine sedimentary environments may provide a baseline dataset for sedimentary change in the New Zealand nearshore. All surfaces created throughout the project are made freely available through the LINZ Data Service. LINZ wish to use this opportunity to not only showcase the data already collected, but to invite the coastal scientific community to utilise the data to support their own research.

Environmental Controls on Bioclastic Sediment Supply across Modern Turbid and Clear-Water Reef Systems

Marlena Joppien^{1,2}, PhD Riovie Ramos¹, Mr Rafael J.P. Dumalan³, Asst Prof Kyle Morgan^{1,2}

¹Earth Observatory of Singapore, Nanyang Technological University, Singapore, Singapore, ²Asian School of the Environment, Nanyang Technological University, Singapore, Singapore, ³Department of Biological Sciences, Visayas State University, Philippines

4B: Carbonate systems and processes (3), Tāwhirimātea C (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

The production and delivery of carbonate sediment by reef organisms underpin the geomorphology of coral reef habitats and adjacent coastlines. However, local and global disturbances can alter the composition of sediment producers and coastal transport processes, leading to shifts in physical characteristics of bioclastic reef-derived sediments. Modern sedimentary environments on coral reefs remain poorly characterized, limiting our ability to predict how reefs and sedimentary coastlines will respond to ongoing environmental change. In this study, we conducted high-resolution benthic sediment sampling and ecological surveys across two environmentally distinct but geographically proximate reef settings in Leyte, Philippines: a turbid, fringing reef adjacent to mangroves, and a clear-water, island-associated reef. Both systems encompassed coral-, macroalgae-, and seagrass-dominated habitats, with mean coral cover ranging from $1\pm1\%$ in seagrass and macroalgae zones to $30\pm2\%$ in coral-dominated areas. Fine sediment content ($<63\ \mu\text{m}$) was significantly higher at the turbid site ($2.8\pm0.4\%$) compared to the clear-water site ($0.6\pm0.1\%$). Coral-derived grains dominated bioclastic sediment at the clear-water site ($51\pm2\%$) but were less prevalent at the turbid site ($32\pm4\%$). In contrast, large benthic foraminifera - primarily *Calcarina* spp. and *Amphistegina* spp. - were significantly more abundant at the turbid site ($34\pm5\%$) than at the clear-water site ($8\pm1\%$). Foraminiferal abundance was strongly negatively correlated with coral-derived sediment ($r = -0.8$), indicating a potential compensatory role of foraminifera in the sediment pool as coral contributions decline. These findings suggest that although both reef systems experience similar disturbance regimes, turbid reefs may maintain more consistent carbonate sediment supply through functional shifts in sediment-producing communities. This is likely facilitated by the high abundance and rapid turnover of large benthic foraminifera. Our findings demonstrate that modern sediment generation processes on reefs reveal broader ecological patterns, offering valuable insights into how different reef types may respond to future environmental change.

Large-scale Submarine Sediment Waves at Macauley Caldera Volcano: In-situ Evidence of High-Flux, Syn-Eruptive Submarine Transport

Ms Shannon Frey, **Dr Martin Jutzeler**², Dr. Matthieu Cartigny³, Dr. Rebecca Carey⁴

¹University of Tasmania, Hobart, Australia, ²University of Tasmania, Hobart, Australia, ³Durham University, Durham, United Kingdom, ⁴University of Tasmania, Hobart, Australia

3D: Controls on sedimentation at submarine active margins (3), Rongomātāne A (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

High magnitude, shallow marine or coastal volcanic explosive eruptions and their associated subaqueous density currents can have substantial global impacts. These density currents can be fast and destructive, damaging underwater infrastructure, benthic ecosystems, and creating tsunamis that impact distant coastal communities. However, despite their potential damaging effects, subaqueous density currents associated with volcanic eruptions remain poorly understood. Fields of large-scale sediment waves (100s of m in amplitude) on volcanic flanks are commonly attributed to syn-eruptive volcanic density currents, depositing upstream-migrating bedforms such as cyclic steps and antidunes. We present the first study to examine both the broad-scale sedimentary architecture and high-resolution depositional features of large-scale submarine sediment waves associated with eruption-fed density currents, using two sediment cores and a seismic section collected from Macauley volcano. We show the facies characteristics of the cores is consistent with deposition under moderate concentration density currents with antidune bedform geometry. We suggest that the 100s of m high bedforms accumulate as amalgamated sets of smaller-scale (m-high) bedforms during prolonged deposition of a high-flux volcanic event. We demonstrate that the bedforms were deposited in two stages; an initial stage consisting of fast, high concentration density currents that deposited cyclic steps, and a second stage of slower, moderate concentration density currents depositing antidunes. We present numerical modelling to constrain the velocity of the flows and duration and compare with estimations for deposit volumes and mass flux rates for Plinian eruptions. Modelling indicates stage 1 was deposited in a matter of hours, using estimated eruption rates of 108 kg/s, while stage 2 was deposited over a period of several days to weeks, at a reduced eruption rate. We synthesize a model for this type of endmember deposition and compare with other known submarine eruption-fed sediment wave fields.

Gigantic Submarine Landslide Offshore the SW Tasmanian Shelf, Australia: a Marine Investigation for Tsunami Hazards

Dr Martin Jutzeler¹, Dr Claire Kain², Prof Thomas Hubble³, Bronwyn Davies⁴, Robert De Lastic⁴, Dr Frida Hoem⁵, Ms Ella Clausius¹, Dr Glenn Fabian⁶, Mrs Grace Cumming², Mr Jack Dent⁷, Ms Michaela Durston³, Ms Shannon Frey¹, Ms Gabrielle King³, Dr Rafael Leon¹, Dr Peter Puskic¹, Dr Benjamin Viola¹

¹University of Tasmania, Hobart, Australia, ²Mineral Resources Tasmania, Hobart, Australia,

³University of Sydney, Sydney, Australia, ⁴n/a, n/a, Australia, ⁵University of Bergen, Bergen, Norway,

⁶University of Melbourne, Melbourne, Australia, ⁷ANU, Canberra, Australia

9D: Sedimentary evidence of geohazards (2), Rongomātāne A (Level 1), January 29, 2026, 4:25 PM - 5:55 PM

A gigantic submarine landslide is exceptionally well exposed on the continental margin of southwestern Tasmania, Australia. More than 50 km of continental shelf shows an abrupt headscarp failure associated with a gigantic >500 km³ submarine landslide. The bulk of the submarine landslide deposits lay on the lower continental slope at 2000 m water depth, whereas turbidites continue for >120 km in the abyssal plain. The headscarp is >400 m high at places, attesting of a single (or a few), catastrophic event(s) with minimal post-event sediment remobilisation. The morphology of the submarine landslide deposits suggests to be relatively recent (Pleistocene-Pliocene). Giant piston coring, seismic reflection and dredging carried out on the RV Investigator in 2023 allow to infer on slope failure scenarios. Our seismic surveys are correlated to the nearby Ocean Drilling Program (ODP) Hole 1168 and multiple seismic lines, which have very well constrained ages and stratigraphy. Seismic stratigraphy, augmented with data from giant piston cores and legacy aerial geophysical surveys, allow for characterisation of the causes, age, volume and extent of the landslides. The characteristics of this landslide are used for tsunami modelling, in an effort to mitigate hazards associated with potential future slope failures off the Tasmanian shelf.

Sediment Budget from the Giant Caldera-Forming Silicic Eruption of Macauley Volcano, Rangitāhua/Kermadec Arc

Dr. Martin Jutzeler¹, A/Prof Rebecca Carey¹, Ms Shannon Frey¹, Ms Catherine Lit¹, Dr Steffen Kutterolf², Prof. Stephen Gallagher³, Prof Yusuke Yokoyama⁴

¹University of Tasmania, Hobart, Australia, ²GEOMAR, Kiel, Germany, ³University of Melbourne, Melbourne, Australia, ⁴University of Tokyo, Tokyo, Japan

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Macauley volcano lies in the Kermadec intra-oceanic arc/Rangitāhua, north of New Zealand/Aotearoa. It comprises an extensive shallow-water edifice punctured by a large submarine caldera and the small remnant of an island. Its latest large-magnitude eruption occurred at 6.4 ka, forming its submarine caldera and tens of km³ of slope deposits. Coastal outcrops on Macauley Island record the deposition of a complexly stratified ignimbrite, whereas piston cores acquired on the submarine slopes of the volcano comprise eruption-fed, giant sediment wave deposits; the distal basins record marine tephra fall deposits. The eruption and its associated sedimentary processes are reconstructed based on geochemistry, bathymetry, seismic reflection, bedforms and clast componentry, and exemplify complex syn-eruptive, high-flux sedimentation from submarine vents. The products and inferred processes at play during this 6.4 ka eruption are compared with the much smaller 2022 Hunga Tonga eruption, allowing for hazard assessment and better understanding of the nature of submarine silicic eruptions.

Flow Simulation Results of Statistical Reservoir Models Based on Virtual Outcrops: A Case Study from the Yorkshire Coast, Northeast England

Ms Iuliia Kapustina¹, Dr John Howell¹, Dr Kachalla Aliyuda¹, Dr Jessica Pugsley¹

¹University of Aberdeen, Aberdeen, United Kingdom

2E: Student Research Forum (2), Rongomātāne B (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

Outcrop analogues have long been used to improve the understanding of subsurface systems, including building reservoir models of cliff sections to examine the impact of heterogeneities on fluid flow. Such models are typically built by deterministically mapping key surfaces and architectural elements from outcrops. These deterministic models replicate observed outcrop structures using a spatially referenced grid. Here, we present an alternative statistical approach that employs a coordinate-free 3D grid populated with statistical data, object dimensions, and spatial trends derived from the outcrop. Using this method, reservoir models can be built faster and easier, and more importantly, it enables specialists to compare multiple models with each other, whereas in the deterministic approach, input parameters can be altered for only one outcrop.

This study uses virtual outcrops of the Middle Jurassic fluvial deposits of the Yorkshire coast, northeast England. These outcrops serve as valuable analogues for subsurface hydrocarbon reservoirs and CO₂ storage repositories for the Brent Group and similar paralic systems. Statistical reservoir models were created and flow simulated using standard initial conditions, representing an oil field located two kilometres subsurface, along with average standard petrophysical properties for fluvial systems. Three scenarios for petrophysical properties: low case, middle case, and high case were created with the same facies distribution and architecture.

The simulation results show that when the channel sand proportion is below approximately 50 percent, petrophysical properties have a strong influence on fluid flow behaviour - allowing flow in the high case scenario and preventing it in the low case scenario. In contrast, when the channel sand proportion exceeds 50 percent, fluid flow behaviour is more strongly controlled by the high channel sand facies distribution rather than by petrophysical properties.

Evolution of the Forefield of the Bachfallenferner, Stubai Alps, Austria: Sedimentological Responses to Rapid Change

Sara Karbacher¹

¹University of Vienna, Vienna, Austria

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

This paper describes and interprets the sedimentological and geomorphological evolution of the Bachfallenferner glacial margin in the context of its retreat since 1995. Using a high-quality set of aerial photographs collected by a MAVIC Mini 4 UAV, this study presents the first known map of the forefield in recent times, revealing a thick till sheet with flutes and initiating boulders, a dynamic delta system, a proglacial lake, and extensive supraglacial debris. These images allow the evolution of the forefield to be documented, allowing the initiation, expansion and development of an ice-contact lake to be understood. Moreover, the time series allows the development of a large debris cone on the ice to be documented, which as of 2024 measures 250 m long, up to 100 m wide and 30 m high. Clast analysis (N=90) indicates that supraglacial debris is dominated by angular mica schist and quartz gneiss, primarily sourced from surrounding valley walls via rockfall.

Field observations and geomorphological mapping reveal that debris cover on the Bachfallenferner has expanded significantly since 1997, driven by a combination of englacial transport and direct input from adjacent topography. Debris evolution follows a down-glacier thickening pattern, with insulation effects that locally reduce melt rates. The debris cone formed in zones of efficient debris supply and thermal inversion processes, while debris stripes and flutes reflect both depositional and subglacial histories. The glacier's proglacial lake, having grown from 11,000 m² in 1997 to 53,000 m² in 2024, acts as a sediment trap and potential geohazard due to mass movements.

The Bachfallenferner therefore serves as a small-scale analogue for debris-covered glaciers elsewhere in the European Alps, illustrating how rockfall supply, ice dynamics and meltwater feedback interact to reshape supraglacial, subglacial and proglacial systems under rapid climate warming.

Late Holocene Sedimentary Record from a Doline Lakeshore on an Uplifted Atoll Island in the North Western Pacific Ocean

Mr Katsumi Kasai¹, Dr Kazuhisa Goto¹, Dr Kenta Minamidate¹

¹University of Tokyo, Tokyo, Japan

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Previous studies focusing on the Holocene climate and environment changes in eastern Asia are primarily based on the limited terrestrial and marine sedimentary records. Such records are especially scarce in the northwestern Pacific Ocean because the area is mostly covered by the ocean with spotty small islands. The Minami-Daito Island, Okinawa Prefecture, Japan, is an uplifted atoll island in the northwestern Pacific Ocean. It is in an isolated setting island, making it minimally influenced by continental environments. The island is surrounded by coastal cliffs 30-50 meters high, and its central area lies at a lower elevation, being geographically separated from direct contact with the ocean. In this study, we conducted a coring survey within a mangrove forest that rims the doline lake in the central part of the island to clarify past environmental and climatic changes on this isolated island in the northwestern Pacific Ocean. We successfully obtained an eight-meter-long sediment core. Based on the previous study, the core likely contains a continuous sedimentary record about 7000 years. Multiple lithological changes were observed in the core. From top to bottom, 0-0.3 m is composed of ocher silt with plant fragments, possibly indicating land development by humans around 120 years ago. Humic soil with plant fragments such as mangrove leaves and roots is observed at 0.3-1.9 m. From 1.9 to 5 m, light gray silt with lamination is predominant. Then, dark gray silt with lamination is observed in 5-8 m. Thin sandy silt layers with several centimeters thick are intermittently observed throughout the core. According to the results of XRF core scanning, these sandy silt layers are enriched in Ca and Sr, suggesting an influx of carbonate into the lake.

From “Volcanic Sedimentology” to “Sedimentary Volcanology”: the Role of Volcaniclastic Deposits in Terrestrial and Deep-Water Environments

Professor Kyoko Kataoka¹

¹Research Institute for Natural Hazards and Disaster Recovery, Niigata University

Keynote: Prof. Kyoko Kataoka, Tāwhirimātea A (Level 2), January 27, 2026, 9:00 AM - 9:45 AM

Sedimentary volcaniclastic deposits formed through transportation and deposition by water occasionally occupy a certain volume in a sedimentary succession in volcano flank and apron, fluvial, deltaic, and deep-water (marine and lacustrine) environments. This talk emphasizes on how the sedimentological viewpoint and approach to these volcaniclastic sediments is significant to understand volcanic processes and their impacts. First, the classical facies analysis and paleo-hydrological application on volcaniclastic deposits will be discussed, which encompasses studies of lahars (volcanic debris flows and volcanogenic floods) and fluvial sedimentary and geomorphic responses to volcanism, and their cascading processes in an entire catchment “from volcanic source to sink”. Secondly, how to reconstruct the missing eruption information from volcaniclastic (other than primary) deposits in fluvial and lacustrine successions will be addressed with the view of “sink to volcanic source”. Facies analysis plus petrography and geochemistry of lahars and volcaniclastic fluvial deposits as well as volcaniclastic turbidites/hyperpycnites are useful to evaluate past eruption information such as location of the eruption center, eruption style, and eruption age, even in the absence of proximal primary eruption records and/or on the volcanic edifice itself. Third, the application of studies on volcaniclastic sediments to understand future hazards will be introduced. Sedimentary information on past lahar and volcanogenic flood deposits are invaluable to verify the numerical modelling and lahar flow simulation. Also, historical and geological volcanic sedimentary successions are helpful in predicting decadal- to millennial-scale fluvial and coastal geomorphic modifications after an eruption, which cannot be assessed by direct observation. Although a broad knowledge of volcanology, sedimentology, geomorphology, and hydrology is necessary, research on volcaniclastic deposits is key for risk assessment and reduction of hydrological volcanic hazards such as lahars, volcanogenic flood, and long-term geomorphic responses and environmental impact after an eruption.

How to Differentiate an Earthquake-Triggered Turbidite from a Volcanogenic Hyperpycnite in a Volcanic Lacustrine Setting? – Sedimentary Facies, Depositional Patterns, Magnetic Susceptibility and Micro-Xrf Analyses

Professor Kyoko Kataoka¹, Professor Atsushi Urabe¹, Professor Yoshitaka Nagahashi²

¹Research Institute for Natural Hazards and Disaster Recovery, Niigata University, Niigata, Japan,

²Faculty of Symbiotic Systems Science, Fukushima University, Fukushima, Japan

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Areas near active plate margins are prone to both earthquake and volcanic hazards. Sedimentary records of paleo-earthquakes and volcanic eruptions are key to our understanding of recurrence intervals of such phenomena and our capacity to forecast them. Elucidating evidence of strong ground motions based on the analysis of lacustrine successions requires the characterization of a turbidity current deposit (turbidite) unambiguously associated with earthquake-induced lake slope failure; however, there are few clear criteria by which to differentiate earthquake-triggered turbidites from volcanogenic hyperpycnites sourced from outside the lake (i.e. via lahars in volcanic settings). Analyzing the lacustrine sediments of Lake Inawashiro, Fukushima, northeast Japan, this study aims to characterize, compare, and contrast (1) the turbidite resulting from the 11 March 2011 Tohoku-oki earthquake and (2) the subaqueous part of a debris avalanche-transformed lahar deposit (i.e. volcanogenic hyperpycnite) from the 1888 Mt Bandai eruption. The volcanic dammed lake, formed by the 50 ka eruption and debris avalanche at Bandai, has an area of 103 km² and a maximum depth of 94 m. Lake-floor sediments were collected at various depths at >40 locations using piston and gravity corers. The topmost 50 cm-thick part of lake floor sediments intercalates both event deposits. The 2011 turbidite becomes thicker at the deepest part of the lake with a thick turbidite mud section, interpreted as an amalgamated or ponded turbidite. The chemical composition is similar to the background lake deposits, which suggests that it originated from failure of surrounding lake slopes without other inputs. In contrast, the 1888 volcanogenic hyperpycnite thins from the locations near the feeder channel into the lake. The deposits are clay-rich and their chemical composition and magnetic susceptibility imply the contribution of volcanic materials. These results pave the way for disambiguating otherwise similar deposits (such as homogenites), improving our capacity to characterize the sedimentary record.

Intergranular Cements in Holocene Reef Margin Grainstones from Heron Reef, Southern Great Barrier Reef: Implications for Early Marine Cementation in Tropical Reefs

Ms Lisa Kearney¹, Dr Luke Nothdurft¹, Professor Gregory Webb², Dr David Murphy¹, Professor Jody Webster³

¹Queensland University of Technology, Brisbane, Australia, ²University of Queensland, Brisbane, Australia, ³The University of Sydney, Sydney, Australia

5B: Carbonate systems and processes (4), Tāwhirimātea C (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

Tropical carbonate reefs form through complex interactions among biological, chemical, and physical processes. Amid these, early marine cementation is one of the least understood but increasingly recognised components of reef development. Marine cements play a critical role in stabilising reef frameworks, especially along shallow, high-energy margins subject to wave action and bioerosion. As climate change accelerates reef degradation and rubble production, understanding how and when sand and rubble become lithified into stable substrates is essential. Modern reefs can rapidly modify original biogenic structures through endolithic activity, sediment infill, and early cementation—processes that enhance substrate stability, reduce porosity, and strengthen reef components. These diagenetic alterations can also complicate the interpretation of geochemical proxies and radiometric dating by modifying original skeletal compositions.

This study investigates the early diagenetic processes that act as the mineral “glue” binding reef margin deposits, with a primary focus on the intergranular cementation of floatstones and rudstones. Holocene samples, ranging from friable to well-indurated, were selected from the upper ~1.5 m of cores collected within 20 m of the leeward margin of Heron Reef, southern Great Barrier Reef. High-resolution scanning electron microscopy and energy-dispersive X-ray spectroscopy (SEM-EDS) analyses were performed using a TESCAN Integrated Mineral Analyzer (TIMA) at the Central Analytical Research Facility, QUT. Large-area SEM-EDS maps (e.g., 6.6 × 8.9 mm), combined with fine-scale imaging, captured the complexity of cements and allochems, allowing detailed textural, geochemical, and mineralogical characterisation.

Intergranular cements are dominated by high-magnesium calcite (HMC), occurring as irregularly distributed peloidal micrite. Common fabrics include massive peloidal micrite, meniscus-like cements, and bridging cements. Isopachous cements and aragonite are markedly absent. The textures observed are consistent with microbial mediation, indicating a significant microbial role in early reef cementation.

The Critical Role of Outcrop Analogue Studies in De-Risking Subsurface Hydrogen Storage in Salt Basins

Dr Rachelle Kernen¹, Prof Kathryn Amos¹, Dr Mark Bunch¹, Dr Georgie Virgo¹

¹Adelaide University, Adelaide, Australia

8F: Sedimentology and Sustainable GeoEnergy, Rongomātāne C (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

Outcrop analogues are critical tools for advancing geological understanding of subsurface sedimentary basins, particularly in contexts where subsurface data is limited or of low resolution. They provide high-resolution, three-dimensional insights into facies heterogeneity, depositional architecture, and structural frameworks that are often difficult to resolve using seismic and well data alone. This is especially relevant in the context of underground hydrogen storage (UHS), an emerging component of clean energy systems with substantial environmental and economic implications. Globally, salt formations are considered prime candidates for UHS due to the favourable mechanical and chemical properties of halite. However, these same properties that make halite suitable for storage also render it challenging to image and characterize geophysically. In Australia, many regions under consideration for UHS are constrained by vintage seismic datasets and sparse structural interpretations, underscoring the need for improved geological analogues to reduce uncertainty in site selection.

This study presents a combined methodological framework that integrates outcrop analogue characterization with physical and synthetic seismic modeling to better predict the internal architecture and heterogeneities of subsurface salt formations. Field data from the Flinders Ranges in South Australia—a region with well-exposed evaporite sequences—demonstrates the application and value of this approach. Our results enhance understanding of evaporite stratigraphy at multiple scales and support the development of predictive models for salt cavern suitability. The findings contribute to improved subsurface characterization and risk assessment for UHS and apply to broader geoscientific and energy industry challenges. This research also highlights key knowledge gaps and future directions for studying evaporite sequence heterogeneities, providing a foundation for more reliable siting and engineering hydrogen storage caverns in salt-bearing basins.

Salt Diapirs as an Architect of Neoproterozoic Stromatolite Platform Reefs

Dr Rachelle Kernen¹, Prof Kathryn Amos¹, Dr Georgie Virgo¹, Dr Jared Lloyd¹, Dr Darwinaji Subarkah¹

¹Adelaide University, Adelaide, Australia

8B: Carbonate depositional systems from platform, slope to basin (2), Tāwhirimātea C (Level 2),
January 29, 2026, 1:40 PM - 3:10 PM

During the Precambrian, stromatolite reefs were fundamental in regulating Earth's climate and supporting early life. These microbial reef structures contributed significantly to carbon cycling and marine ecosystem stability. While many Precambrian sedimentary basins exhibit salt-influenced stratigraphy, the capacity of syntectonic salt diapirism to create specific depositional environments favorable for stromatolite-bearing carbonate platform development remains underexplored.

This study presents new outcrop evidence from the Cryogenian-aged Umberatana Group in the Adelaide Rift Complex, South Australia. A series of stromatolite reef systems is preserved across an approximately 6-kilometer stretch directly above the Enorama Diapir. The depositional environment is interpreted as a mixed siliciclastic-carbonate shallow marine setting comprising eight lithofacies grouped into four primary facies associations. A lowstand systems tract, a transgressive surface, and an overlying transgressive systems tract unconformably bound these deposits.

The stratigraphic framework reflects the influence of halokinetic processes, where the growth and movement of the underlying diapir generated parasequence-scale halokinetic sequences. These consist of hook and wedge geometries, stacking into larger tabular and tapered composite sequences bounded by halokinetic sequence boundaries. Above these, diapir-derived detritus—such as slump deposits and debris flows with dolerite conglomerate clasts sourced from the Enorama Diapir—provides evidence for syntectonic sedimentation. The progressive growth of the Enorama Diapir provided the necessary tectonic uplift and topographic relief to create a suitable environment to facilitate the establishment of a carbonate platform conducive to stromatolite reef development. This study illustrates the influence of Neoproterozoic diapirism on sedimentary architecture and highlights the role of salt tectonics in fostering early carbonate reef ecosystems in Precambrian basins.

Paleoceanographic Information from the Turbidite-Containing Sediments in the South Shetland Trench of the Antarctic Ocean

Professor Boo-Keun Khim¹, Professor Minoru Ikehara², Professor Asuka Yamaguchi³, Mr Hyuk Choi¹

¹Pusan National University, Busan, South Korea, ²Kochi University, Kochi, Japan, ³University of Tokyo, Tokyo, Japan

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

A piston core about 11 m-long (PC02) was collected from the South Shetland Trench (61°59.02'S, 62°19.41'W, 4731 m deep) during the KH-19-6 expedition using R/V Hakuho-maru in 2019. Based on visual observation of core sediments and examination of core photos and CT images, 29 turbidite layers were distinctly recognized, overlying the liquefied mud and sand/gravels at the lower part of core, which are consistently repeated, despite the different thickness. Each set of turbidite layers consists of the upper turbidite mud and lower muddy sand, both of which were capped by the hemipelagic mud layer, although the boundary between the hemipelagic mud and turbidite mud seems unclear. Grain size analysis confirms the upward fining trend within a set of hemipelagic mud, turbidite mud, and muddy sand. Each muddy sand coincides exactly with the maximum magnetic susceptibility (MS) whereas the minimum MS corresponds to the hemipelagic mud. The AMS 14C dating of bulk sediments in the hemipelagic mud layer marks old core-top age (~8.6 ka) and about 15.7 ka for the lowest hemipelagic mud. Geochemical properties (TC, TN, and biogenic opal), representing the surface water productivity, were different between the turbidite muds and hemipelagic muds, and the turbidite muds are higher than hemipelagic muds. Such difference implies that the turbidite muds might be transported from the shallower areas where the open ocean favors high productivity. In addition, the hemipelagic muds, after excluding turbidite mud and muddy sand, show the upward increasing TN contents. Based on the linear sedimentation rate and assumed age model, the climate shift from the middle Holocene climate optimum to the late Holocene Neoglacial condition seems to be recorded even in the South Shetland Trench of the Antarctic Ocean.

The Influence of Bottom Current on the Morphology of a Coral-Topped Mud Volcano off Southeast Korea

Mr Joohyeon Kim¹, Prof Young Jae Shinn¹, Mr Lee-Sun Yoo²

¹ Department of Convergence Study on the Ocean Science and Technology, Korea Maritime and Ocean University, Busan, South Korea, ²Korea Institute of Ocean Science and Technology, Busan, South Korea

Poster Session 1 & Afternoon Tea, Level 1 Foyer (tākina Convention & Exhibition Centre), January 27, 2026, 3:10 Pm - 4:25 Pm

This study examines the influence of bottom current on the morphology of a mud volcano found on the southeastern Korean continental shelf, using multi-beam bathymetry, CHIRP profile, Acoustic Doppler Current Profiler (ADCP), and backscatter data. Multi-beam bathymetry data exhibit an asymmetrical SW–NE oriented mound with the steep northeastern and gentle southwestern flanks, with water depths ranging from 85 to 115 m. CHIRP profiles show elongated depressions along the foot of the northwestern and northeastern flanks, and wedge-shaped sediments aside the depressions. These morphological features suggest that the mound has been influenced by bottom current since the cessation of mud volcanism activity. ADCP data indicate that the bottom current has an SSW or SW direction with a speed of approximately 0.25 m/s, and the surface current has a NE direction with a speed of approximately 0.35 m/s. The SW-flowing bottom current encounters the northeastern flank of the mud volcano, eroding the flank and exposing buried cold-water coral mounds. This process is also verified by higher backscatter values in the steep northeastern flank than in the gentle southwestern flank. The elongated depression is likely an erosional moat formed by the bottom current. However, given the measured current speeds, it is uncertain whether the mud volcano is currently being eroded or was eroded in the past. Compared to the bottom current speed measured in the SW Atlantic and south China Sea areas, the bottom current speed in the study area is likely sufficient to form the erosional moat. A long-term monitoring study is further required to better understand the relationship between bottom current activity and morphological change of the mound.

Influence of Subunit Structures in Tsunami Deposits on the Reconstruction of Hydraulic Conditions through Inverse Analysis

Yoshiaki Kiyozuka¹, Masaki Yamada¹, Hajime Naruse², Daisuke Ishimura³, Ryo Nakanishi⁴, Katsuya Maehashi¹

¹Shinshu University, ²Kyoto University, ³Chiba University, ⁴National Institute of Advanced Industrial Science and Technology (AIST)

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Inversion methods of tsunami deposits quantitatively estimate tsunami characteristics based on depositional information, such as layer thickness and grain-size distribution. Recently, an inversion approach utilizing a deep neural network (DNN) has been developed, and its application to recent tsunamis has successfully reconstructed key hydraulic parameters including inundation distance, flow velocity, and flow depth (Mitra et al., 2020). The existing verifications of the DNN inversion method have assumed that a single run-up flow formed the tsunami deposits. In contrast, tsunami deposits often demonstrate multiple layers, implying multiple inundation flows may form them. Multiple run-up flows were confirmed during the tsunami caused by the 2024 Noto Peninsula earthquake, and our field observations revealed a distinct subunit structure composed of two sand layers. Thus, this study applied the DNN inversion method to the two-layered tsunami deposit to verify the applicability to more complex situations. Our field surveys were conducted immediately after the event, and samples were taken from each layer of the tsunami deposit. We performed inverse analysis based on two scenarios and compared the results. One scenario assumes that each layer corresponds to an individual wave and limits the inverse analysis to the first wave. The other scenario assumes that a single inundation flow formed the two layers and performs inverse analysis using both layers' average grain-size distribution and total layer thickness. The estimated inundation distances from both scenarios were compared with observed inundation extents measured from aerial photographs. The inversion result of the first scenario was consistent with observations, whereas the second scenario resulted in significant errors in inundation distance estimates. These findings highlight that misinterpretation of depositional structure may cause substantial underestimation or overestimation of tsunami hydraulic conditions, underscoring the importance of accurately identifying depositional features to ensure reliable inversion outcomes.

Contourite Identification in the Stratigraphic Record; Two Examples

Professor Benjamin Kneller¹, Dr Pan Li

¹University of Aberdeen, Aberdeen, United Kingdom

5F: Contourites and Mixed Depositional Systems (1), Rongomātāne C (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

Fine-grained contourites are widespread, common and often thick on modern continental margins, but apparently uncommon in the stratigraphic record. The question arises as to whether they really are rare (and if so why), or whether they are being misidentified. We suggest that the latter is at least partly responsible, and that this is due to current contourite facies models being based largely on regimes dominated by the oxygen-rich thermohaline circulation on passive margins. However, even at the present day contourites occur in other tectonic settings, and sometimes in oxygen-poor environments. We present examples of thick successions of fine-grained, sparsely- to non-bioturbated deepwater deposits from two foreland basins (the Silurian Bannisdale Formation, Windermere basin, UK, and the Triassic Longwuhe Formation, Gonghe basin, China), that are neither turbidites nor conform to current fine-grained contourite facies models, but which we nonetheless interpret as fine-grained contourites formed in an oxygen-poor environment.

Mercury Deposition in South China across the Ordovician-Silurian Transition: Implications for Climate Change

Dr. Weiliang Kong¹, Dr Zhen Qiu¹, Dr Jiaqiang Zhang¹, Dr Wen Liu¹, Dr Qin Zhang¹

¹Research Institute of Petroleum Exploration & Development, Petrochina, Beijing, China

6E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (3), Rongomātāne B (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

Most of the global climate changes are closely associated with volcanic activity. However, the link between global cooling during the Ordovician-Silurian (O-S) transition and volcanism remains unclear due to limited constraints on large volcanic events before, during, and after the peak of the Hirnantian glaciation (PHG). Here, we present high-resolution mercury (Hg) concentrations and isotopes from South China across the O-S transition to assess volcanic activity and its contributions to climate changes. Anomalous Hg enrichments and volcanic-range Hg isotopes in samples above volcanic ash layers confirm the effectiveness of Hg as a tracer of volcanic events. Variations in Hg isotopes across the O-S transition reveal multiple Hg sources related to volcanic activity, i.e., dominant volcanic Hg input during pre-PHG and post-PHG-2, deposition of volcanic-sourced atmospheric Hg(II) to seawater during PHG, and increased terrestrial Hg input from enhanced weathering during post-PHG-1. We propose that prolonged global cooling was driven by an albedo catastrophe caused by volcanic aerosols and sustained by reduced atmospheric CO₂ levels due to enhanced organic carbon burial and weathering. This study highlights Hg as a tracer of volcanic activity and provides new evidence on the role of volcanism in driving climate changes across the O-S transition.

Shape and Magnitude of Paleocene-Eocene Carbon Isotope Excursions Recorded in Shallow Carbonate Ramp Successions of the Northern Adriatic Carbonate Platform, Slovenia

Dr Adrijan Košir¹, Giovanna Della Porta²

¹Research Centre of The Slovenian Academy of Sciences and Arts, Ljubljana, Slovenia, ²Department of Earth Sciences, University of Milan, Italy

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Paleocene-Eocene Thermal Maximum (PETM, ~56 Ma) was the largest Cenozoic hyperthermal, characterised by an abrupt and short-lived temperature increase of about 5 K, corresponding to a massive release of ¹³C-depleted carbon to the ocean-atmosphere system. The PETM was associated with a pronounced negative carbon isotope excursion (CIE) recorded globally in different depositional settings from palaeosols to deep-sea sediments. Because of its global occurrence and a relatively short duration (~100-200 ky), the CIE has been selected as a criterion defining the Paleocene-Eocene (P/E) boundary. Several recently documented P/E sections have also captured a transient precursor event, termed the pre-onset excursion (POE), indicating multiple carbon injections associated with the PETM onset.

Shallow-water carbonate platform record of the PETM is rather limited due to a paucity of complete sections covering the P/E boundary interval, and also due to the discrete nature and palaeoenvironmentally-limited use of early Palaeogene shallow benthic zones (SBZ).

We present a comparative analysis of P/E facies successions and CIE records from a fully-recovered core (T1-7) and published sections from an aggradational ramp sequence of the northern Adriatic Carbonate Platform. The P/E interval in all sections is characterised by unsorted and burrowed Alveolina- and larger miliolid-dominated facies and bioclastic packstone facies without obvious discontinuities. Facies assemblages correspond to an inner ramp, mostly seagrass-related euphotic depositional environment. Obtained carbon isotope records, based on matrix and individual LBFs, are influenced by a heterogeneous isotopic signal of the benthic carbonate material, which is not necessarily indicative of the global carbon signature, and by a possible deep taphonomically active zone in shallow settings, resulting in sediment mixing and averaging of the isotopic signal. However, despite presumably strongly time-averaged sediments, a clear negative $\delta^{13}\text{C}$ isotope excursion (of 2-2.5‰) was identified, including a discrete, lower-magnitude negative excursion (1-1.5‰), probably corresponding to the POE.

Modal Composition and Textural Features of Post-Rift Sediments from the North Croatian Basin as Indicators of Tectonic and Climatic Events; Pannonian Basin System, Croatia

Dr Marijan Kovačić¹, Dr. Frane Marković¹, Dr Tomislav Kurečić², Dr Davor Stanko³

¹University of Zagreb Faculty of Science, Zagreb, Croatia, ²Croatian Geological Survey, Zagreb, Croatia,

³University of Zagreb Faculty of Geotechnical Engineering, Varaždin, Croatia

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The North Croatian Basin, situated in southeastern Europe, forms the southwestern segment of the Pannonian Basin System. During its post-rift phase, beginning in the Late Miocene, the basin accumulated over one kilometer of clastic sediments in fluvial, lacustrine, and terrestrial environments. Petrographic analysis of modal composition and textural features provides critical insights into sediment provenance and the associated tectonic and climatic processes that governed basin evolution.

Upper Miocene sandstones are texturally mature and compositionally uniform throughout the basin. Their detritus primarily originated from the weathering of metamorphic and older clastic sedimentary rocks located to the north and northwest, within the Eastern Alps and Western Carpathians. In contrast, Pliocene sediments display significant spatial variability. In the northwestern sector, they closely resemble Upper Miocene deposits, while in the southern part of the basin, they comprise mineralogically and texturally immature sediments derived from older sedimentary, metamorphic, and mafic magmatic rocks, sourced either locally or from the Inner Dinarides to the south.

During the Pleistocene, widespread deposition of loess occurred across much of the basin, transported from the north by the floodplain of the Paleo-Danube River. Marginal zones, however, were characterized by the accumulation of immature, coarse-grained clastic material derived from proximal sources.

The transition from the Late Miocene to the Pliocene was marked by a warm and humid climate, coinciding with a tectonic shift from extensional to compressional regimes, leading to the uplift of surrounding orogenic belts and intra-basin structural blocks. The Pleistocene was characterized by cooler climatic conditions and continued compressional tectonics, with ongoing uplift of structural blocks—a process that remains active today.

Climate-Driven Shifts in Phytoplankton Taxonomy and Organic Matter Sources in High Arctic Fjords: a Multiproxy Approach Based on Lipid Molecular Markers in Sediments

Dr Magdalena Krajewska¹, Dr Ludwik Lubecki¹, Professor Wojciech Tylmann², Associate professor Małgorzata Szymczak-Żyła¹

¹Institute of Oceanology Polish Academy of Sciences, Sopot, Poland, ²University of Gdańsk, Gdańsk, Poland

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Täkinä Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

This study investigates (i) sources of organic matter in recent sediments from three western Spitsbergen fjords (Hornsund, Kongsfjorden, Raudfjorden), and (ii) the impact of climate change on primary production and phytoplankton taxonomy composition over the last century, based on records of molecular markers in sediment cores. In sediments (0-5 cm) we analysed various classes of lipid molecular markers, including photosynthetic pigments, n-alkanes, saturated cyclic hydrocarbons (hopanes, steranes), IP25 (sea-ice proxy), alkenones, and polar steroids.

The findings of this study indicate the presence of sedimentary organic matter derived from multiple marine and terrestrial sources in the studied fjords. Biomarker analysis reveals pronounced differences between fjords located in the southern and northern parts of western Spitsbergen in terms of contributions from biogenic sources (phytoplankton, animal-derived material, and terrestrial vascular plants), the relative abundance of specific phytoplankton groups (diatoms vs. dinoflagellates), and the intensity of bio-advection (e.g., *Emiliania huxleyi*) associated with inflows of warm Atlantic Water.

To reconstruct historical changes, we analysed sedimentary pigments in long cores. Profiles of $\sum\text{Chl}a$ (sum of chlorophyll-a and its derivatives) and the $\sum\text{Hex}/\text{Diat}$ ratio (sum of 19'-hexanoyloxyfucoxanthin and 19'-hexanoyloxy-4-ketofucoxanthin to diatoxanthin ratio) indicate long-term trends in primary production and phytoplankton composition. Warming-related shifts—such as increased primary production and greater haptophyte contributions relative to diatoms—are evident in Kongsfjorden and Raudfjorden, with changes in Raudfjorden lagging by about a decade. In Hornsund, productivity also increased, though more gradually, likely due to the persistent influence of Arctic Water.

The results of this research demonstrate the sensitivity of primary producers in Arctic fjords to climate-driven oceanographic changes. In this study we apply biomarker analysis to ancient sediments to elucidate the history of organic matter input and ecosystem dynamics in this rapidly changing region as a part of the implementation of the project funded by National Science Centre, Poland (2023/49/B/ST10/03768).

Upper Cretaceous Contourites within the Polish Basin – Unique Example of Widespread Inversion-Related Along-Slope Deposition in Tectonically Active Intracontinental Setting

Professor Piotr Krzywiec¹, Dr Aleksandra Stachowska¹

¹Institute of Geological Sciences, Polish Academy of Sciences, Warsaw, Poland

6F: Contourites and Mixed Depositional Systems (2), Rongomātāne C (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

Most commonly, contourites are associated with passive or active continental margins as they form regional slopes along which bottom currents flow. Slopes that are steep enough to focus bottom currents could be however formed also in settings characterized by syn-depositional uplift of crustal blocks such as intracontinental basins during their inversion. As a result, recognition of fossil contourites can provide wealth of information about paleo-sea bottom dynamics driven by tectonic movements.

The Polish Basin formed the eastern part of the Permian–Mesozoic system of epicontinental basins in western and central Europe. Its Late Cretaceous inversion was associated with uplift of its axial part and formation of the Mid-Polish Anticlinorium that extends for over 1,000 km from SW Baltic Sea to SE Poland. Basin inversion led also to growth of salt diapirs in its central and northern part, where thick Upper Permian evaporites were deposited. Inversion-related uplift of the basin floor resulted in formation of regional or local morphological barriers and slopes that focused flow of bottom currents. Santonian - Campanian contourites deposited by these bottom currents were recognized using seismic reflection data acquired within the flanks of the Mid-Polish Anticlinorium, both offshore and onshore. Excellent seismic imaging allowed for precise recognition of all key elements of contourites such as moats and drifts. Regional, long-range bottom current systems have flown along uplifted edges of large crustal blocks that formed the Mid-Polish Anticlinorium. On a more local scale, uplifted and arched roofs of compressionally-reactivated salt diapirs created morphological barriers encircled by contour currents that formed contourites. The formation of the contourites hints at the fact that strong sea floor currents must have sculpted the bottom over an extended period of time. Our results provide independent evidence for regional bottom-current palaeocirculation.

This study was supported by NCN grants 2017/27/B/ST10/02316 and 2018/29/B/ST10/02947.

Late Cretaceous Bottom-Current System along the East African Transform Margin

Dr Aleksandra Stachowska¹, **Professor Piotr Krzywiec**¹, Professor Joe Cartwright², Dr Samuel C. Boone³

¹Institute of Geological Sciences, Polish Academy of Sciences, Warsaw, Poland, ²Department of Earth Sciences, University of Oxford, Oxford, UK, ³School of Geosciences, University of Sydney, Sydney, Australia

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

High-resolution 2D reflection seismic data of the East AfricaSPAN™ survey acquired by ION Geophysical were used to investigate bottom current-controlled depositional and erosional features of Late Cretaceous along the transform continental margin offshore Kenya, Tanzania, and northern Mozambique. This region underwent significant tectonic reorganization during the break-up of Gondwana. Following Early Jurassic rifting (c. 183–177 Ma), Madagascar drifted southeastward along the Davie Transform Zone (DFZ), reaching its present position in the Early Cretaceous (c. 120.8 Ma).

The seismic dataset reveals regional and local unconformities, erosional incisions, and stratigraphic pinch-outs. In deep-water settings, across profiles from offshore Kenya to southern Tanzania, we identified contourite-related features: mounded drifts with associated paleo-moats and sediment waves migrating along bathymetric highs. Mounded drifts show semi-continuous, mounded internal reflections of alternating amplitude, typically bounded upslope by paleo-moats. Sediment waves display wavy, discontinuous to semi-continuous reflections, often bounded by high-amplitude basal reflections. These features developed in response to bottom-current activity influenced by uplifted structures related to strike-slip fault zones. In addition, the seismic data record extensive Late Cretaceous submarine volcanism and intrusive sill complexes. Volcanic highs likely acted as barriers that redirected bottom currents, influencing sediment pathways.

The combined evidence highlights a complex interplay where: (1) tectonic uplift and inversion reshaped seafloor topography, (2) volcanism created relief and modified sediment dispersal, and (3) bottom currents reworked and redistributed sediments along these obstacles. These processes provide new insights into the evolution of the East African transform margin, with broader implications for reconstructing Late Cretaceous paleogeography and sediment-routing systems. Offshore evidence of tectonics, volcanism, and bottom-current activity also correlates with thermochronological data indicating exhumation onshore East Africa.

This study was supported by NCN (2024/08/X/ST10/00218), and the NAWA Bekker Program (BPN/BEK/2024/1/00102). Seismic data was provided by ION Geophysical; academic access to IHS Markit Kingdom was granted by S&P Global.

Record of Enhanced Volcanism at Devonian-Mississippian Boundary Based on Mercury and Tellurium Chemostratigraphy

Ms Daria Książak¹, Professor Michał Rakociński¹, Professor Leszek Marynowski¹, Professor Zofia Dubicka², Mr Jakub Kucharczyk¹, Dr Andrew Cullen³, Dr Firuza Salimova⁴, Dr Nuriddin Abdiev⁵

¹Faculty of Natural Sciences, University of Silesia in Katowice, Katowice, Poland, ²Faculty of Geology, University of Warsaw, Warsaw, Poland, ³University of Oklahoma, Norman, U.S.A, ⁴State Enterprise 'East Uzbekistan Survey Search Expedition, Tashkent, Uzbekistan, ⁵Kitab State Geological National Park, Shakhrisabz, Uzbekistan

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Significant global perturbations in marine environments during the Late Devonian and Mississippian are recorded worldwide as organic-rich facies linked to cyclic climatic and eustatic fluctuations, including sea-level rise, eutrophication, and anoxia. Enhanced volcanic activity during this time caused major climatic and biospheric changes, comparable to those during the Hangenberg extinction (~359 Ma), one of the most severe biosphere crises. This event led to the extinction of ~50% of marine genera, especially pelagic taxa such as ammonoids, conodonts, and placoderm fish. Recent discoveries of mercury (Hg) spikes at the Devonian-Mississippian boundary in different parts of the world, present convincing evidence of increased volcanic activity. Today, the global volcanic flux often shows greater enrichment in Te than other volatile elements like mercury, thallium, or bismuth. Until now, tellurium has been successfully used to confirm extensive volcanic activity at the end-Permian, end-Cretaceous and early Eocene periods. We have examined several successions of pelagic sedimentary basins, encompassing the Devonian–Mississippian boundary interval of different paleogeographic domains for mercury and tellurium content. We documented for the first time large Te spikes, which correspond with Hg anomalies. In the Carnic Alps, Austria/Italy the maximum value of Hg is 20216 ppb, while that of Te is 890 ppb; in the Tien Shan, Uzbekistan max. value of Hg is 5825 ppb, and of Te is 930 ppb; in Oklahoma max. value of Hg is 7449 ppb, and of Te is 2820 ppb; in the Holy Cross Mountains, Poland max. value of Hg is 169 ppb, and of Te is 220 ppb. Our results indicate that Te could be a promising volcanic activity proxy in complement to Hg in deep time intervals.

This project was financially supported by the National Science Centre in Poland (grant no. 2023/49/N/ST10/00868).

Record of the Mid-Tournaisian Anoxic Event in the Southern Euramerican Shelf and in the Palaeotethys Area

Mr Jakub Kucharczyk¹, Ph.D. Michał Rakociński¹, Ms Daria Książak¹, Ms Marta Palarz¹, Professor Leszek Marynowski¹

¹University of Silesia in Katowice, Faculty of Natural Sciences, Institute of Earth Sciences, Będzińska Str. 60, 41-200 Sosnowiec, Poland

6C: Sedimentology of Black Shales through Phanerozoic (1), Tāwhirimātea E (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

The Mississippian constituted a time of important global changes in marine environments. However, in contrast to the Late Devonian events, the investigations of the Mississippian events are not as advanced as the Devonian ones and still need intensive research, especially regarding high-resolution $\delta^{13}\text{C}_{\text{org}}$ chemostratigraphy. The mid-Tournaisian Event, also called the Lower Alum Shale Event (LASE), was a global anoxic event ca. 355 Ma ago. This event is connected with increased productivity in the water column, expanded anoxia, and drastic facies changes from pelagic carbonate sedimentation to widespread black organic-rich siliceous shales and radiolarites in many parts of the world. Previous studies by our team show that the conditions during the LASE in pelagic settings were not uniform, with variable bottom-water oxygenation and different proximity and influence of volcanic activities. The numerous regional magmatic centres are considered to be potentially responsible for the drastic depositional changes at a local scale and the bioproductivity increase at the global scale. Recent research aimed to decode paleoceanographic conditions based on inorganic geochemistry and especially to fill this gap by investigating in high resolution the changes of the stable carbon isotopes (especially in Corg) in several European successions. Positive carbon anomalies were often associated with oceanic water eutrophication, however some of recent studies provide new perspectives for decipher changes in $\delta^{13}\text{C}_{\text{org}}$ record, and several negative isotope anomalies have been reinterpreted as a primary signal associated with large-scale thermogenic degassing of light isotopically carbon (^{12}C isotope), due to increased volcanic activity. Our isotopic data reveal negative shifts in the Carnic Alps, Montagne Noire, Ardennes, at the beginning of the LASE interval, reflecting a volcanic impact on the global carbon cycle.

This project was financially supported by the grants of the National Science Centre in Poland no. 2014/15/B/ST10/03705 and 2023/49/N/ST10/00857.

Orbitally Induced Cyclicity in Very Thin-Bedded Lower Cretaceous Turbidites Detected Using Innovative Methods for Time-Series Analysis

Miss Agata Kuźma¹, Dr Krzysztof Ninard², Professor Alfred Uchman²

¹Jagiellonian University, Doctoral School of Exact and Natural Sciences, Institute of Geological Sciences, Gronostajowa 3a, 30-387, Kraków, Poland, ²Jagiellonian University, Institute of Geological Sciences, Gronostajowa 3a, 30-387, Kraków, Poland

1E: Student Research Forum (1), Rongomātāne B (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

Recognizing orbitally induced signals in the sedimentary record of complex, high-energy environments, such as turbiditic systems, remains a challenge. However, recent advances in numerical methods have provided powerful new tools to investigate the influence of orbital forcing on sedimentation, although many of these approaches have not yet seen widespread adaptation in sedimentology. This study examines Lower Cretaceous deep-marine deposits (Upper Cieszyn Beds and Hradiště Beds, Outer Western Carpathians, Poland) characterized by well-defined cyclicity in lithological features, as demonstrated through an integrated suite of independent numerical techniques. They were subjected to high-resolution, bed-by-bed logging. Measured bed thicknesses were treated as a time series and analyzed for cyclicity using autoassociation analysis, midpoint-triangle interpolation, recurrence plots, and circular spectral analysis. The results reveal clear periodicities in sedimentation, including phases of intensified terrigenous input and formation of intervals marked by rusty beds, likely reflecting episodic iron oxidation. The turbiditic succession shows a strong correlation with astronomical forcing, including precession, obliquity, short eccentricity, long eccentricity, and the 173 kyr obliquity-modulation cycle. Autoassociation analysis proved particularly effective in detecting lower-frequency cycles (e.g., 173 kyr and long eccentricity), performing comparably to the emerging method of recurrence plots, which is applied here for only the second time in sedimentological time-series analysis and for the first time in deep-marine sedimentology. In contrast, higher-frequency cycles were more readily detected using circular spectral analysis and midpoint-triangle interpolation with the Lomb-Scargle transform. The standard Walsh spectral method was ineffective in interpreting this highly variable time series, highlighting the potential of these novel approaches as valuable alternatives. The observed cyclicity may reflect orbital control on sediment supply and periodic iron oxidation; however, further detailed sedimentological and geochemical analyses are required to refine this interpretation. Notably, iron oxidation appears to respond more strongly to higher-frequency orbital cycles (particularly precession) than to long-period variations.

Sedimentary Evolution of the Rangitāiki Plains in Aotearoa New Zealand: Implications for Coastal Processes and Management

Ms Bailey Rackham¹, **Dr Andrew La Croix**¹, Dr Toru Tamura², Dr Rafael Carvalho^{3,4}

¹Sedimentary Environments and Analogues Research Group, University of Waikato, Hamilton, New Zealand, ²Geological Survey of Japan, National Institute of Advanced Industrial Science and Technology, Japan, ³School of Environmental and Life Sciences, The University of Newcastle, Newcastle, Australia, ⁴College of Science and Engineering, James Cook University, Townsville, Australia

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Rangitāiki Plains have prograded ~10 km over the past 6,500 years. Situated in a subsiding part of the Taupō Volcanic Zone, the shoreline advanced via infilling of mixed siliciclastic and volcanoclastic sediments. This progradation built sandy beach ridges which record the nature and chronology of coastal outbuilding. However, several beach ridge sets remain undated or are constrained by uncertain tephrochronological correlations, resulting in gaps in the reconstruction of progradation rates. Additionally, limited textural and geochemical characterisation of beach ridges has hindered understanding of sediment provenance.

To address these limitations we integrated Light Detection and Ranging (LiDAR), Ground Penetrating Radar (GPR), Optically Stimulated Luminescence (OSL) dating, and geochemical analyses (XRF, XRD). The goal was to refine the chronology and investigate the timing, rates, and controlling mechanisms of Holocene coastal progradation. LiDAR revealed the modern morphology and ridge patterns, allowing us to identify five major beach-ridge sets and three minor stranded ridges aligned parallel to the northwest-southeast-orientated modern coastline. OSL dating provided a refined chronology of ridge formation, giving absolute dates to ridges and establishing new progradation rates. Since 6.2 ± 0.6 ka, the coastline has advanced approximately 7.95 km at an average rate of 1.28 m/yr, with peak progradation rates around 6.2 ka (up to 3.48 m/yr) declining to less than 1 m/yr by 3.3 ka. GPR images revealed previously undocumented subsurface stratigraphy and suggested variation in the direction of progradation. Geochemical and textural data show consistent sediment composition between ridges; medium-grained, moderately well-sorted sands dominated by quartz, plagioclase, and mica.

Our findings advance our understanding of the chronology of progradation of the Rangitāiki Plains and the processes driving coastal evolution in this volcanoclastic sedimentary system. Results are valuable for coastal management and planning in mixed-source, sediment-rich environments across Aotearoa New Zealand and other volcanoclastic settings.

Multi-phase Paleokarst Reconstruction over Hundreds of Millions of Years - a Case Study of the Majiagou Formation, Ordos Basin

Dr Haoxiang Lan¹, Prof Meiyan Fu¹, Prof Hucheng Deng¹, Prof Reza Rezaee², Dr Tang Li¹, Mr Junyang Zhu¹

¹Chengdu University of Technology, Chengdu, China, ²Curtin University, Perth, Australia

9B: Carbonate depositional systems from platform, slope to basin (3), Tāwhirimātea C (Level 2),
January 29, 2026, 4:25 PM - 5:55 PM

Karstification over hundreds of millions of years profoundly influences carbonate reservoir evolution globally, yet the timing of karst stages and their impact on pore preservation remain poorly constrained. The Ordovician Majiagou Formation in the Ordos Basin, China - exposed to subaerial weathering for ~150 million years during the Late Caledonian - Hercynian orogenies - serves as an ideal analog for dissecting long-lived karst systems. The top submembers (Ma5₁ to Ma5₇) of the Majiagou Formation were analyzed using core examination, major and trace elements measurement, $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ analysis, and calcite U-Pb dating to clarify the impact of surface exposure on the original deposition and the age of calcite cementation in diagenetic phase. The results reveals cyclic "collapse-accommodation" breccia patterns in the upper Ma5 submembers (Ma5₁-Ma5₄), where alternating high/low-mud breccias destroyed early dissolution pores, supported by geochemical indicators like elevated Mn/Sr ratios (>2) and strong terrigenous element (Al/Th/Zr)-REE correlations ($r^2 > 0.95$) reflecting intense meteoric water input. Tight limestones in Ma5₅ acted as a barrier, evidenced by lower Mn/Sr ratios (0.86-1.30) and weaker correlations in deeper submembers (Ma5₅-Ma5₇). U-Pb dating of calcite cements (252.7±6.3 to 308.6±3.9 Ma) constrains post-uplift cementation to the Late Carboniferous-Permian, lasting >44 million years with horizontal fluid flow. These findings highlight how protracted karstification, via collapse cycles and terrigenous inputs, detrimentally impacts pore preservation. Furthermore, the study explores the significance of U-Pb dating in reconstructing diagenetic sequences of palaeokarst formations.

Dryland Fluvial-deltaic Depositional Systems of Western Australia

Prof. Simon Lang¹, Dr Victorien Paumard¹, Dr John Shepherd¹, Mr Andrew Winch¹, Mr Alex Sullivan¹, Mr Thomas Cottle¹, Mr Vaisakh Prathapan Seema¹, Professor John Holbrook², Mr Henry Henk², Mr Matthew Kelly², Mr Jacinto Garza², Mr Whitten Horton², Mr Andrew Waltrip², Professor Stephen Hasiotis³

¹Centre For Energy & Climate Geoscience, School of Earth & Oceans, University of Western Australia, Perth, Australia, ²Department of Geological Sciences, Texas Christian University, Fort Worth, USA,

³Department of Geology, Kansas University, Lawrence, USA

5C: Coastal to shelf environments across time and space (5), Tāwhirimātea E (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

The Gascoyne, Ashburton, and De Grey are dryland deltas along the arid to semi-arid coast of Western Australia and are being investigated to characterise the impact of increasing tidal range and storm-generated flooding on delta sedimentation in the Holocene. Satellite data, LiDAR, drone photogrammetry, auger drilling, coring, laser particle size analysis and age-dating are used to produce new depositional element complex maps for each delta. The geometry and spatial juxtaposition relationships of the element complexes on the deltas reflect the relative dominance of F, W, & T processes, and the various combinations of mixed-influences. Highly variable discharge (ephemeral) river flows are associated with widespread flooding after cyclones. Tidal and wave reworking of the delta front is significant, and surficial aeolian reworking (A) are locally important on the beach ridges and the delta plain. Upstream avulsion during major flood events produce fluvial-dominated distributor channels in the lower alluvial plain and upper delta plain, feeding tide-influenced to tide-dominated distributaries on the lower delta plain, and asymmetric wave- to tide-dominated mouth bars on the mixed-influenced delta front. Larger tidal range increases the size of mouth-bar elements that amalgamate on the sand-prone delta front, increasing lateral sand connectivity at the element complex scale. Highly bioturbated tidal bars fill the estuarine distributary channels complex. Storm waves rework the mouth-bars to produce beach-ridges, moulded by aeolian processes. Tidal flats pre-dominate down-drift, stabilised by mangroves and cut by tidal creeks. At the De Grey delta, extreme evaporation and 6m+ tidal range produces brown ooids (aragonite-coated terrigenous fine sand) on the tide-dominated mouth-bars/shoreface, which are then washed onto foreshore/beach ridges and upstream along the tide-dominated channel complex for >10km. The element complex maps and geometric database are useful for subsurface reservoir modelling of analogous ancient successions for sedimentary copper and uranium, oil, gas, carbon sequestration and gas storage.

Dolomitization in Drift and Platform Margin Deposits in the Maldives Archipelago

Dr Juan Carlos Laya¹, Dr David Budd², Dr Carl Jacquemyn³, Dr Cameron Manche¹, Dr Kieron Prince¹

¹Texas A&M University, College Station, United States, ²University of Colorado, Boulder, United States,

³Imperial College London, London, United Kingdom

2B: Carbonate systems and processes (1), Tāwhirimātea C (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

Isolated Neogene carbonate platforms and their adjacent slope deposits have long served as natural laboratories for studying dolomitization models involving seawater circulation. However, dolomites within drowned platforms and associated deep-water drift deposits remain underexplored. This study presents a detailed investigation of dolomites from the drowned Miocene Kardiva Platform and adjacent slope drifts, using samples from IODP Expedition 359.

In the drift deposits, dolomite occurs primarily in the oldest drift sequence, which is followed by an 8.3 Ma depositional hiatus. These dolomites are very fine- to fine-crystalline, forming as cements and mimetic replacements. They constitute less than 10% of the sediment and are characterized by non-stoichiometric compositions (mean 42.7 mol% MgCO_3), consistently positive $\delta^{13}\text{C}$ values (1.3–1.7‰ VPDB), and high Sr concentrations (354–1250 ppm). Previous studies also report elevated $\delta^{34}\text{S}$ in these dolomites, suggesting microbial influence.

In contrast, the youngest platform margin deposits are fully dolomitized by fine- to medium-crystalline, fabric-retentive mosaics. These dolomites exhibit near-stoichiometric compositions (mean 47.4 mol% MgCO_3), higher $\delta^{13}\text{C}$ values (2.1–2.7‰ VPDB), but lower Sr contents (156–377 ppm).

Sr-isotope data show that drift dolomites formed either during deposition or at the onset of the 6.3 Ma hiatus. Platform-margin dolomites formed 2.6–4.2 Ma after platform drowning and during the same hiatus. $\delta^{18}\text{O}$ values (2.1–3.5‰ VPDB) and burial models indicate dolomitization occurred by normal marine seawater at 10–15°C, while the sediments lay submerged beneath ~400 m of seawater.

Geochemical and petrographic evidence suggests platform dolomitization occurred via open-system advection of seawater, likely driven by current-pumping. In contrast, drift dolomites formed in more diffusion-dominated, closed systems. Fluid-flow simulations support that Miocene bottom currents could have driven seawater through sediments, forming substantial dolomite volumes within <0.5 Ma.

Mapping Marine Sediments in the Romanian Sector of the Black Sea

Mr Constantin Lazar^{1,2}, Mr Adrian Popa^{1,2}, Mr Vlad Apotrosoaei^{1,2}, Dr Mihaela Melinte Dobrinescu¹, Dr Gabriel Ion¹

¹National Institute for Marine Geology and Geo-ecology – GeoEcoMar, Bucharest, Romania, ²The Doctoral School of Geology, Bucharest, Romania

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The marine environment, mainly the shelf area, is in general the place that sustains large human communities and provides them many kinds of resources and natural services. Human society is more and more interested in exploiting and protecting the oceans and seas; accordingly, the mapping of the continental shelves is more important than ever. The advances in the development of new or enhanced equipment, able to map larger areas, with better resolution and to bring new information, previously impossible to obtain, opened a new era in mapping the continental shelves. It is the case of the Romanian sector of the Black Sea, where new equipments and methodologies are employed to study the shallow sediments, from many points of view: detailed bathymetry, grain size distribution, habitat mapping, capacity to properly sustain the marine life, marine aggregates, suitability to host submarine infrastructure such as oil and gas pipelines, offshore wind farms, telecommunication or power cables, but also to envisage the status of sediment pollution. We currently use several methods that provide us with results that are correlatable and complementary, as follows: multibeam echosounding (MBES), high and very high reflection seismics, side scan sonar, water column recording to search for seepages, sea bottom sampling with Van Veen grabs or box corer, gravity coring, but also photo and video recording. In this work we present results regarding the detailed mapping of the sea floor in terms of its very detailed morphology (Digital Terrain Models – via multibeam echosounding), detailed structure of shallow sediments (via sub-bottom profiling and sparker seismics), the physical mapping of the water/sediment interface and fluids seepage detection and mapping, via MBES and side scan sonar. We mapped and characterized specific submarine structures as: physical habitats, relic coasts, dune fields, structures specific for differential compaction, canyons, and pockmarks.

Mapping the Forefield of the Gepatschferner: The Race against Time to Understand the Demise of Austria's Second Largest Glacier

Professor Daniel Le Heron¹, Mr Christoph Kettler⁴, Professor Charlie Bristow², Professor Bethan Davies³, Miss Paulina Mejías Osorio¹

¹University of Vienna, Vienna, Austria, ²Birkbeck, University of London, London, United Kingdom,

³Newcastle University, Newcastle, United Kingdom, ⁴GeoSphere Austria, Vienna, Austria

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Gepatschferner is Austria's second largest glacier. The rapid retreat of glaciers in the European Alps means that urgent efforts are underway to monitor them from every possible perspective. Monitoring of the glacier margin has been undertaken on an annual (sometimes biannual) basis by our team since 2019. Efforts have focussed on (i) understanding the sedimentological and geomorphological evolution of the glacier's forefield, (ii) the evolution of debris on the surface, (iii) the development and distribution of englacial channels, (iv) Quaternary sediment mapping and (v) mapping of basement geology. We have used repeated Uncrewed Aerial Vehicle (UAV) surveys to produce time series maps, concentrating on the sedimentology (patterns of till deposition, flutes, crevasse squeeze ridges, evolving fluvial terrace deposits), supported by ground-level photogrammetry. Ground penetrating radar (RDR) in sequential surveys has been deployed to understand meltwater channel evolution (and hence sediment pathways). Relevant aspects include the role of sedimentology and sediment erosion in glacier access and therefore Alpine tourism, the style of sediment production and deposition in the context of accelerating climatic change. This poster presents the key findings of a multi-year team effort and an example of the sedimentology-focussed opportunities presented by undertaken detailed understanding at a modern glacier margin.

Mapping a 300-MillionYear Old Glacier Bed: The Noordoewer Section, Orange River, Namibia

Professor Daniel Le Heron¹, Paulina Mejías Osorio¹, Ricarda Wohlschlägl¹

¹University of Vienna, Vienna, Austria

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Glacial geomorphological structures produced during the Late Palaeozoic Ice Age (LPIA) of Namibia provide exceptional insight into the flow direction, flow behaviour, and plumbing of subglacial drainage systems in deep time. At Noordoewer (southern Namibia), along the Orange River, a unique and largely undocumented ~300 Ma assemblage of subglacial structures within the Dwyka Group is investigated. A detailed geological map documents a complex array of both hard- and soft-bed features shaped by the combined action of subglacial abrasion and meltwater. Structures trend parallel to the Orange River, supporting the view that part of its course originated as a Late Carboniferous valley. Key glacial indicators in a hard bedrock area developed on the Nama Group (Ediacaran metasediments) include (i) striated pavements, (ii) multiple roches moutonnées, and (iii) meltwater channels / p-forms. In areas comprising either a veneer or sheet of sandy diamictite, additional soft subglacial bed features are recognised, including (iv) a flute field, (v) soft-sediment striated surfaces (SSSS) and (vi) glaciotectionic structures including deformation bands. Collectively, these six sets of features support a NNW-directed palaeoflow, in direct contrast to previous interpretations of a southward or westward glacial flow down the axis of the Karasburg Basin. Thus, the new findings have broad implications for reconstructing past ice sheet dynamics and interpreting the geological record of glacial landscapes in the Late Palaeozoic record.

Using U-Pb Detrital Zircon Geochronology to Investigate the Provenance of Mesozoic Sedimentary Successions on the Continental Slope at Wreck Bay, Queensland

Mr Casey Lee¹, Prof Eric Roberts^{1,2}, Dr Rob Beaman¹

¹James Cook University, Townsville, Australia, ²Colorado School of Mines, Golden, United States

3A: Next Generation Sediment Provenance (3), Tāwhirimātea A (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

The tectonic setting of north-eastern Gondwana during the Mesozoic remains largely unresolved. Sedimentary provenance studies in the Great Australian Superbasin support a continuation of Palaeozoic-initiated subduction and continental arc magmatism along the east Gondwana margin throughout the Late Triassic to mid-Cretaceous. However, little is known about the northern extent of this system and its relationship with northern Zealandia due to a lack of known igneous or metamorphic outcrops of Mesozoic age in north-eastern Australia.

During a seabed survey of sediment cover and benthic and pelagic biology in 2020, several hundred metres of sedimentary bedrock was found outcropping on a subvertical section of the continental slope at Wreck Bay, east of the Cape York Peninsula. Using a remote operated deep-sea submersible, rock samples were collected between 1462m and 2051m below sea level and then analysed using U-Pb detrital zircon geochronology (LA-ICP-MS), sandstone petrography, and zircon grain morphology to investigate their provenance.

Results from U-Pb geochronology reveal most grains were sourced from known nearby Proterozoic (North Australian Craton, Grenville orogeny) and Palaeozoic (major Mossman Orogen, minor New England Orogen and Pacific Gondwana) units. However, a minor population of grains yielded ages ranging from Late Triassic to Early Cretaceous (230Ma-139Ma, with clusters at ~170Ma and ~155Ma) that have a locally unknown source. Petrographic analyses indicate a transition from fluvial into marginal marine and shallow marine environments. Zircon grain morphology suggests minimal recycling of Palaeozoic grains (dominantly euhedral) and mixed recycling of zircons with other ages.

These results strongly support continued magmatism in northeast Gondwana during the Mesozoic. Additionally, the rocks from Wreck Bay bear striking similarities to Jurassic- Cretaceous units to the south (Dalrymple Sandstone and Gilbert River Formation) and ostensibly validate assumptions that the Laura Basin extends offshore to the Grenville Basement High (immediately north of Wreck Bay).

The Initial Impact of Explosive Volcanic Eruptions on Fluvial Sedimentation: A Study of the Cretaceous Goseong Formation, Gyeongsang Basin, Se Korea

Mr Kyungjin Lee^{1,3}, Dr Yong-Un Chae², Assoc. Prof. Yong Sik Gihm^{1,3}

¹Department of Geology, Kyungpook National University, Daegu, South Korea, ²Institute of Environmental Geosciences, Pukyong National University, Busan, South Korea, ³KNU G-LAMP Research Center, Kyungpook National University, Daegu, South Korea

4E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (1), Rongomātāne B (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

Explosive volcanic eruptions alter fluvial dynamics by modifying sediment supply rates, sediment composition, and channel behaviors, thereby producing distinctive stratigraphic signatures. This study investigates early fluvial responses to explosive volcanic eruptions recorded in fluvial sedimentary successions of the Cretaceous Goseong Formation, Gyeongsang Basin, southeastern Korea. Detailed sedimentological analysis reveals systematic vertical variations in depositional characteristics from the lower to upper Goseong Formation, reflecting volcanoclastic sediment influx from the Gyeongsang Volcanic Arc. The Goseong Formation exhibits three distinct upward transitions: (1) sediment composition from terrigenous clastic to volcanogenic materials, (2) narrowing channel geometry from multi-story, sheet-type (apparent width-to-thickness [W/T] ratio = 26.4) to single- to multi-story, ribbon-type (W/T ratio = 11.7), and (3) increased thickness ratio of crevasse channel and splay deposits to floodplain fines. Despite cohesionless volcanoclastic sediment supply, channel geometry decreases in channel width with occurrence of single-story channel fills, contrasting to classical models. High sedimentation rates in channels imposed by onset of explosive volcanism cause rapid increase in channel bed elevation, resulting in reduction of downstream flow efficiency and concurrent frequent overbank floods. Consequently, rapid aggradation of both in-channel beds and proximal floodplain areas facilitated channel perching and subsequent channel avulsion events. Furthermore, vegetation and early cementation of floodplain substrates, as evidenced by root traces and calcretes, probably increased channel bank stability, preventing lateral channel migration. Therefore, these vertical variations in channel geometry and floodplain sedimentation resulted from combined effects of rapid in-channel bed aggradation rates and frequent overbank flooding with channel avulsion, resulting in occurrence of ribbon-type, single-story channel bodies, despite input of cohesionless volcanoclastic sediments. The Goseong Formation preserves systematic records of early-stage fluvial architectural responses to explosive volcanism, providing insights into ancient volcano-sedimentary fluvial successions in non-marine environments.

Pattern, Frequency, and Drivers of Flood Events in the Southern Mid-latitudes over the Past 2600 Years from Varved Sediments in Lake Ohau, New Zealand.

Professor Richard Levy^{1,2}, Associate Professor Gavin Dunbar², Professor Stephen Meyers³, Associate Professor Jamie Howarth², Dr Marcus Vandergoes¹, Professor James Renwick², Associate Professor Huw Horgan^{2,4}, Professor Sean Fitzsimons⁵, Dr Fabio Florindo⁶, Assistant Professor Alex Forrest⁷, Professor Andrew Gorman⁵, Dr Xun Li¹, Dr Joseph Prebble¹, Dr Jen Purdie⁵, Assistant Professor Heidi Roop⁸, Professor Geoff Schladow⁷, Dr Sharon Walker⁹, Professor Gary Wilson¹⁰

¹GNS Science, Wellington, New Zealand, ²Victoria University of Wellington, Wellington, New Zealand,

³University of Wisconsin, Madison, USA, ⁴WSL-Institut für Schnee- und Lawinenforschung SLF, Davos, Switzerland, ⁵University of Otago, Dunedin, New Zealand, ⁶National Institute of Geophysics and Volcanology (INGV), Rome, Italy, ⁷University of California - Davis, Davis, USA, ⁸University of Minnesota, St Paul, USA, ⁹NOAA/PMEL, Seattle, USA, ¹⁰University of Waikato, Hamilton, New Zealand

10E: Varved and high-resolution lacustrine sequences as records of climate change, anthropogenic impact and extreme events, Rongomātāne B (Level 1), January 30, 2026, 11:00 AM - 12:30 PM

Large rainfall events and associated floods are one of the costliest natural hazards with significant societal and environmental impact. Intensification of the hydrological cycle and an increase in the frequency of extreme events is an expected consequence of anthropogenic climate change. A robust understanding of regional influences on precipitation, including extreme pluvial events and floods, is required to reduce uncertainty in decision making as communities develop plans to adapt to changing climate. Detecting and projecting changes in regional extreme precipitation remains challenging. Forecasts rely on physics-based climate simulations (GCM's) and statistical learning models that require constraints from long observational datasets of historical precipitation change.

Compilations of meteorological records dating back to the 17th century offer crucial insight into interannual-to-decadal variations in climate. However, long time series that span multiple cycles of key climate modes (e.g., Interdecadal Pacific Oscillation) are rare, and their spatial distribution is limited. New high fidelity climate reconstructions that span multi-centennial and multi-millennial time periods at regional scale are required to reduce uncertainties regarding historical and future climate change. Varved lake sequences offer such records. Here we discuss an annually resolved flood frequency record from a sedimentary sequence recovered in a 19 m-long section of core from Lake Ohau, South Island, New Zealand. Environmental monitoring in the lake and surrounding region allows us to link regional hydroclimate to lake dynamics and sedimentary processes and the influence of precipitation on the sedimentary record is well established. This well-dated sequence offers a means to examine the frequency, pattern, and drivers of lake inflow events over the past 2600 years in a region of our planet where these data are sparse. Integration of data with synoptic scale climate analyses provides insight into the changing influence of key climate modes on the position and strength of the Southern Hemisphere Westerly Winds.

Who Is Providing and What Is Driving the Muddy Subaqueous Deltas Obliquely along the Quaternary South China Sea Margin?

Dr Xubiao Li¹

¹Southwest Petroleum University, Chengdu, China

2A: Next Generation Sediment Provenance (2), Tāwhirimātea A (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

Up to 2 km-high muddy shelf-margin clinoforms are well preserved along the Quaternary north-western South China Sea (NW SCS). However, key questions regarding the source providers and fairway drivers of these abundant siliciclastic sediments in the source-to-sink pattern are still debated. Detrital zircon U-Pb dating, rare earth elements and heavy minerals from this succession SCS show that epidote and garnet are relatively abundant in both shelf and deep-water settings, suggesting a high-grade metamorphic provenance. Major zircon U-Pb ages (254, 418, 751, and 1848 Ma) and negative Eu anomalies indicate Red River-sourced sediments. In contrast, only shelf-located samples signalling Yanshanian age peaks reveal that sediments derived from Hainan are localized, mainly along a coastal zone. In addition, Central Vietnam was a main sediment contributor to the accreting abyssal plain area of NW SCS. Zircon age-based mixture modelling of well-defined provenance end-members demonstrates that a Red River source dominates the Quaternary shelf margins (> 70%). Furthermore, the values decline from 88% to 71% eastwards, indicating a nearly 200 km-lateral sediment spread along the Quaternary shelf-margin. This type of highly skewed source-to-sink pattern is not often described and likely results jointly from two possible drivers: (1) the increased and varying clastic influx from Red River drainages due to the strengthening of the East Asian monsoon and the high amplitudes of Icehouse eustatic sea-level fluctuation; (2) a-NE-striking, strong oceanic surface flow of the South China Sea Warm Current (SCSWC) along the outer-shelf to shelf-margin isobaths (100-300 m). These currents likely drove muddy subaqueous shelf deltas extensively along strike as well as spilled sediment across the shelf break as evidenced by oblique accretion of the shelf margin. This study provides a precise and unique example of the interaction between oceanic-current flow and laterally skewed routing systems of shelf and shelf-margin deposits.

Sediment Dynamics and Their Influence on Sedimentary Processes in Semi-Enclosed vs. Half-Open Bays

Dr Xin Li^{1,2}, Professor Qingbin Xie^{1,2,3}, Professor Longwei Qiu³, Professor Coco Giovanni⁴

¹China University of Petroleum-Beijing at Karamay, Karamay, China,

²Xinjiang Key Laboratory of Intelligent Petroleum Exploration and Engineering, Karamay, China,

³China University of Petroleum-Beijing, Beijing, China, ⁴China University of Petroleum-East China,

Qingdao, China, ⁵University of Auckland, Auckland, New Zealand

3C: Coastal to shelf environments across time and space (3), Tāwhirimātea E (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

The openness index is defined as the ratio of the width of the inlet throat to the length of the bay's shoreline. Based on this metric, bays are classified into four categories: open bays (>0.2), half-open bays ($0.1-0.2$), semi-enclosed bays ($0.01-0.1$), and enclosed bays (<0.01). Among these, half-open and semi-enclosed bays exhibit particularly complex sedimentary dynamics and geomorphological evolutionary processes compared to their open and enclosed counterparts. Therefore, it is of great significance to study the influence of sedimentary dynamics on the sedimentary process in semi-closed and half-open bays. Remote sensing imagery and 1:5,000-scale maps were used to calculate the openness of 92 bays along the Shandong Peninsula of China. Through model simplification, Delft3D was employed to numerically simulate evolutionary processes under hydrodynamic conditions in semi-enclosed and half-open bays using a single-factor control approach.

The results show that under tidal dominance alone, semi-enclosed bays display stronger tidal dynamics than half-open bays, leading to the formation of multiple secondary tidal channels extending both seaward and bayward at the inlet throat, accompanied by small "M"-shaped or "W"-shaped fan complexes. When both tidal and wave forces act in combination, waves can penetrate semi-enclosed bays through narrow inlet throats, though wave action remains more pronounced in half-open bays. The two types of bays are dominated by regular fan-shaped sediments. Within the bays, waves exhibit a greater capacity for sediment transport and transformation compared to tides. Prevailing winds further amplify the energy of both waves and tides, particularly enhancing wave-driven sediment dynamics. Sedimentary numerical simulations enable the clarification of sedimentary evolution across different temporal sequences and dynamic conditions. By applying the geological principle of "the present is the key to the past," this study contributes to advancing the theory of land-sea interactions and addressing knowledge gaps in sedimentary dynamics-geomorphology coupling within land-sea transition zones.

Postglacial Mud Mounds in Queen Charlotte Strait, Western Canada, in Relation to Glacially Shaped Accommodation Space

Dr Zhen Li¹, Cooper Stacey¹

¹Geological Survey of Canada-Pacific, Natural Resources Canada, Institute of Ocean Sciences, Sidney, Canada

4C: Coastal to shelf environments across time and space (4), Tāwhirimātea E (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

Queen Charlotte Strait (QCSt), located between northern Vancouver Island and the mainland of British Columbia, is one of the critical waterways in western Canada. Postglacial mud is extensively distributed in its central basin. In this study, properties of the postglacial depositional architecture and sediment distribution within the depressions of the strait have been investigated using data of multibeam bathymetry and sub-bottom profiles, seafloor photographs, surface sediment samples, sediment cores, radiocarbon dates, and Pb-210 activity data. We found that there are several large mud mounds, which are bounded by moraines and old glacial diamictons or ridges formed during previous glaciations, with maximum thicknesses ranging from 30 to ~60 m, and the accumulation rates vary from several decades to over 100 cm/ka. The areas of thick mud mounds are characterized by weak bottom currents, indicating a dynamic interaction between inherited glacial morphology and modern hydrodynamic conditions. The mud is likely from adjacent glacial marine deposits or other non-mud areas separated by moraines, where the bottom currents are strong, as evidenced by the occurrence of sand waves and erosive scours.

These findings highlight the dual influence of glacial and bottom-current activity in controlling accommodation space, sediment distribution and shaping modern seafloor morphology, offering valuable insights into analogous processes on other glaciated continental shelves.

Time Machine: Transforming Paleogeographic Reconstruction with an Integrated Browser-Based Platform

Dr Haipeng Li¹, Mr. Han Cheng¹, Prof. Christopher Scotese², Dr. Christian Verard³, Prof. Mingcai Hou¹, Prof. Chengshan Wang⁴

¹Chengdu University of Technology, Chengdu, China, ²Northwestern University, Evanston, United States, ³University of Geneva, Geneva, Switzerland, ⁴China University of Geosciences, Beijing, China

3E: Geoheritage and geodiversity of the sedimentary record & Open Science in Sedimentology, Rongomātāne B (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

Time Machine (<https://deeptime.world/>), a novel browser-based platform, transforms paleogeographic reconstruction by overcoming critical data acquisition, integration, visualization, and reproducibility challenges inherent in traditional, fragmented workflows. The platform achieves this by integrating multiple global plate motion models, comprehensive paleogeographic atlases, and cross-database querying functionalities into an intuitive web interface. It delivers instantaneous paleo-coordinate projections onto temporally precise paleogeographic maps through GPU-accelerated rasterization and ensures seamless integration of diverse geological, paleontological, and paleoclimatic data via an innovative spatiotemporal framework. Consequently, Time Machine provides researchers with dynamic data visualizations, interactive paleogeographic evolution charts, and cloud-based project management, significantly enhancing data transparency and reproducibility. A Cretaceous paleogeographic reconstruction case study substantiates the platform's capacity to improve the accessibility, accuracy, and collaborative nature of paleogeographic research, marking a substantial advancement in the field.

Low Temperature Dolomitization in the Mesoproterozoic Tieling Formation in North China: Evidence from Clumped Isotopes

Pingping Li¹, Shijie He, Fang Hao, Yongfei Jiao, Haobo Chai, Yaxuan Gao, Runze Tao, Mingliang Sun

¹China University of Petroleum (Beijing), Beijing, China

5B: Carbonate systems and processes (4), Tāwhirimātea C (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

The Meso-Neoproterozoic strata contain thick dolostone deposits, which have long been regarded as part of the "dolomite problem." Thick dolostones (cumulative thickness exceeding 5,000 m) are widely developed in the Mesoproterozoic Tieling Formation, Wumishan Formation, and Gaoyuzhuang Formation of the North China Craton. These dolostones have been interpreted as either primary or penecontemporaneous dolomites based on petrological and geochemical evidence, but no direct temperature data or constraints on the nature of the dolomitizing fluids have been provided. In this study, we collected dolostone samples from the Mesoproterozoic Tieling Formation on the northern margin of the North China Craton and conducted systematic clumped isotope analyses to determine the formation temperature of the dolomite and the oxygen isotope composition of the dolomitizing fluids. Petrological observations reveal that the dolostones of Tieling Formation are mainly micritic dolomites, with dolomite crystal sizes ranging from 7 to 17 μm (average 13.3 μm), and with dull cathodoluminescence. These indicate that these dolostones have not undergone significant recrystallization and can thus be used to study their initial formation. The clumped isotope (Δ_{47}) temperatures of the dolostones range from 29.6 to 32.7°C, representing the lowest reported formation temperatures for Mesoproterozoic dolostones to date. Dual clumped isotope (Δ_{47} and Δ_{48}) analyses confirm that the dolomites reached clumped isotope equilibrium. Additionally, the maximum burial temperature of the strata, constrained by the thermal maturity of organic matter in adjacent layers, was below 120°C, indicating that the clumped isotope signatures of the dolostones were not reset in the solid state. These analyses suggest that the clumped isotope temperatures of the Tieling Formation dolostones can reliably represent their initial precipitation temperatures. Finally, the initial formation temperature of the Tieling Formation dolostones is slightly higher than the precipitation temperature (26–28°C, representing seawater temperature) of coeval limestones, supporting a penecontemporaneous origin for these dolostones. Furthermore, the oxygen isotope composition of the dolomitizing fluids is similar to that of coeval seawater, further indicating that the diagenetic fluids were primarily contemporaneous seawater. This study provides robust temperature data for dolomite formation, offering new insights into resolving the Meso-Neoproterozoic dolomite problem.

Morpho-Dynamics in Fan Deltas: Effect of Topography on Flow Transformation, Facies Distribution and Graded Profile Evolution

Dr Shunli Li¹, Prof. Xinghe Yu, Mr. Hongwei Sun

¹China University of Geosciences, Beijing, Beijing, China

9F: Sediment gravity flow deposits in lacustrine basins (1), Rongomātāne C (Level 1), January 29, 2026, 4:25 PM - 5:55 PM

Fan deltas are usually constructed through episodic flood events with debris flow transforming to hyper-concentrated flow during sediments proceeding. However, the role of topography in controlling the flow transformation and sediment aggradation has been less studied. This constrains studies of sediment distribution and understanding of graded profile. For lake basin sequences, geomorphological control is much stronger than lake level rise and fall. Under extreme conditions, sediments can still prograde when the lake level rises. Therefore, describing the influence of geomorphology on the flow transformation and stacking pattern of the lobes can provide a deeper understanding of the controlling factors of the lake basin stratigraphy sequence. Xiligou lake (XLG) fan delta from Xisai Basin provides an optimal case for addressing this issue. Three lobes developed on the XLG fan delta with significant differences in their morphologies, architectures, lithofacies, sediment distributions and topographies. Through trenching, drone photography, and satellite data, we analyzed the structure of the sediments and the distribution of sedimentary facies. Based on the analysis of debris flow and hyper-concentrated flow deposits, two transformation models corresponding to different topographies were established. Sediment unloading is caused by a frictional reduction or a sudden momentum loss in the sediments flow's carrying capacity, allowing the debris flow transforms to hyper-concentrated flow and then to stream flow during the movement. The role of topography in controlling sediment flow transformation and sediment distribution is clarified through forces analysis of sediment grain.

Gravity Flow under the Constraints of Indosinian Movement and Soft-Sediment Deformation—Evidence from the Lacustrine Sedimentation of the Western Thrusting Belt, Ordos Basin.

Mr. Xingyu Li¹, Dr Zaixing Jiang¹, Mr Chengchun Liang², Ms Yuxuan Qin³

¹China University of Geosciences (Beijing), Beijing, China, ²North China Oil and Gas Branch, SINOPEC, Zhengzhou, ³Fudan University Institute of Higher Education, Shanghai, 中国

9F: Sediment gravity flow deposits in lacustrine basins (1), Rongomātāne C (Level 1), January 29, 2026, 4:25 PM - 5:55 PM

The western Mahuangshan area is located at the western thrusting belt, Ordos Basin. Due to the influence of tectonic movements since the Indosinian period, the study area has formed a complex geological structural characteristic. The Chang 62 Sub-member is an important exploration and development unit in the western Mahuangshan area, characterized by numerous structures resulting from soft-sediment deformation structures (SSDS). Currently, a mature understanding of the sedimentary system and trigger mechanisms of the SSDS are still lacking, with the relationship between SSDS and the structural background remaining unclear. This study, based on core observations, logging and drilling data, combined with mineral composition, particle size distribution, and dating analysis tests, identifies the storm deposits and gravity flow deposits triggered by storms, furthermore, it clarifies their formation processes and products. Importantly, it reveals the mechanisms and indicative significance of SSDS under the constraints of the Indosinian movement. The results indicate that the Chang 62 Sub-member belongs to the storm sedimentary system, characterized by storm and gravity flow deposits; A complete storm sediment presents a "Bouma-like sequence" vertically, reflecting the variations in the strength of the storm; The U-Pb dating clarified the sedimentation period of Chang 62 Sub-member corresponds to the early Indosinian movement which primarily altered the structural stress field, providing the initial driving conditions for SSDS; The SSDS is jointly controlled by storm, earthquake, and earthquake-storm interaction, with lithofacies evolution shaped by geography, fault distribution, water depth, while its scale and degree are controlled by different driving factors. This study reveals the spatiotemporal evolution characteristics and driving factors of SSDS under the Indosinian movement, enriching the genetic theory of SSDS in storm deposits and storm-driven gravity flow deposition. At the same time, it provides important insights for the recovery and prediction of extreme disaster events.

Lacustrine Deposition in Response to the Middle Eocene Climate Evolution and Tectonic Activities, Bohai Bay Basin, China

Prof. Qing Li¹, Professor Xuelian You²

¹China University of Petroleum (Beijing), Beijing, China, ²China University of Geosciences (Beijing), Beijing, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The lower unit of the third member of the Eocene Shahejie Formation (Es3L, 42.5 to ~40Ma) is one of the most important petroleum exploration targets in the Bohai Bay Basin. Lacustrine deposits are widely distributed in the Es3L unit of the Shulu Sag and display strong vertical and horizontal variations in lithofacies and geochemical characteristics. Based on core data, thin-section petrography, stable $\delta^{13}\text{C}$ isotope analyses, and organic geochemistry data, eight lithofacies and six evolutionary lake stages are identified. Combining the results of the astronomical time scale (ATS) and the radiometric age, the correlation between the evolutionary lake stages of Es3L and the Eocene global climate curve was illustrated. Tectonic movement caused the basin to subside and resulted in shallow lake formation (Stage 1) during the cooling phase prior to the Middle Eocene Climatic Optimum (MECO); then, the lake level began to rise (Stage 2) with an increasingly warm and humid climate. Stage 3 corresponds to the peak of the MECO and was influenced by the warm and humid climate during the thermal maximum period, forming a deep, freshwater lake. This stage was followed by highly turbulent lake conditions (Stage 4), which were influenced by both the cooling climate and intensive tectonic activity. Subsequently, a stable lake (Stage 5) was formed, which was mainly controlled by the slightly warming climate since the tectonic movement was relatively stable, followed by another stage of turbulent lake conditions (Stage 6). The results show that the global mid-Eocene climate played an important role in the relative lake level changes and TOC enrichment. The MECO led to a rise in the relative sea-level and the obvious rise in relative lake-level in the Bohai Bay Basin. The evolution of the depositional settings was controlled by both global climate and tectonic activities and accounted for the deposition and distribution of lithofacies with distinctly different characteristics and origins.

Quaternary Magnetic Stratigraphic Framework for the U1526B Cores, IODP Expedition 375 From the Northern Hikurangi Subduction Margin: Constraints for Sedimentary, Paleogeographic and Volcanic Reconstruction

Mr Xuesen Li¹

¹Guilin University of Technology, Guilin, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The slow slip events (SSE) in northern Hikurangi subduction margin are characterized by shallow distribution depth and frequent occurrence, making it an important research site for global studies on slow slip events. The scientific objective of the IODP 375 expedition is to study the mechanism and process of the slow slip events (SSE) in the Hikurangi subduction zone. Through conducting alternating demagnetization (AF) processing on the core samples, combined with lithostratigraphy and biostratigraphy, and comparing with the standard GPTS, the polarity chronology column of the U1526B borehole is established. Two important polarity boundary lines, the Blake polarity drift event (0.116- 0.108 Ma), the Jaramillo positive polarity event (0.90- 0.97 Ma), and the Olduvai positive polarity event (1.67- 1.87 Ma), as well as three polarity events and a local Gaussian positive polarity period, are identified. Based on the established polarity chronology column, the sedimentation rate is calculated to reveal the sedimentary and tectonic environments of each polarity period. In addition, by using the relationship between magnetic inclination and latitude, the latitude of the sediment in each polarity period is calculated, thereby inferring the relative motion direction of Tūranganui Knoll seamount from 2.58 Ma to the present. Finally, through the magnetic stratigraphy features, additional details of volcanic ash layers are added to the lithostratigraphy, and the volcanic activities are identified through the core profile and magnetic susceptibility data.

Surface Geology and Sediment Dynamics of the Pacific Coast: Baseline Geoscience for Marine Spatial Planning in British Columbia, Canada

Cooper Stacey¹, **Zhen Li**¹, Karen Douglas¹, Kim Conway¹, Randy Enkin¹, Dr Jordan Eamer², Dr John Shaw², Kai Boggild², Dr Vaughn Barrie¹, Tark Hamilton¹, Robert Kung¹, Dr Gwyn Lintern¹, Phil Hill¹, Thomas Carson¹, Angus Robertson², Peter Pledge², Laura Broom², Brett Pickrill², Pauline Martens¹, Felix Parkinson¹, Anna Podhorodeski¹

¹Geological Survey of Canada-Pacific, Natural Resources Canada, Institute of Ocean Sciences, Sidney, Canada, ²Geological Survey of Canada-Atlantic, Natural Resources Canada, Bedford Institute of Oceanography, Dartmouth, Canada

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The modern seafloor sediments and geomorphic features along the west coast of Canada have been shaped by a complex interplay of tectonic activity, glacial and deglacial processes, sea-level fluctuations, vigorous hydrodynamic forces, and shifting current regimes. Marine spatial planning (MSP) in such dynamic coastal and shelf environments requires high-resolution geological and geomorphological datasets. The Geological Survey of Canada (GSC), a branch of the Canadian Department of Natural Resources, in partnership with Fisheries and Oceans Canada, is conducting a comprehensive seabed mapping initiative along the Pacific coast of British Columbia. The objective is to develop robust surficial geological and sedimentological baselines that underpin regional MSP frameworks and cumulative effects assessments. More than 19,000 km² of new multibeam bathymetric data and approximately 50,000 km of sub-bottom profiles have been acquired through collaboration with the Canadian Hydrographic Service. Complemented by seabed photography, surface sediment samples, and over 17,000 archived grain-size records, these datasets have been thoroughly analyzed to identify surficial geology and have facilitated the creation of a series of geospatial products, including multi-resolution digital elevation models, surficial geology and geomorphology maps of various regions, and a semi-automated seabed classification model built using Esri ArcGIS. The resulting maps reveal distinct sedimentary and geomorphic features across the west coast of Canada, highlighting sediment transport dynamics and facies heterogeneity on Dogfish Bank; submarine channel incision offshore the Nass River; deglacial volcanoclastic sequences in Milbanke Sound; glacial retreat features in Queen Charlotte Strait; hydrocarbon seepage and gas venting structures on Swiftsure Bank; and anthropogenic seafloor disturbance across the Salish Sea. All data products will be made publicly available through the Government of Canada's Open Data Portal (<https://open.canada.ca>), contributing a vital geoscientific foundation for integrated ocean management and long-term environmental stewardship.

New Discovery of †Elcanoidea (Orthoptera) From Mid-Cretaceous Kachin Amber in Northern Myanmar

博士 Lingwei Li^{1,2,3,4}, Professor André Nel⁴, Postdoctoral Chunpeng Xu^{2,3,5}, Professor Zhiping Wu¹, Professor Bo Wang^{2,3}

¹China University of Petroleum (East China), Qingdao, China, ²Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing, China, ³State Key Laboratory of Palaeobiology and Stratigraphy, Nanjing Institute of Geology and Palaeontology and Center for Excellence in Life and Palaeoenvironment, Chinese Academy of Sciences, Nanjing, China, ⁴Institut de Systématique, Évolution, Biodiversité (ISYEB), MNHN, Paris, France, ⁵Institut für Zoologie und Evolutionsforschung, Friedrich-Schiller-Universität Jena, Jena, Germany

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Here we present new Burmese amber Elcanidae, viz. a new genus (*Kachinelcana* gen. nov.) and three new species (*Elca oblica* sp. nov., *K. elongata* sp. nov., *Probaisselcana kachinensis* sp. nov.), increasing the knowledge on the morphological diversity and ecological adaptations of the family. Characteristics of the new taxa include (1) wing vein specialization, such as morphological differences in the wing nevus of *Elca oblica*, a unique forewing vein sequence in *K. elongata* (the most recent and first amber record of the subfamily Archelcaninae), and a double row of spiny spurs on the hind tibia of *P. kachinensis*; (2) three-dimensionally preserved intact body structures such as the extra-long filiform antennae, specialized hind tibial spurs, and a hint that short-winged Elcanidae may have had the ability to jump, providing a new direction for the study of locomotor behavior in †Elcanidae, which may be related to their survival and predation avoidance; (3) the diversity in the female ovipositor of †Elcanidae, contrasting between the elongate, needle-like ovipositor of *P. kachinensis* vs the short falcate ovipositor of some other species, reflecting ecological differentiation, possibly related to bark fissure penetration vs soil burial. The study confirms that Burmese amber fossils can break through the limitations of compression specimens to fully analyze the morpho-functional associations of extinct taxa. The new discoveries not only enrich the biodiversity of the mid-Cretaceous †Elcanidae, but also reveal the potential connection between their locomotor behaviors and ecological adaptations, providing key empirical evidence for the study of the early radiation and behavioral evolutionary mechanism of this group of Orthoptera.

Origin and Spatial Distribution of Argillaceous and Calcareous Interlayers in a Miocene Wave-Dominated Coastal Bar Reservoir from South China Sea

Ms Lin Li¹, Professor Keyu Liu¹, Associate Professor Taixun Liu¹, Mr. Ning Lv¹

¹China University of Petroleum (East China), Qingdao, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Reservoir interlayers are natural fluid barriers and their spatial distribution within a reservoir may pose significant challenges for oil and gas development. Two types of reservoir interlayers, namely argillaceous layers and calcareous layers, are widely developed within a Miocene wave-dominated coastal bar reservoir in South China Sea. An integrated analysis of seismic, well log and core data employing seismic sedimentology, isotope geochemistry and stratigraphic forward modeling was conducted to delineate the spatial distribution of the reservoir interlayers and to unravel their formation mechanisms. The argillaceous interlayers comprise predominantly silty mudstone or argillaceous siltstone, whereas the calcareous interlayers consist mainly of light gray medium and fine sandstone, which is tightly cemented in patches. The argillaceous interlayers are relatively thick and extensive laterally. Stratigraphic forward modeling indicates that they are intimately associated with marine flooding surfaces relating to high-frequency (5th to 6th order) eustatic sea level fluctuations. The argillaceous interlayers were developed as fine-grained sedimentary facies under weakening hydrodynamic conditions. The calcareous interlayers are categorized into two types in the studied coastal bar reservoir: top calcareous interlayers and internal calcareous interlayers. The top calcareous interlayers are controlled by marine transgression, whereas the internal calcareous interlayers are primarily controlled by local sedimentary microfacies and/or depositional hiatus. Petrographic characterization and carbon isotope analysis suggest that the top calcareous interlayers are of early diagenetic origin and were developed by early diagenesis involving dissolution and massive cementation of biological debris by meteoric water under low precipitation temperatures of 20 to 40°C and are characterized by a $\delta^{13}\text{C}$ ratio comparable to modern marine biological debris; while the internal calcareous interlayers were formed by dissolution and cementation of biological debris involving decarboxylation of organic acids derived from hydrocarbon charge as revealed by their extremely light $\delta^{13}\text{C}$ ratios of -33‰.

The Delta-Fluvial Evolution of a Lacustrine Basin with Gentle Slope and Low Sedimentation Rate: A Case Study of the Fudong Slope, Junggar Basin, Northwest China

Prof Shengli Li¹, Dr. Xinghe Yu¹

¹China University of Geosciences, Beijing, Beijing, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Gentle slope belts of lacustrine basins are important areas for the generation of stratigraphic petroleum reservoirs controlled by sedimentary systems. Based on coring, well logging, 3D seismic and analytical test data, the sedimentary system and sandbody distribution characteristics of the Jurassic Toutunhe Formation (J2t) in the Fudong slope of the Junggar Basin were analysed. The results indicated that the Fudong slope showed the characteristics of low sediment input. Sediments mainly originated from the Shaqi uplift, and the sediment input gradually weakened from the early to the late J2t stages. The sedimentary system evolved from a delta to a meandering river, resulting in a delta front facies in the 1st member (J2t1) and a meandering river facies in the 2nd (J2t2) and 3rd (J2t3) members of the Toutunhe Formation. A sedimentary evolution pattern for the gentle slope with low sediment input was established. Thick deltaic sandbodies developed locally in the J2t1 stage. However, meandering rivers with high sinuities predominantly developed and resulted in a striped geometry in the J2t2 and J2t3 members. Moreover, the meandering sandbodies exhibited an anastomosing morphology after multistage superposition. The channel and point bar facies in J2t2 were more developed than those in J2t3 because of sediment input differences. Under low-sediment input conditions, the sedimentary environment of the gentle slope belt in the lacustrine basin was controlled by changes in the palaeoclimate, palaeogeomorphology, gradient (slope) and base level. Palaeoclimate was the main factor controlling the evolution of the sedimentary environment. Palaeogeomorphology and slope controlled the distribution of sedimentary microfacies, channel sinuosity and sandbodies. Base-level change restricted the sandbody superimposition style.

Cretaceous Source-to-Sink Systems in the Southeastern Tibetan Plateau

Doctor Zhiwu Li¹, Lecturer Zijian Wang¹, Professor Chihua Wu¹, Professor Shugen Liu¹, Lecturer Chaoqun Yang¹, Lecturer Kui Tong¹, Lecturer Jie Hu¹

¹State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Chengdu University of Technology, Chengdu, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Tibetan Plateau is the origin of continental-scale giant river systems in Asia, the uplift of which has long been a central focus and frontier topic in global geoscientific research. Existing tectonic and low-temperature thermochronological studies indicate that both the interior and eastern regions of the plateau underwent significant uplift and erosion during the transition between the mid- and late Cretaceous, resulting in the production of substantial volumes of clastic material. However, the ultimate sedimentary sinks of these materials remain unclear. Reconstructing the source-to-sink systems of the southeastern margin of the Tibetan Plateau during the Cretaceous is therefore critical for evaluating the plateau's initial topography prior to the India-Eurasia collision, and for understanding the early uplift processes of the plateau as well as the evolution of adjacent sedimentary basins.

A series of Cretaceous basins are distributed along the southeastern margin of the Tibetan Plateau, including the Sichuan, Chuxiong, Lanping-Simao, and Khorat basins. The red-bed sedimentary sequences developed within these basins provide a significant insight into the uplift and erosion histories, the contributions from major source areas, the sedimentary-tectonic evolution, and the paleogeographic and drainage reorganizations of the southeastern margin of the Tibetan Plateau. This study focuses on the detailed sedimentology, paleocurrent and provenance analyses of these Cretaceous basins along the eastern margin of the plateau. In particular, detrital single-mineral geochronology and geochemistry are employed for provenance tracing and correlation. Combined with previous research, the study explores the Cretaceous evolution of source-to-sink systems and basin-mountain architecture along the southeastern margin of the Tibetan Plateau. The results reveal that: (1) Beginning in the mid-Cretaceous, sediment sources expanded from the basin margins into the plateau's interior, with two significant shifts occurring at ~120 Ma and ~80 Ma. (2) During the Cretaceous, the eastern Tibetan Plateau likely developed into a paleo-Plateau with considerable scale, resulting in elevated landform with regional rapid denudation. This supplied vast amounts of sediment to the surrounding basins and intensified climatic aridification, promoting the evaporite and aeolian deposition. (3) During the Early Cretaceous, the Khorat basin was likely directly connected to the southern margin of the Paleo-Yangtze lacustrine system. During the Late Cretaceous, the uplift of the paleo-Ailaoshan-Red River tectonic belt separated the Paleo-Yangtze and Lanping-Simao-Khorat lacustrine systems. This resulted in a significant provenance shift and drainage reorganization, potentially promoting clastic sediments from the western margin of the Upper Yangtze to be transported via the paleo-Red River system to what is now the South China Sea.

Sedimentary Architecture Unit Classification and Structural Style of Marine-Continental Transitional Shales

先生 **Yueli Liang**¹

¹South West Petroleum University, Chengdu, China

8C: Sedimentology of Black Shales through Phanerozoic (3), Tāwhirimātea E (Level 2), January 29, 2026, 1:40 PM - 3:10 PM

Marine-continental transitional shales are important reservoirs with significant exploration potential. However, their thin layers, rapid facies changes, and strong heterogeneity pose challenges for fine-scale characterization, limiting efficient gas development. Based on the theory of cyclostratigraphy and geomorphology, this study divides the early Permian Shanxi Formation in Ordos Basin into vertical architectural interface and lateral architectural boundary and establishes the depositional architectural model of marine-continental transitional shale. The results show that the GR data series of the Shanxi Formation record three main astronomical cycles: 1.2 Myr long obliquity cycle, 405 kyr long eccentricity cycle, and 100 kyr short eccentricity cycle. The 1.2 Myr long obliquity cycle has a good coupling relationship with the third-order sequence, corresponding to the third-order architectural units, with a thickness of tens of meters. The 405 kyr and 100 kyr eccentricity cycles have a good correspondence with the fourth-order and fifth-order sequences, corresponding to the fourth-order and fifth-order architectural units. Fourth-order architectural units are typically tens of meters thick, with boundaries marked by facies changes. Fifth-order units are a few meters thick, with boundaries corresponding to subfacies transitions. Secondly, the lateral architectural boundaries of transitional shale are by sedimentary facies change and karst palaeogeomorphology. The lateral boundaries of third-order architecture are controlled by the interface of sedimentary system transformation. and the shale is abundantly developed in the lagoon facies and gradually pinched out near facies boundaries. Fourth- and fifth-order lateral boundaries are influenced by karst palaeogeomorphology. Within karst depressions, shale occurs as lenticular bodies with limited lateral continuity, whereas outside the depressions, shale becomes more tabular and laterally extensive. Well log data indicate a significant negative correlation between the thickness and width of Lower Permian transitional shale and the thickness of the overlying Dongdayao limestone (Taiyuan Formation). This correlation weakens with increasing distance from karst depressions, suggesting that the influence of paleogeomorphology on shale development decreases laterally.

Organoclastic Sulfate Reduction in the Sulfate-Methane Transition Zone: Petrographic and In-Situ Sulfur Isotope Evidence from Early Silurian Nodules

Professor Chao Liang¹, Dr Shichao Ji¹, Dr Yingchang Cao¹

¹China University of Petroleum (East China), Qingdao City, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The sulfate-methane transition zone (SMTZ) is the terminal zone for marine sulfate reduction, where the anaerobic oxidation of methane (AOM-SR) links the carbon and sulfur cycles and influences the surface redox balance. During the Early Silurian, extensive marine transgressions and forced regressions driven by the Guangxi Orogeny on the South China Block caused paleo-SMTZ fluctuations and widespread nodule accumulation. This study integrates petrographic observations with NanoSIMS in-situ sulfur isotope analysis of pyrite from two representative nodule types of the Aeronian Stage to elucidate their formation and record of paleo-SMTZ dynamics.

The genesis of these nodules is linked to the SMTZ by the presence of diagenetic barite and ³⁴S-enriched pyrite. Authigenic growth sequences revealed by sedimentary microtextures, together with pronounced heterogeneity in $\delta^{34}\text{S}_{\text{pyrite}}$ values, point to a multi-stage formation process. In Type-1 nodules, $\delta^{34}\text{S}_{\text{pyrite}}$ values at the edges (as low as 8.6‰) are significantly lower than those at the centers (up to 18.8‰). At the individual grain scale, $\delta^{34}\text{S}$ values vary from -1.9‰ to 29.1‰. A three-stage model is proposed: (1) formation of nodule embryos with ³⁴S-depleted pyrite edges in the sulfate reduction zone, based on a diffusion-precipitation model; (2) nodule growth within the SMTZ, where barite dissolution and reprecipitation facilitate the formation of ³⁴S-enriched euhedral pyrite and generate strong sulfur isotope heterogeneity within grains; and (3) extensive replacement of barite by other minerals below the SMTZ due to sulfate depletion.

For Type-2 nodules, a pronounced concentric structure indicates multiple formation episodes, with an initial stage congruent with Type-1 nodules and subsequent edge formation involving needle-shaped minerals responding to vertical SMTZ shifts. Notably, calcite—a mineral typically associated with SMTZs—is scarce within these nodules. Instead, quartz acts as the primary nodule matrix and commonly forms pseudomorphic replacements after barite. The substantial enrichment of quartz over calcite is interpreted as a consequence of microbial activity altering pore water pH and alkalinity, thereby serving as a petrographic fingerprint for organoclastic sulfate reduction within paleo-SMTZs.

Fluvial Response to Global Warming on Northern South China Sea Shelf during the Middle Miocene Climate Optimum

Ms Li'e Lin¹, Prof Haiteng Zhuo¹, Mr Zhigao Li², Mr Weitao Chen²

¹Sun Yat-sen University, Zhuhai City/ Xiangzhou District/ Tangjiangwan Town, China, ²Shenzhen Branch of CNOOC (China), Shenzhen City/ Nanshan District, China

8E: Deciphering climate and environmental records in shallow marine environments across space and time (2), Rongomātāne B (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

Climatic forcing shapes fluvial stratigraphic architecture by influencing water discharge, sediment flux, and vegetation dynamics. However, climatic signatures in low-latitude fluvial stratigraphy under intensified monsoonal conditions is complicated by the fluvial avulsion, lateral and down-dip accretion within the sediment routing system, thus remains controversial. The middle Miocene Climate Optimum (MMCO), recognized as a sustained global warming phase of the Miocene epoch, has been proposed to be an eccentricity-modulated geologic analogue for anthropogenic climate change. Here we evaluate the fluvial response in the northern shelf of the South China Sea to the MMCO based on 3D seismic data, well logs and chronostratigraphic constraints. Synchronous with the delineation of the MMCO, our findings document a basin-wide shift to thick, multi-staged braided fluvial systems characterized by variable channel types, dimensions and erosional sedimentary structures. Seismic geomorphology shows that higher discharge variability widened (>3 km in width) and deepened the channel systems (five times greater than the mean channel depth), preserving lateral accretion features and linear erosional bedforms. This progradation of coarse-grained lithofacies and strengthened erosional degree match model predictions for rapid increases in sediment flux (ca. 80% rise in average) and discharge (ca. 68% increase in average), opposite to rising global sea-level and dense vegetation conditions. Fluvial systems in this study persisted well beyond the around 2-million-year MMCO, characterized by progressive weakening of erosional signatures and periodic variations in fluvial dimension, ultimately terminating development of large braided channel systems and reflecting a gradual return to periodic sea-level control. Our results reveal that prolonged warm and humid climatic conditions drive increased discharge in fluvial systems, triggering intensified lateral channel accretion and drastic erosion, thereby providing predictive insights into low-latitude fluvial responses to future warming scenarios.

Accelerated Channel Migration and Planform Morphodynamics in the Upper Yarlung Tsangpo River

Dr. Zhipeng Lin¹

¹Sichuan University, Chengdu, China

6D: The complexity of braided rivers that reach the base level, Rongomātāne A (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

River meandering and lateral migration pose significant global threats to soil stability, sediment flux, and riparian ecosystems. While these processes are well-studied in lowland floodplains, the morphodynamics of upland alluvial rivers, particularly in periglacial environments, remain poorly understood. This study quantifies accelerated channel migration and planform adjustments in the upper Yarlung Tsangpo River, a high-elevation gravel-bed system in the Himalayan headwaters, from the 1980s to the 2010s. Integrating multi-decadal remote sensing analysis with field investigations, we document a ~69% increase in bend migration rates (from 1.63 m/yr to 2.76 m/yr) and a 30% rise in cutoff frequency, with peak migration rates reaching 18.61 m/yr. The most dynamic bends exhibit width-normalized curvature radii of 3.0–5.0 and sinuosities of 1.2–1.5, suggesting a strong morphometric control on lateral erosion. These changes correlate closely with regional warming (~1°C increase in mean annual air temperature), glacial lake expansion, and enhanced runoff, implicating climate-driven hydrological shifts as a key driver of accelerated morphodynamics. Our findings reveal the exceptional sensitivity of upland alluvial rivers to climatic forcing, with frozen bank erosion playing a critical role in channel adjustment. These results underscore the broader implications of a warming climate on high-elevation fluvial systems, where intensified bank erosion may disrupt sediment regimes and riparian habitats.

Differential Diagenetic Evolution and Formation Mechanism of High-Quality Reservoirs in the Upper Triassic Xujiahe Formation Tight Sandstones under the Influence of Multi-Provenance, Sichuan Basin, China

Professor Liangbiao Lin^{1,2}, Dr. Yu Yu^{1,2}, Mr. Tao Zeng^{1,2}

¹State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Chengdu University of Technology, Chengdu, China, ²Institute of Sedimentary Geology, Chengdu University of Technology, Chengdu, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Upper Triassic Xujiahe Formation in the Sichuan Basin hosts abundant tight sandstone gas resources, but its multi-provenance background has resulted in complex and diverse sandstone compositions. This study focuses on the second and fourth members of the Xujiahe Formation to investigate the rock fabric, reservoir characteristics, and pore formation mechanisms of high-quality reservoirs under multi-provenance influences, as well as the formation mechanisms of such reservoirs under differential diagenetic evolution. The findings aim to provide insights for geological exploration of tight sandstone sequences with similar multi-provenance settings. Key results include: (1) Provenance variations significantly control sandstone compositions, further controlling diagenetic pathways and pore evolution. Near-source areas (e.g., the Western Sichuan Depression and Northern Sichuan) develop feldspar-poor sandstones forming fracture-pore composite systems, while distal mixed-provenance regions (e.g., Central and Southern Sichuan) feature feldspar-rich matrix porosity-dominated reservoirs. (2) High-rigidity clasts, early-stage chlorite coatings, and overpressure systems collectively inhibit compaction and partial cementation, preserving primary intergranular pores in deeply buried (>5000 m) sandstones. (3) Organic acid dissolution, meteoric water leaching, clay mineral transformation, and fracture-related deep fluid dissolution are key drivers of secondary porosity, but exhibit distinct spatiotemporal distributions. The interplay of provenance-driven rock fabric differences, burial-uplift history, fracture development, and fluid-rock reactions has shaped the current reservoir heterogeneity in the Xujiahe Formation sandstones.

Lateral Variations in Tidal-Fluvial Interaction Revealed by 3D Seismic Analysis of the Mid-Miocene Pearl River System, Northern South China Sea

Ms Li'e Lin¹, Prof Haiteng Zhuo¹

¹Sun Yat-sen University, Zhuhai City/ Xiangzhou District/ Tangjiangwan Town, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The South China Sea, as a microtidal marginal sea, provides an exceptional natural laboratory for examining tide-river interplay within deltaic successions. Here, integration of high-resolution three-dimensional seismic data, wireline logs, and core analyses reveals pronounced east-west architectural heterogeneity within the Mid-Miocene Pearl River deltaic system. The eastern distributary complex exhibits distinct tidal signatures including bidirectional cross-stratification, rhythmic mud-sand couplets, inclined heterolithic stratification, and elongate tidal sand ridges with low-angle master bedding. Attribute stratal slices demonstrate limited channel bifurcation indices and restricted lateral migration, consistent with strong tidal dampening. Conversely, the western distributary fluvial system is characterized by unidirectional cross-stratification, upward-fining point bar sequences, multiple crevasse splay deposits, and higher channel bifurcation indices. Channels display multi-storey stacking patterns with extensive lateral accretion surfaces and amalgamated channel belts oriented southwestward, reflecting dominant fluvial processes with minimal tidal influence. Sequence stratigraphic correlations demonstrate that hydrodynamic partitioning persists through multiple parasequence sets. This east-west differentiation stems from differential Pacific tidal influence, where the eastern sector experiences enhanced tidal resonance while the western sector is dominated by fluvial processes and longshore currents. Our findings reveal how spatially variable tidal forcing establishes distinct morphodynamic equilibria that govern deltaic architecture, providing a novel framework for interpreting tidal-fluvial interactions in ancient deltaic systems.

Volcano-Tectonic Coupling Controls on Reservoir Development and Diagenetic Evolution in the Middle Jurassic of the Sichuan Basin, China

先生 **Can Ling**¹, Long Wei Qiu¹, Yong Qiang Yang¹, Lu Lu Zhong

¹China University of Petroleum East China, Qingdao, Shandong Province, China, China

3F: Diagenesis of volcanoclastic sediments, Rongomātāne C (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

This study investigates the formation mechanisms and controlling factors of tuffaceous continental reservoirs in the Middle Jurassic of the Sichuan Basin, China, proposing an innovative "tripartite reservoir-controlling" theoretical model driven by coupled volcanic activity and tectonic compression. Key findings demonstrate that: (1) Tectonic uplift induced phased enhancement of sediment supply, leading to the transition from early confined channel-lacustrine deposits to braided delta systems; (2) A progressive paleoclimatic shift from arid to humid conditions amplified the transport capacity of surface runoff for volcanoclastic materials and facilitated large-scale tuffaceous input triggered by volcanic activity, a process potentially linked to the global Middle Jurassic biotic extinction event; (3) The influx of volcanic materials profoundly altered diagenetic evolution trajectories. Hydrolysis-generated acidic fluid systems promoted a multi-mineral cementation sequence comprising chlorite rim cementation, laumontite pore-filling, and authigenic quartz overgrowths. Early-stage chlorite coating cementation and laumontite densification significantly reduced reservoir permeability, while late-stage organic acid fluids coupled with hydrocarbon charge selectively dissolved chlorite cements, forming favorable reservoir spaces characterized by mesoporous networks connected via micrometer-scale throats. Based on these insights, we establish a volcano-tectonic coupled "tripartite reservoir-controlling" geological model: (a) Paleo-provenance architecture controls reservoir material composition by governing sandbody stacking patterns and spatial distribution; (b) Volcanic hydrothermal activity dominates diagenetic pathways through regulation of silicate mineral hydrolysis-precipitation equilibria; (c) Tectonic compression intensity determines reservoir densification processes and fracture development chronology via differential stress field distribution. This model effectively explains the heterogeneous distribution of high-porosity-permeability reservoirs in lacustrine tight sandstones, clarifies the CO₂ mineral trapping mechanism of volcanic-derived chlorite-laumontite assemblages, and provides critical theoretical and practical guidance for hydrocarbon exploration and CO₂ geological storage site optimization in continental sedimentary basins.

High Productivity and Seaway-Driven Circulation on the Late Cretaceous Arctic Shelf

Dr. Shan Liu¹, Meting Chen¹, Haiyu Fan¹, Zhi Lin Ng¹, Prof. Haiteng Zhuo¹

¹Sun Yat-sen University, Zhuhai, China

5F: Contourites and Mixed Depositional Systems (1), Rongomātāne C (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

The Late Cretaceous was a pivotal period in the paleoceanographic evolution of the Arctic Ocean, transitioning from an open marine system to an enclosed, warm basin. During this time, the Arctic was connected to global ocean circulation primarily through the Western Interior Seaway (WIS) and the Western Siberian Seaway. These connections facilitated significant water mass exchange, influencing regional sedimentation and ecological dynamics. This study integrates detailed stratigraphic analysis with high-resolution seismic interpretation to identify extensive Late Cretaceous contourite drifts (80–66 Ma) and cool-water carbonate mounds on the Chukchi Shelf, situated at the northern outlet of the WIS. The abrupt cessation of these features at 66 Ma aligns with the final closure of the WIS, underscoring its key role in driving thermohaline circulation and bottom current activity in the region.

Unlike the Chukchi Shelf, other Arctic basins lack similar mounded drift deposits, supporting the interpretation that WIS-derived thermohaline forces were the primary driver of Late Cretaceous deep-water circulation. The carbonate mounds further indicate high marine productivity, likely sustained by nutrient-rich waters entering from the WIS and enhanced by regional tidal mixing. These conditions promoted carbonate precipitation and the development of bottom current-controlled depositional systems.

The termination of these processes around 66 Ma coincided with major tectonic events, such as the WIS closure, and a global sea-level fall, resulting in Arctic Ocean isolation and a fundamental shift in sedimentary regimes. This transition reflects the onset of a more restricted Arctic system with diminished bottom current activity. The findings contribute to a refined understanding of Late Cretaceous Arctic paleoceanography and offer critical perspectives on the broader implications of seaway closures for ocean circulation and ecosystem productivity in both ancient and modern contexts.

Sedimentary Evolution and Controlling Factors of Middle Miocene Complex Clinoforms on the Western Shelf, Pearl River Mouth Basin, South China Sea

Weifeng Liu¹, Professor Haiteng Zhuo¹, Weitao Chen², Zhigao Li²

¹Sun Yat-sen University, Zhuhai, China, ²CNOOC Limited - Shenzhen, Shenzhen, China

2C: Coastal to shelf environments across time and space (2), Tāwhirimātea E (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

One of the most critical contemporary challenges in sequence stratigraphy lies in accurately and objectively identifying stratigraphic surfaces and sequences across multiple scales. Clinoforms serve as essential indicators in paleogeographic and paleo-bathymetric studies, while the migration and evolution of their rollover points—specifically the shoreline migration trajectory—have increasingly become a primary analytical tool in sequence stratigraphy. This study employs high-resolution 3D seismic data to interpret the complex clinoforms within the Middle Miocene strata of the Pearl River Mouth Basin's western shelf (South China Sea). Recent rapid advancements in offshore hydrocarbon exploration in this basin have yielded enhanced scientific datasets, including volumetric seismic and core-log data. By utilizing full-volume seismic interpretation techniques that integrate the three-dimensional variability of sequence development, combined with quantitative paleo-clinoform restoration and shoreline trajectory analysis, we have objectively and systematically established a high-resolution sequence stratigraphic framework. Analysis of sedimentary characteristics observed in seismic profiles and plan-view data has identified multiple clinothem developed during distinct evolutionary phases. Quantitative analysis of these clinothems involved calculating and statistically evaluating key parameters (e.g., migration trajectory angle, progradation rate, aggradation rate) to investigate how clinoform characteristics influence the triggering mechanisms of gravity flows on their surfaces. Thickness mapping and RGB-fused attribute slice characterization of clinothems revealed the sedimentary evolution history of the complex clinoform system. Furthermore, this study integrates clinoform depositional modeling (using Dionisos software) with constraints from paleoclimatic conditions, paleo-sea-level fluctuations, and paleo-channel development during the depositional phase. This integrated approach demonstrates how the synergistic interplay among sediment supply, relative sea-level change, tectonic activity, volcanic events, and climatic forcing controlled the Middle Miocene depositional evolution of the western shelf, Pearl River Mouth Basin, South China Sea.

Coupled Tectono-Geomorphic Dynamic and Depositional Modeling: Sedimentary Evolution of a Cretaceous Fluvial-Shallow Marine Sequence in Tarim Basin, China in Response to the Tethys Geodynamic Evolution

Dr Jia Chang¹, **Professor Keyu Liu**¹

¹China University of Petroleum (East China), Qingdao, China

4A: Can Forward Stratigraphic Modeling enhance geological understanding of the subsurface and predict sedimentation through time and space? (1), Tāwhirimātea A (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

The southwestern Tarim Basin in western China sits in the central part of the Tethys belt. The infill of the basin has been profoundly affected by basin-range coupling in response to the Tethyan Geodynamic System, resulting in unique source-to-sink systems and complex tectono-sedimentary regimes. Building upon analysis of basin filling processes and paleo-drainage systems evolution of the basin during the Cretaceous using a basin and landscape dynamics (Badlands) modeling approach, we attempt for the first time to reconstruct the sedimentary evolution of the Cretaceous sequence at basin and reservoir play scales by coupling with a hydrodynamics-based stratigraphic forward modeling (SedSim), in which Badlands provides quantitative sediment input information for SedSim. The Early Cretaceous sediments comprise predominantly alluvial fan and braided river delta sequences. Braided deltaic sand bodies were extensively developed in the northwestern depression with widespread development, while alluvial fan sands exhibit limited lateral continuity. In the Late Cretaceous, climate change and sea-level fluctuations drove major transitions of sedimentary systems. The early Late Cretaceous was occupied by a braided river delta of transitional marine-terrestrial facies with thick sand bodies. By the mid-Late Cretaceous, tidal flat and lagoon systems became dominated with widespread occurrence of fine-grained sediments due to climatic oscillations. Carbonate platforms were developed during marine transgressions in the latest Late Cretaceous, developing wedge-shaped eastward thinning sequences. Sandstone play fairways are identified, offering strategic targets for hydrocarbon exploration including the braided river delta sand bodies of the Early Cretaceous in the Wuboe Structural Belt, dominated by stacked multi-cycle thin sand bodies; braided river delta sand bodies of the Late Cretaceous in the Qibei and the Kedong structural belts, featuring thick single layers and good lateral continuity. The coupling of tectono-geomorphic dynamic and hydrodynamic modeling offers an effective stratigraphic forward modeling approach for studying complex tectono-sedimentary regimes.

Sedimentary Characteristics and Interactions among Volcanic, Terrigenous, and Lacustrine Processes: The Xiguayuan Formation in the Luanping Basin, North China

Mr Xiaoning Liu¹, Mr Zaixing jiang¹, Mr Xiaodong Yuan¹, Mr Cheng Wang¹

¹China University of Geosciences Beijing, Beijing, China

10F: Sediment gravity flow deposits in lacustrine basins (2), Rongomātāne C (Level 1), January 30, 2026, 11:00 AM - 12:30 PM

In the context of rifting, continental rift lacustrine basins often exhibit multiple material sources due to volcanic activity, tectonics, and climate change, leading to complex sedimentary sequences. The Lower Cretaceous Xiguayuan Formation in the Luanping Basin was deposited in a lacustrine environment influenced by explosive volcanic activity, providing crucial records of the interaction between a siliciclastic sedimentary system and volcanic-derived products.

This study, based on field characteristics, core features (sedimentology and lithology), and optical microscope analysis, identifies 17 lithofacies from sites representing different positions within the basin, which are categorized into six facies associations. The spatial relationships between these facies reveal two volcanic cycles and the primary sedimentation of the lacustrine environment, indicating paleoenvironmental evolution. Deep-lacustrine background sediments directly overlie volcanic clastic deposits, with a significant increase in terrestrial clastic input at the top. This reflects the transition from a volcanic clastic sedimentary system to a terrestrial clastic sedimentary system, where volcanic control over sedimentation was supplanted by tectonic and climatic influences. Turbidite fan deposits preserve the input of both siliciclastic and volcanoclastic sediments from the shelf, transported into the deep-lacustrine environment by a suite of subaqueous sediment gravity flow processes. This study provides new insights into the complex interactions between volcanic activity and sedimentary processes in continental rift basins, enhancing the understanding of hydrocarbon systems in similar geological settings.

Estimating Stratal Completeness of Carbonate Deposition via Process-Based Stratigraphic Forward Modeling

Assoc. Prof. Jianliang Liu¹, Prof. Keyu Liu¹

¹China University of Petroleum (East China), Qingdao, China

4A: Can Forward Stratigraphic Modeling enhance geological understanding of the subsurface and predict sedimentation through time and space? (1), Tāwhirimātea A (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

Hiatuses are ubiquitous in stratigraphic records at various temporal scales, but they cannot be easily identified and quantified owing to the lack of adequate analytical methods. Recognizing stratal disconformities or hiatal surfaces, and quantifying the stratal completeness of carbonate/clastics are essential for palaeoclimatic and palaeobiologic research, stratigraphic correlation, interpretations of time series of depositional settings and sedimentary processes, and hydrocarbon explorations. Although many researchers have attempted to delineate strata completeness using different approaches, there are still some unresolved issues relating to the topics.

In this study, we firstly constructed a three-dimensional basin-fill model using sedimentary process-based stratigraphic forward modelling and then extracted crucial information of both “depth domain” and “time domain” from the 3D model to probe sedimentary evolution process, delineate hiatus surfaces and quantitatively determine the completeness of strata in the platform margin, slope and basin facies. Under the platform margin setting (PW1), the PW1 was dominated by intertidal and shallow subtidal facies. The stratal completeness is only 0.15, when using a 5 kyr simulation time-step, indicating that majority of the total deposition time has not been preserved in the platform margin setting. The PW2 location, presently in a slope setting, is dominated by deep subtidal to slope facies, which seems to represent a continuous deposition in the depth domain. While two episodes of slope failure events were found in the time domain, resulting in the stratal completeness being of 0.76. In the deep water basin environment (PW3), pelagic sediments with low accumulation rates were continuously deposited, and the stratal completeness is 1.00. Controlling factors were further investigated by using sensitivities analysis. It is indicated that the stratal completeness appears to be controlled by sea level changes, depositional environments, carbonate growth rates and tectonic subsidence patterns in various ways.

Multistage Blocky Calcite Cementation in the Cretaceous Carbonates of Central Iraq: Insights from Integrated Petrology, Geochemistry, and U–Pb Dating

Dr. Hangyu Liu¹, Kaibo Shi², Bo Liu³

¹China University of Geosciences (Beijing), Beijing, China, ²Peking University, Beijing, China, ³Peking University, Beijing, China

3B: Carbonate systems and processes (2), Tāwhirimātea C (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

Blocky calcite cement (BC) is ubiquitous and serves as a key archive for deciphering basin fluid circulation. However, the environmental conditions responsible for BC formation and reliable ways to distinguish its origin remain inadequately documented. To address this, the widespread BC in the Cretaceous Rumaila Formation of the Mesopotamia Foredeep, central Iraq was investigated via integrated petrology, geochemistry and U–Pb dating techniques. Six distinct BC phases, occluded in various pore types, are distinguished. The first two BC stages, dated at ca. 93 Ma and 92 Ma, formed in the marine realm, originating from coeval normal oxic seawater and modified suboxic seawater. The subsequent four BC stages, dated between ca. 55 Ma and 21 Ma, formed in the burial realm where parent fluids—primarily formation water—were alternatively mixed with freshwater and low-temperature hydrothermal fluids. Early BC phases exhibit more pronounced recrystallization in open diagenesis systems, causing larger mean square weighted deviations (MSWDs > 3) in U–Pb data. The final BC phase yields two distinct U–Pb ages, suggesting prolonged crystallization in minimally altered fluids within a progressively closed diagenetic system. These findings challenge the traditional view that BC typically forms in late diagenesis, revealing instead that multistage BC can span from syngedimentary to late diagenetic stages. Furthermore, the low Mg/Ca ratio and sulfate ion level of seawater during the Calcite Sea period may have facilitated early BC precipitation. The observed association between pore types and BC phases suggests that poorly connected, small-pore spaces are more conducive to early BC formation, providing a preliminary basis for identifying BC origins. Additionally, cathodoluminescence and trace element (rare earth elements and yttrium [REE + Y]) indices, combined with U–Pb dating, enable the identification of multistage BC origins and the reconstruction of subtle temporal and spatial evolution of basin fluids. The fluid origins and pathways of burial BC are closely linked to the Zagros orogeny, providing new evidence that supports the latest revised collision time (ca. 56 Ma). This implies that tectonic-driven diagenesis extends far inboard from the orogenic front and plays an underestimated role in basin water-rock interactions.

Fine-Grained Sediments, Hydrodynamic Characteristics, and Depositional Model of an Organic Matter-Rich Mixed-Ramp: Yuetus Formation, the Lower Cambrian, Tarim Basin.

Mr Xiangyu Liu¹, Dr Changsong Lin¹

¹China University of Geosciences (Beijing), Beijing, China

1E: Student Research Forum (1), Rongomātāne B (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

Significant advances in expounding the processes of fine-grained sediments recently, the depositional mechanism of organic matter-rich fine-grained successions in siliceous-carbonate mixed ramp is a growing interest. Cores data, well logs, outcrops, thin sections and geochemical data of Yuetus Formation, the lower Cambrian, Tarim Basin, were integrated to evaluate the hydrodynamics, depositional environments, and cycles of the organic matter-rich fine-grained sediments, furthermore, establish the depositional model. Nine lithofacies and seven lithofacies associations are recognized by specific micro-macro-sedimentological features, indicating hyperpycnal flow, wave-enhanced sediment gravity flow, storm flow, tidal current and flocculent suspension. Combined with geochemical data, five ramp environments are subdivided: mixed tidal flat-inner ramp develops tide more, storm flow occasionally; mid ramp showing storm in considerable intervals; mid-outer ramp influenced by wave, hyperpycnal flow and mud debris flow sporadically; outer ramp develops current-enhanced sediment gravity flow and flocculation settling influenced by bottom current markedly; and outer ramp to deep-water basin, flocculation settling and weak bottom current as essential processes in its deposition. Hydrothermal activities develop in the mid-outer ramp, the influence diminishes farther away. The hydrodynamic and organic matter accumulation forcing exhibits responses to sea-level change, growing TOC is in coordinate with transgression, flocculation settling and gravity flow primarily, the organic matter is preserved as organo-mineralic aggregates. Consequently, the organic-rich fine-grained sediments depositional model of the Yuetus Formation is presented: a terrigenous-depleted mixed-ramp influenced by hydrothermal activities, the inner to outer ramp transition shows a gradual shift from carbonate-rich to silica-rich facies, tidal current and storm flow regime transition to gravity flows and flocculation settling downslope, TOC increases correspondingly. Hydrothermal fluid-free outer ramp is proposed to be the primary fairway of organic matter in the mixed-ramp system.

Unraveling Hiatus in Black Shale: Mechanisms and Implications from the Early Silurian Longmaxi Formation, South China

Dr Yichen Liu^{1,2}, Prof Benzong Xian^{1,2}

¹Hainan Institute of China University of Petroleum (Beijing), Sanya, China, ²College of Geosciences, China University of Petroleum (Beijing), Beijing, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Fine-grained sedimentary successions, once regarded as continuous records of Earth's history, are now recognized as dynamic systems marked by cryptic hiatuses and episodic sedimentation. This study examines the Early Silurian Longmaxi Formation in the Sichuan Basin, South China, to unravel the mechanisms and patterns of hiatuses in deep-water fine-grained systems. Using a multi-proxy approach, including petrography, sequence stratigraphy, cyclostratigraphy, and geophysical and geochemical data, we identify hiatuses linked to sea-level lowstands driven by glacio-eustatic and tectonic forces. A novel evolutionary spectral analysis method reveals hiatuses through spectral bifurcations and transitions, tied to bottom currents and sediment density flows. Cyclostratigraphic analysis shows partial preservation of Milankovitch cycles (~405 kyr), providing an astronomical time scale anchored to these cycles. The study highlights the hierarchical nature of hiatuses, the dominance of long-term astronomical and tectonic influences on Silurian eustasy, and the effectiveness of cyclostratigraphy in disturbed deep-water settings. These findings advance the understanding of non-steady-state deposition in fine-grained systems and offer a refined framework for sequence stratigraphy and paleoenvironmental reconstructions.

Sediments Drove Continental Maturation

Dr. Peng Liu¹, Dr Tim Johnson², Dr Bo Wan¹, Dr Peng Peng¹

¹Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, China, ²Curtin University, Perth, Australia

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The compositional evolution of Earth's continental crust is a direct manifestation of planetary differentiation, influencing habitability through nutrient (re)cycling, climatic stabilization, and biosphere development. However, the processes driving the potassium enrichment and increasing maturity of the continental crust remain contentious. Here, we integrate zircon oxygen isotopes, trace element geochemistry, whole-rock potassium-to-sodium (K/Na) ratios, and phase equilibrium modeling to establish sedimentary recycling as the primary driver of the chemical diversification of continental crust since the Hadean. Variations in the incorporation of potassium-rich sediments into magma sources explain key transitions in crustal compositions at 3.0–2.5 Ga and 1.5–1.0 Ga, which are marked by systematic shifts in whole-rock K/Na and Rb/Sr ratios, zircon europium anomalies (Eu/Eu*), phosphorus (P) contents, and thorium-to-uranium (Th/U) ratios. Notably, modern granitoids (<200 Ma) exhibit K/Na ratios that mimic Archean values, reflecting a recent decline in the incorporation of potassium-rich sediments. Sediments are not merely passive recorders of Earth history, but active participants in shaping the compositional evolution of the continental crust, its tectonic evolution, biogeochemical cycles and climate dynamics.

Quantitative Study of Shallow-Water Carbonate Factories Following the Carnian Pluvial Episode (Late Triassic) in the Northwestern Sichuan Basin, China

Miss Jingjing Liu¹, Dr. Xia Wang^{1,2}, Miss Yue Zhang¹, Mr. Mobin Chen³, Prof. Dr. Mingcai Hou^{1,2}

¹Key Laboratory of Deep-time Geography and Environment Reconstruction and Applications of Ministry of Natural Resources, Institute of Sedimentary Geology, Chengdu University of Technology, Chengdu, China, ²State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Chengdu University of Technology, Chengdu, China, ³College of Earth and Planetary Sciences, Chengdu University of Technology, Chengdu, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

A significant global climate event—the Carnian Pluvial Episode (CPE) occurred during the Late Triassic, leading to the widespread disappearance of microbial carbonate deposits such as stromatolites, which had previously dominated the Tethyan realm. These microbial carbonates were subsequently replaced by ooid and bioclastic limestones, with a gradual recovery of microbial carbonate production not occurring until the Tuvanian stage. Previous studies have suggested a temporal coupling between the transformation of carbonate production modes and the CPE event. However, the specific drivers behind the post-event recovery of microbial carbonate production remain unclear. To further investigate the recovery of microbial carbonates and the associated sedimentological transitions, this study focuses on the Guanyinya section in Hanwang, Mianzhu, located in the northwestern Sichuan Basin on the eastern margin of the Tethys Ocean. The study area provides a detailed record of the changes in carbonate depositional types during the CPE. Building up on prior work, we identify several distinct types of carbonate factories in this section, including peloid factory, ooid factory, bioclastic factory, and sponge–microbial reef factory. A comprehensive analysis integrating petrographic and geochemical methods, including quantitative grain size and morphology assessments and element analyses (e.g., terrigenous-sensitive elements such as Al_2O_3 , SiO_2 , Na_2O , K_2O , and TiO_2 ; redox-sensitive indicators including MoEF, UEF, and VEF; and paleo-productivity proxies such as Cuxs, Nixs, and Pxs), was conducted to examine the composition, characteristics, transitions, and driving mechanisms of these factory types. Our results reveal that microbial carbonate production gradually recovered during the Tuvanian and played an increasingly significant role in the peloid, ooid, bioclastic, and sponge–microbial factories. Furthermore, the development and transition of various carbonate factory types in the study area were influenced by a combination of sea-level fluctuations, terrestrial input, nutrient levels, and redox conditions, although the dominant controlling factors may have varied among them.

Acknowledgement: supported by NSFC 42293291 and 42102143.

Serpentinization-driven Hydrogen Production: Fluid-chemical Interactions and Reservoir Implications in Bohai Bay Basin

Qinghua Liu¹

¹China University of Petroleum (east China), Shandong Province Qingdao City Huangdao District, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Serpentinization is a key process for the generation of natural hydrogen (H₂) in ultramafic rocks, yet the fluid–rock interfacial dynamics and element migration patterns involved remain poorly understood. This study integrates petrographic analysis and hydrothermal experiments to investigate the serpentinization pathways and hydrogen generation mechanisms in the Bohai Bay Basin (BBB). This Cenozoic rift basin is characterized by widespread basaltic intrusions and fault-controlled fluid circulation. By simulating varying pH levels, salinity, and water–rock interface conditions, the study evaluates mineral phase transitions and redox-driven Fe/Al ion exchange processes during serpentinization. The results reveal how secondary mineral precipitation (e.g., spinel and silica phases) modulates the reaction pathways and H₂ yield, especially under conditions where Fe²⁺ is oxidized to form magnetite.

The study also simulates abiotic hydrogen production and consumption processes in sedimentary basins by introducing other compounds commonly present in geological fluids (such as hydrocarbons and CO₂) into the hydrogen-generating reactions. The experiments demonstrate how geological fluid environments control hydrogen production efficiency and sustainability: acidic conditions can disrupt alumina-hydroxide coatings and accelerate surface ion exchange, while the addition of CO₂ induces hydrogen consumption reactions (e.g., $\text{CO}_2 + 4\text{H}_2 \rightarrow \text{CH}_4 + 2\text{H}_2\text{O}$) and influences the formation of secondary minerals such as magnesite during serpentinization.

This research establishes fundamental constraints on the hydrogen storage potential and longevity of basin systems, particularly regarding rock–water–gas interactions that affect reservoir durability in the context of energy transition. This case study highlights how coupled chemical–physical processes govern the hydrogen enrichment threshold, offering significant implications for assessing natural hydrogen as a sustainable subsurface energy resource, predicting optimal hydrogen-generating windows in real geological settings, and advancing the industrial development of natural hydrogen in sedimentary basins.

Grain Size and Thickness of Event Layers in Relation to the Flood Magnitude: An Example from a Floodplain in the Middle Yangtze River, China

Dr Xiujuan Liu¹

¹China University of Geosciences, Wuhan, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

River floodplain deposits are formed by flooding events of various magnitudes. However, the relationship between the characteristics of floodplain deposits and the magnitude of flooding events is still poorly understood. Here we show that such a relationship exists between the grain size/thickness associated with the flood deposits and the flood magnitude. We analyzed three flooding events and their sedimentary records for the floodplain in the middle reach of the Yangtze River. These flooding events include a small flood in 2011, a large flood in the upper reach in 2012, and a moderate flood in the middle and lower reaches in 2016, whereas the magnitude of the 2012 flood is lower than that of the 2016 flood in the middle reach. The thicknesses of the event layers by the 2011, 2012 and 2016 floods are 2.5 cm, 16 cm and 12 cm, respectively; in terms of grain size of coarse sediment in the event layers, the sediment is finest for the 2011 deposit and coarsest for the 2016 deposit. These demonstrate that the grain size of flood deposits is controlled by the local flood magnitude and thickness of those is determined by both flood magnitude and source area of flood event. A systematic analysis of the spatial variations of the flood deposits along the entire course of the river helps establish the definition of the flood magnitude as a function of the event layer grain size and the spatial coverage of the flood.

CO₂ Geological Storage: Water-Rock Interactions and Heterogeneity Evolution—Physicochemical Coupling Mechanisms Governed by Migration-Mineralization Synergistic Regulation

Mr Lulu Liu¹, Prof. Guanghui Yuan¹

¹China University of petroleum (East China), Qingdao, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

CO₂ geological storage is critical for mitigating global warming, with CO₂-water-rock interactions posing key scientific challenges. This study developed four heterogeneous geological models based on Bohai Bay Basin subsurface parameters, using TOUGH2-ECO2N-TOUGHREACT for numerical simulations. Key findings: (1) Buoyancy-driven CO₂ migration forms high-saturation plumes during storage. CO₂ dissolution in pore water releases H⁺, causing a sharp pH decline that accelerates the dissolution of minerals such as calcite and K-feldspar. Mineral saturation indices exhibit an "initial surge followed by gradual decline" trend from the CO₂-pore water interface inward. (2) Mineral dissolution/precipitation varies vertically, peaking mid-reservoir due to CO₂ saturation, water saturation, and reactive mineral dynamics. High-reactivity minerals (e.g., calcite) dominate porosity/permeability changes. (3) The extremely low porosity/permeability of mudstone limits CO₂ diffusion, while H⁺ diffusion triggers mudstone mineral dissolution, releasing Al³⁺ and SiO₂(aq) that are immobilized through kaolinite and quartz precipitation. (4) The tight calcite-cemented layers exhibit weaker chemical reactivity due to their inherent physical properties and mineral kinetic characteristics, while quartz precipitation is notably prominent owing to the transport of SiO₂(aq) between mudstone and calcite layers and the high specific surface area advantages. (5) Tight calcite-cemented layers release Ca²⁺ under CO₂ fluid interaction, which diffuses into mudstone layers, increasing the saturation of calcite in pore water. This inhibits mineral dissolution at mudstone interfaces, mitigates porosity/permeability changes, and regulates CO₂ migration through dual mechanisms—physical barriers and geochemical feedback—thereby reducing caprock alteration. The CO₂-water-rock interactions govern the heterogeneous evolution of mineral reactions, jointly controlled by pore water content, ion diffusion, and mineral properties. This reveals the critical role of coupled CO₂ migration-mineralization mechanisms in maintaining the chemical-physical stability of storage systems, providing key scientific insights for enhancing CO₂ storage efficiency.

Keywords: CO₂ geological storage; water-rock interaction; numerical simulation; geochemical modeling

Selective Dolomitization of Ooids in the Canglangpu Formation of Cambrian (Series 2) from North Sichuan Basin, China

Miss Jingjing Liu¹, Dr. Xia Wang^{1,2}, Miss Yuhan Zen¹, Miss Xinyi Li¹, Dr. Meng Ning^{1,2}, Dr. Hanting Zhong^{1,2}, Prof. Dr. Mingcai Hou^{1,2}

¹Key Laboratory of Deep-time Geography and Environment Reconstruction and Applications of Ministry of Natural Resources, Institute of Sedimentary Geology, Chengdu University of Technology, Chengdu, China, ²State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Chengdu University of Technology, Chengdu, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Canglangpu Formation in the northern Sichuan Basin possesses significant potential for natural gas exploration, and the variation in dolomite fabric within this formation provides important evidence for changes in early diagenetic environments. However, a comprehensive understanding of the genesis of dolomite—particularly the complex and diverse phenomenon of selective dolomitization of ooids—remains limited. This study focuses on the oolitic dolomite of the Canglangpu Formation in Wangcang area and aims to explore the characteristics and genesis of selective dolomitization in different types of ooids from a microscopic perspective. Through an integrated analysis involving cathodoluminescence, scanning electron microscopy (SEM), carbon and oxygen isotopes, as well as major and trace element geochemistry, we identify the microstructural features of various ooid types, including purely radial ooids, concentric-radial ooids, radial-concentric ooids, micritic ooids, single-crystal ooids, and polycrystalline ooids. The results indicate that radial ooids are selectively dolomitized in their cores and along intercrystalline pores between radial fibers, typically forming micritic dolomite. In concentric-radial ooids, dolomitization preferentially occurs in specific concentric laminae, whereas in radial-concentric ooids, the core is more susceptible to dolomitization. Micritic ooids display selective dolomitization within the dark, mottled laminae of their shell layers, forming finely crystalline dolomite. Polycrystalline ooids tend to experience a higher degree of dolomitization compared to single-crystal ooids. Furthermore, ooid size, concentric shell structure, degree of recrystallization, and the influx of terrigenous clastic material all influence the extent and pattern of dolomitization. Geochemical data reveal at least two major stages of dolomitization: an early, shallow process driven by a combination of seepage-reflux and microbial mediation, and a later deep-burial dolomitization phase. This study establishes an evolutionary model for the dolomitization of different ooid types and highlights the importance of multi-factorial coupling in the genesis of dolomite within Cambrian carbonate reservoirs.

Late Quaternary Evolution of the Indus River Delta, Pakistan: Fluvial Responses to Sea Level Changes as Revealed by Stratigraphic Forward Modelling

Mr Hafiz Hassan¹, **Professor Keyu Liu**¹

¹China University of Petroleum (East China), Qingdao, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Stratigraphic forward modeling was employed to simulate the evolution of the Indus delta from 200 kyrs BP (ka) to the next 5 kyrs with an aim to investigate fluvial responses to sea level changes. Various input parameters were derived from field observations, Landsat images, digital elevation model and published works. The simulation has a temporal resolution of 1000 years and covers the period of the last two glacial-interglacial cycles. From 200 ka to 130 ka, sedimentation on the Indus delta continued via a partial flow of the Indus River during this lowstand. From 130 ka to 60 ka, sea level rose during the Last Interglacial period. From 60 ka to 18 ka, sea level fell and reached its lowest point during the Last Glacial Maximum. This lowstand period was characterized by the least deposition and the strongest erosion on the delta plain. From 18 ka to present and to next 5 kyrs, sea level rose rapidly accompanied by a strong monsoonal climate condition. Deposition rate was higher during this highstand period with maximum avulsion and aggradation. The stratigraphic model successfully predicted the depositional thickness of the delta plain over the past 200 kyrs. The modelled maximum thickness is located at the shoreline platform up to ~200 m and in the northeastern part of the delta with a thickness reaching ~175 m, while the central delta has a maximum sediment thickness of ~100 m. This study allows us to quantitatively evaluate the fluvial responses to sea level fluctuations. The modelling also reveals that the geomorphic changes of the Indus River delta would have some catastrophic socio-economic implications in the future if sea level is rising at the rate of 1 m/kyr because the low-lying delta plain and coastal zone are presently populated by millions of people.

Astronomical Forcing of Lake-Level and Environmental Changes in Saline–Alkaline Lakes during the Late Paleozoic Ice Age

Dr. Dadong Liu¹

¹China University of Petroleum Beijing, Beijing, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Late Paleozoic Ice Age (LPIA) records Earth's latest icehouse-greenhouse transition, which offers a deep-time perspective for future climatic and environmental predictions. Astronomical cycles are believed to play a key role in the evolution of climatic and environmental changes during the LPIA. However, the interactions among the astronomical forcing, climatic conditions, sea- and lake-level changes remain ambiguous. Here, we conducted a cyclostratigraphic analysis of gamma ray (GR) and paleo-water depth (WD) data derived from sedimentary rocks in the upper Carboniferous–lower Permian Fengcheng and Lucaogou formations in the saline–alkaline lakes from the Junggar Basin, NW China. A floating astronomical time scale of ~3.4 Myr for the Fengcheng Formation and ~5 Myr for the Lucaogou Formation are established by astronomical tuning of GR data to the robust 405 kyr eccentricity cycle. The lake-level changes of the two formations are recovered based on the sedimentary noise model, which both show antiphase relationship with relative sea-level fluctuations, however different phase relationship with obliquity amplitude variations. The ~1.2 Myr (s4–s3) obliquity amplitude modulation cycle was the main driving force of lake levels in the Northern Hemisphere during the LPIA. In addition, the ~170 kyr cycles regulate the lake-level fluctuations and affect the development of saline-alkaline minerals in the closed lake basins. The cyclical growth and retreat of extensive ice sheets was an important factor that influenced the hydrological response to the same obliquity cycles, which reflect the nonlinear response of Earth's climate system to changes in astronomical orbital parameters. We conclude that the combination of climatic background and astronomical forcing cannot be generalized, as they have a more complex superposition mechanism. Our study demonstrates the important role of the termination of icehouse climate in lake evolution and supports the existence of the 'nonlinear response process' across different time scales.

Baer's Knolls of the Northern Pre-Caspian Plain: New Evidence for the Aeolian Genesis of the Landforms

Miss Daria Lobacheva¹, Mr Radik Makshaev¹, Mr Andrei Korotkov²

¹Lomonosov Moscow State University, Geography Faculty, Research Laboratory of Recent Deposits and Pleistocene Paleogeography, Moscow, Russian Federation, ²Lomonosov Moscow State University, Faculty of Economics, Moscow, Russian Federation

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

In the Northern Pre-Caspian, unique ridge landforms - Baer's knolls - are widely spread, which received their name in honor of the naturalist Carl von Baer. The researcher first gave a description of parametric characteristics and the way of origin of these landforms in 1856. Despite the long history of study, the origin of Baer's knolls, the time and conditions of their formation remain unsolved questions of geomorphology and paleogeography of the Caspian region. There are nine groups of hypotheses of their origin. The aim of our report is to present a generalized paleogeographic scheme of the stages of formation of these landforms and new sedimentological data indicating a prioritized aeolian genesis of the landforms.

According to the textural analysis data, deflationary scarp covered with detritus or large gypsum crystals was identified inside the dune stratum, and inverse gradational layering was recorded, its formation is characteristic of exceptionally subaerial aeolian conditions of sedimentation.

The Caspian lowland terrain is very heterogeneous and is represented by a complex composition of different-sized, more often closed depressions and ridges or isometric uplands. This is a marine relief formed as a result of wind-wave impact during the sea level recession. This relief is superimposed on top by the aeolian dunes of different morphology, mostly linear. Fork-shaped joints between linear ridges always face upwind, indicating the dominance of easterly winds. The oblique wedge-shaped and cross-bedded texture, frequently varying angles of inclination of bedding joints, and the presence of reverse gradational laminations are a sign of aeolian sedimentation.

The absence of organic matter in the sediment (except for detritus) may indicate the aridity of climatic conditions.

The study was performed within the framework of the Russian Science Foundation Grant No. 25-17-00024 "Caspian Sea: level fluctuations and evolution of the natural Holocene environment

Facies Model of the Middle Miocene Explosive Eruptive Period in the North Patagonian Andes: Timescales of Volcaniclastic Processes from Seconds to Millennia

Dr Manuel López¹, Prof Leandro D'Elia¹, Dr Andrés Bilmes², Prof Károly Németh^{3,4,5,6,7}

¹Centro De Investigaciones Geológicas (CONICET-UNLP), La Pala, Argentina, ²Instituto Patagónico de Geología y Paleontología (CONICET), Puerto Madryn, Argentina, ³Saudi Geological Survey, Jeddah, Saudi Arabia, ⁴Institute of Earth Physics and Space Science, Sopron, Hungary, ⁵Massey University, Palmerston North, New Zealand, ⁶The Geoconservation Trust Aotearoa Pacific, Opotiki, New Zealand, ⁷Istituto Nazionale di Geofisica e Vulcanologia, Bologna, Italy

4E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (1), Rongomātāne B (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

Arc volcanism is responsible for most of the explosive volcanic eruptions on Earth. The temporal and spatial distribution of explosive volcanic eruptions throughout the long-lived lifespan of volcanic arcs (Ky–My) has drawn increasing interest, particularly regarding their variability in normal steady-state and unusual high-volume explosive eruptive periods. Significant advances in understanding arc-derived volcaniclastic processes and Earth system responses have stemmed from the study of recent short-term (Dy–Yr) and high-frequency explosive eruptions, resulting in punctual environmental signals and shifts in depositional systems. The univocal relation between volcanic eruptions and Earth's surface responses suggests that geological records preserve overlapping volcanic signals across a wide range of timescales. The recognition of these signals may be key to understanding the temporal and spatial distribution of arc-related volcaniclastic processes modulated by Earth's surface processes.

During the Miocene, the North Patagonian Andes underwent a transition from high to low magmatic productivity (~20–10 Ma). As a result, whereas the actual axis of the North Patagonian Andes records the root of the Miocene volcanic systems, intermountain basins of the North Patagonian retro-arc preserve arc-derived high to low-volume explosive pyroclastic products and resedimented deposits. Through a detailed volcanological and sedimentological facies analysis together with a multi-scale architectural approach supported by unconformity-bounded stratigraphic units, this study performed a hierarchized time-rock scheme that reveals short- to long-term (seconds to millennia) volcaniclastic depositional processes. The hierarchical scheme illustrates how eruptive pulses (seconds) and episodes (Dy–Yr) are preserved in volcaniclastic depositional systems resulting from arc-related unusual to normal explosive eruptive periods (Ky), with overprinted, quasi-instantaneous to delayed and syn to post-eruptive environmental responses.

Reconstructing Interglacial Sea-Ice Variability in the Late Quaternary Arctic Ocean Using Bioturbation and Trace Fossil Indices

Dr. Ludvig Löwemark¹

¹National Taiwan University, Taipei, Taiwan

2F: Earth's sedimentary record of glaciation (2) & Sedimentation in polar ice sheet margins,
Rongomātāne C (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

In general, deep-marine sediments from the Arctic Ocean show a distinct pattern of intensely bioturbated sediments during interglacials, and largely undisturbed sediments during glacial intervals. This is believed to be directly related to the sea-ice cover. During glacial intervals, when the Arctic Ocean was largely covered by thick ice shelves, primary productivity was extremely low, resulting in very low food flux to the sea floor, and consequently little activity by benthic organisms. In contrast, interglacial intervals characterized by less severe sea-ice conditions and partly open waters during the summer months are typically heavily bioturbated and often contain a large number of trace fossils. However, there are also large spatio-temporal variations in the type and intensity of bioturbation and trace fossils between different interglacials and between different areas.

In this study, bioturbation intensity and trace fossil diversity are assessed using X-ray radiographs of marine cores from the Arctic basins in order to map out spatial differences in sea-ice extent between different interglacials. A comparison between sediments from the Eemian interglacial (MIS 5e) and the Holocene (MIS 1) shows considerably stronger bioturbation and more diverse trace fossils during the Eemian, compared to the Holocene. For both intervals, there is also a strong gradient in intensity and diversity from the highest values in the central Arctic Ocean to lower values in the area off Greenland. This pattern corresponds closely with the modern sea-ice pattern, where the area off Greenland is characterized by the most severe sea-ice conditions in the entire Arctic Ocean, while the central Arctic is characterized by open leads and relatively thinner sea ice during summers. Consequently, in an environment where conventional paleoceanographic proxies such as foraminifera or nannofossils are notoriously scarce, bioturbation and trace fossils can provide an independent assessment of spatio-temporal variations in sea-ice cover.

Fossil and Geochemical Evidence for the Paleoenvironmental Evolution of the Late Pleistocene Szekou Formation in Southern Taiwan

Dr. Ludvig Löwemark¹, Mr. Zong-Dai Chen¹, Dr. Tzu-Ruei Yang²

¹National Taiwan University, Taipei, Taiwan, ²Geology Department, National Museum of Natural Science, Taichung, Taiwan

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Late Pleistocene Szekou Formation in southern Taiwan preserves a diverse fossil assemblage, including marine vertebrates, mollusks, and foraminifera. These fossils record the evolution of a coastal lagoon influenced by rapid tectonic uplift and glacial-interglacial sea-level fluctuations. Although earlier studies proposed a semi-open to open lagoon system, interpretations have been limited by insufficient chronological control and unclear stratigraphic correlations.

Recent discoveries of articulated cetacean fossils by the National Museum of Natural Science, along with continuous core data from the Geological Survey and Mining Management Agency (MOEA), have provided new insights into the paleoenvironment of the Szekou Formation. To investigate the relationship between fossil preservation and depositional conditions, we integrated data from outcrop and core samples, including GNSS-based elevation measurements, stable carbon isotope ratios (−26‰ to −22‰), C/N ratios (5 to 29), and biomarker indices such as Paq (0.38 to 0.58), ACL (29.7 to 33.4), and CPI (1.38 to 1.51). Assemblages of foraminifera and mollusks further indicate spatial variability in water depth and reveal temporal shifts in lagoonal openness and restriction.

By integrating multiple lines of evidence, this study reconciles previous discrepancies in paleoenvironmental interpretations of the Szekou Formation. It reconstructs the sequential evolution of the lagoon, from its initial formation to later stages of development, emphasizing the connection between paleoenvironmental conditions and fossil preservation. Ultimately, this research contributes to a broader understanding of coastal lagoon evolution in tectonically active settings during the Late Pleistocene in southern Taiwan.

Reservoir Quality of Tight Sandstone in Ordos Basin, China: Implications for Depositional and Diagenetic Processes and the Role of Volcanic Tuffaceous Sediment in Tight Sandstones

Assoc. Prof. Zhiyuan Lu¹, Prof. Zhiliang He¹, Prof. Guangyou Zhu¹, Prof. Jon Gluyas¹

¹Yangtze University, Wuhan, China

3F: Diagenesis of volcanoclastic sediments, Rongomātāne C (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

The Permian Shan 2 and He 1 members (Shan 2-He 1 Mbr) are the main tight gas-producing intervals in the Ordos Basin. This reservoir mainly comprises low-permeability and ultra-low-permeability fluvial–deltaic sandstones. However, the formation of tight sandstone reservoirs, particularly those associated with volcanic tuffaceous sediment (VTS), remains poorly understood. Therefore, in this study, we aimed to identify the most favourable mechanism for reservoir formation using petrological, mineralogical, scanning electron microscopy with energy dispersive spectroscopy, X-ray diffraction, stable isotopic, and porosity and permeability analyses to investigate the characteristics and porosity changes of the Shan 2-He 1 Mbr. The reservoir consists predominantly of lithic and lithic quartz sandstones, with an average porosity of 6.07% and average permeability of 0.434 mD. Depositional processes were crucial in controlling reservoir formation. Different sedimentary microfacies exhibited varying physical properties, of which coarse-grained braided bars and channel fill that formed in high-energy environments exhibited superior petrophysical properties. Rapid early compaction was the main cause of reservoir densification. The main interstitial fills consist of VTS, clay minerals, quartz overgrowths, and calcite (ferrocalcite). Additionally, illite cement, secondary quartz grain enlargement, and late-stage carbonate cement negatively affected the reservoir quality. Secondary pores formed through the dissolution of terrigenous clasts, VTS, and carbonate cement. Diagenetic processes introduced heterogeneity and modified the reservoir, resulting in an effective reservoir space that comprises dissolution and intercrystalline pores, with limited primary pores. The reservoir's physical properties were influenced by the sedimentary facies, siliceous mineral content, diagenetic processes, and the presence of VTS. Therefore, a comprehensive understanding of these factors is vital for identifying favourable reservoir formation conditions in the Shan 2-He 1 Mbr.

Structural-Sedimentary Responses and the Developmental Mechanisms of Source Rocks in Response to Significant Geological Events

Assoc. Prof. Zhiyuan Lu¹, Prof. Guangyou Zhu¹

¹Yangtze University, Wuhan, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Cambrian period represents a pivotal era in Earth's history, marked by significant biological evolution and environmental transformations. Key geological events, including the pronounced negative excursion of carbon isotopes and the Cambrian explosion, hold substantial scientific value for elucidating the development mechanisms of ultra-deep source rocks and assessing the potential of deep oil and gas resources at depths exceeding 10,000 meters. The globally extensive organic-rich black shales deposited during this period serve as crucial source rocks and provide the material foundation for deep oil and gas exploration at such depths. Metal isotope data and other indicators suggest that the Early Cambrian marine transgression event, characterized by anoxic conditions, continuous ferruginization, and intermittent sulfidation, played a critical role in the formation of high-quality Cambrian source rocks. Paleogeographic reconstructions of key periods in the Cambrian within Chinese cratonic basins reveal that the Tarim Basin exhibited strong inheritance in its paleogeographic pattern, with sedimentary centers remaining largely consistent while the depositional extent gradually expanded. The primary controlling factors for sedimentation shifted from rifting to paleo-uplifts over time. In contrast, the situation in South China differs markedly, lacking the inheritance observed elsewhere. The distribution of Cambrian source rocks in this region is governed by two distinct tectonic cycles. Specifically, the early rifting phase during the Early Cambrian period facilitated the development of high-quality source rocks, whereas the distribution of source rocks during the subsequent late subsidence phase was significantly influenced by fluctuations in sea level. Based on these observations, the spatial distribution patterns of Cambrian source rocks have been characterized.

Reconstruction of Diagenetic Fluid Episodes and Reservoir Forming Mechanisms in Ultra-Deep Carbonates: A Case Study of the Ordovician Yingshan-Yijianfang Formation, Fuman Area, Tarim Basin

Dr Jinyu Luo^{1,2}, Professor Tingshan Zhang^{1,2}, Associate professor Xi Zhang^{1,2}, Dr Jianli Zeng^{1,2}, Engineer Pingzhou Shi³, Master Lubiao Gao¹, Master Jie Ren¹

¹School of Geoscience and Technology, Southwest Petroleum University, Chengdu, China, ²Natural Gas Geology Key Laboratory of Sichuan Province, Chengdu, China, ³PetroChina Tarim Oilfield Company, Xinjiang, China

2B: Carbonate systems and processes (1), Tāwhirimātea C (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

The precise identification of diagenetic fluid phases and their characteristics in carbonates is critical for deciphering carbonate evolution and hydrocarbon accumulation mechanisms. To unravel the diagenetic history of ultra-deep carbonates and their impact on reservoir modification in High-productivity hydrocarbon play, This study employs an integrated approach combining petrography, in-situ geochemistry (LA-ICP-MS), stable isotope analysis ($\delta^{18}\text{O}$ - $\delta^{13}\text{C}$), calcite U-Pb geochronology, and fluid inclusion microthermometry on the grains, matrix, and multi-stage fracture-filling minerals of the ultra-deep Ordovician Yingshan-Yijianfang Formation carbonates in the Fuman area, Tarim Basin. The results delineate eight distinct diagenetic fluid phases: Penecontemporaneous :(1) meteoric water, (2) seawater. Shallow-burial: (3) marine-derived Mg-rich fluids. Medium-deep burial stage:(4) organic acid fluids; (5) hydrothermal Si-rich fluids. (6) hydrothermal Mg-rich fluids; (7) formation brines; and (8) low-salinity fluids. Among these, the penecontemporaneous meteoric water, medium-deep buried (in Late Caledonian) organic acid fluids, and medium-deep buried (in Hercynian) high-temperature Mg-rich hydrothermal fluids played constructive roles in forming high-quality carbonate reservoirs. Meteoric water was more prevalent in the northern high structural zones, creating dissolution pores and cavities in the upper Yijianfang-Yingshan formations. Organic acid and hydrothermal fluids were controlled by later strike-slip faults. Mg-rich hydrothermal fluids locally formed high-quality dolomite reservoirs with bitumen-filled fractures. Silica-rich hydrothermal fluids exhibit a dual role: initial fracture enhancement followed by late pore-filling quartz precipitation. Other fluids predominantly contributed to reservoir densification through cementation, replacement, and recrystallization. This study provides a robust diagenetic fluid-reservoir co-evolution model, offering new insights into hydrocarbon exploration in ultra-deep carbonate settings.

Representation of Outcrops and Geological Heritage Depicted in Ancient Chinese Landscape Paintings

Jingwen Luo¹, Miss Guo Yao^{2,3}, Dr. Wang Xia²

¹Institute of Poetry Calligraphy and Painting of Sichuan, Chengdu, China, ²Institute of Sedimentary Geology, Chengdu University of Technology, Chengdu, China, ³Chengdu University of Technology Museum, Chengdu, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The presentation reviews the fundamental geological information presented in classic Chinese landscape paintings from the 8th to the 14th Century and correlates these depictions with the techniques described in the 17th-Century book "Mustard Garden". A systematic matching is made between the painting techniques (referred to as "cun" in Chinese) and their correspondence to characteristic geological types.

A preliminary classification of Chinese landscape painting techniques reveals that: (1) igneous rocks are represented using brushstroke techniques resembling lotus leaf veins or unraveled ropes; (2) sedimentary rocks are depicted using the ax-cut style; and (3) metamorphic rocks are portrayed through brushstrokes resembling spread-out hemp fibers or iron bands. This classification not only highlights the acute observation of natural geological forms by ancient painters but also elucidates their ability to reproduce complex geological features through sophisticated artistic techniques.

This study builds upon the pioneering works of Japanese scholar Taki (1920), of American scholar Benjamin March (1929), and British scholar Joseph Needham (1976), to further integrate Chinese painting art with petrology in an interdisciplinary manner. Geological heritage and geological diversity, as recorded in sedimentary deposits, have significantly enriched the artistic expression of Chinese landscape paintings. As a significant medium for documenting natural landscapes, landscape paintings not only reflect the comprehension of geological phenomena by ancient artists, but also offer invaluable visual resources for contemporary geological studies. This underscores the profound interconnection between art and science.

Mechanism of Siliceous Rock Differentiation in Carbonates under Fault-Hydrothermal System Interaction: A Case Study from the Lower-Middle Ordovician in Keping Area, Northwestern Tarim Basin

Dr Jinyu Luo^{1,2}, Professor Tingshan Zhang^{1,2}, Associate professor Xi Zhang^{1,2}, Dr Jianli Zeng^{1,2}, Master Jie Ren¹

¹Southwest Petroleum University, Chengdu, China, ²Natural Gas Geology Key Laboratory of Sichuan Province, Chengdu, Chengdu, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The genesis of siliceous rock in carbonate sequences provides critical insights into reconstructing paleoenvironmental, understanding tectonic-hydrothermal process and tracing diagenetic fluid sources. This study investigates the genesis of typical black cherts and white siliceous rock developed within dolostones and limestones of the Lower-Middle Ordovician Penglaiba, Yingshan, and Dawangou formations in the Keping area, Tarim Basin. By integrating petrography, elemental geochemistry, stable isotope geochemistry and microthermometry, we elucidate their formation mechanisms. Black cherts exhibit cryptocrystalline to microquartz textures, preserving ghost structures of carbonate allochems, while white siliceous rock display recrystallized fibrous chalcedony and euhedral quartz clusters infilling fracture networks. Geochemical proxies, mainly including $Al/(Fe+Mn+Al)$, V, Mo, Ba, Th/U, ΣREE , $LREE/HREE$, Y/Ho, Ce/Ce^* , Eu/Eu^* , confirm a hydrothermal origin for both black and white cherts formed in oceanic-basin to continental-margin settings, while indicating distinct diagenetic temperatures between them. Stable isotopes (Si-O) and fluid inclusions collectively indicate a diagenetic origin for the cherts and siliceous rock. Integrated analysis of regional tectonic evolution and fluid properties suggests that: The black chert resulted from mixing of deep-sourced hydrothermal fluids with shallow-burial seawater in Late Caledonian. Silica-rich hydrothermal fluids from deeper sources migrated upward along NE-trending basement faults, mixed with seawater. During lateral migration through lithologic transition zones, unconformity surfaces, and pore/fracture systems, fluids subsequently replaced carbonates to form chert. The white siliceous rock developed during medium-deep burial stages, resulting from mixing of hydrothermal fluids with deep-burial formation brines in Early Variscan. Silica-enriched hydrothermal fluids migrated along strike-slip/thrust faults and their associated fracture networks, where they mixed with formation brines and pore water before precipitating slowly. The results decipher the formation processes of variably siliceous rock in carbonate influenced by fault.

Controls on Deposition and Reservoir Potential of Fine-Grained Submarine Fans, Lingshui Sag, Qiongdongnan Basin, Northern South China Sea

Professor Pengjie Ma¹, Professor Baiquan Yan¹, Professor Daotao Dong¹, Researcher Xin Tong¹

¹Sanya Offshore Oil & Gas Research Institute, Northeast Petroleum University, China, Sanya, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Submarine fans represent primary targets for deepwater hydrocarbon exploration globally within downslope and along-slope settings. This study integrates drilling-derived cores, wireline logs, 3D seismic, XRD, thin-section petrography, and petrophysical analysis to define the distribution patterns, types, and reservoir quality of fine-grained distal submarine fans within the Miocene Meishan Formation, Lingshui Sag, Qiongdongnan Basin, China. These fans comprise a mud-rich, clastic slope system. Sandstone thickness, stacking patterns, and lobe distributions distinguish downslope middle-lower fans from distal basin plain fans. Syn-sedimentary fault troughs, and likely contourite and bottom current influences, control the oblique distribution of middle-lower fans, characterized by peripheral channels, channel-lobe transition zones (CLTZs), and lobe fringes. Distal fans exhibit non-channelized, thin-bedded sandy lobes, possibly linked to high-frequency sea-level fluctuations. Clay content, more than diagenetic alteration, governs reservoir quality in both fan types. Middle-lower fan channels and CLTZs, exhibiting lower clay content and enhanced permeability, show significant natural gas potential. These findings highlight the importance of contourite and bottom current processes in enhancing reservoir quality within slope systems.

Modeling Offshore Slip in the 2024 Noto Peninsula Earthquake Using Tsunami Trace Data

Katsuya Maehashi¹, Masaki Yamada¹, Hajime Naruse², Daisuke Ishimura³, Ryo Nakanishi⁴, Yoshiaki Kiyozuka¹

¹Shinshu University, ²Kyoto University, ³Chiba University, ⁴National Institute of Advanced Industrial Science and Technology (AIST)

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The 2024 Noto Peninsula earthquake (Mw 7.5) caused significant tsunami inundation and left deposits across lowland areas in Ishikawa Prefecture, Japan. The tsunami was triggered as the rupture extended to offshore reverse faults. We conducted forward simulations with multiple fault slip models to investigate how offshore fault slip contributed to the observed tsunami inundation. In addition, we evaluated fault models developed by previous studies based on tsunami waveforms and crustal deformation data, by comparing them with observed 109 tsunami trace heights collected in Suzu City and Noto Town, Ishikawa Prefecture. As a result, it was revealed that most previous models significantly underestimated inundation across the study area, likely due to insufficient slip assigned to offshore segments. In contrast, we set a large slip area into offshore fault segments, and tested 18 patterns by varying depth and along-strike position of the large slip area. The most successful model placed the large slip area in the shallow part of the offshore fault. The resulting simulation yielded $K = 1.03$ and $\kappa = 1.22$, values meeting the reproducibility indicators defined by the Japan Society of Civil Engineers. Our results demonstrate that incorporating high-density tsunami trace height data enables better constraint of offshore slip distributions and more accurate reproduction of observed inundation heights. Although sedimentary data were not directly used in this study, the modeled inundation patterns and flow conditions derived from tsunami trace data offer physical constraints on tsunami behavior. Combined with ongoing stratigraphic analyses of tsunami deposits at the same sites (Yamada et al., in this session), this approach provides new insights into the relationship between tsunami dynamics and deposit stratigraphy.

Aeolian Deposits and Co₂ Storage, Utah, USA

Elizabeth Mahon¹, Cari Johnson¹

¹University of Utah, Salt Lake City, United States

8F: Sedimentology and Sustainable GeoEnergy, Rongomātāne C (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

The Glen Canyon Group formed as a massive desert system across western USA during the Late Triassic and Early Jurassic. It's composed of thick aeolian sandstones, minor interdune deposits, and ephemeral fluvial deposits. These aeolian sandstones are thought to be one of the largest erg systems preserved in the rock record. Due to its thick, regionally extensive aeolian sandstones, the Glen Canyon Group has been identified as a prospective reservoir for CO₂ storage. The aeolian Navajo and Wingate Sandstones are the primary targets. To date, most research has focused on localized studies, either outcrop-based or using limited subsurface data. However, carbon storage planning and management at scale requires a more regional understanding of lateral continuity, reservoir heterogeneity, and the distribution of stratigraphic and diagenetic controls on porosity and permeability. This project aims to build a more regional framework by integrating detailed outcrop observations with historic well log and core data from across Utah. Outcrop studies provide high-resolution information on facies and sedimentary architecture, while subsurface data helps establish broader patterns of connectivity and reservoir quality. Our goal is to better constrain the stratigraphic complexity and lithologic heterogeneity within the Glen Canyon Group, to provide more representative geologic inputs for reservoir modelling and CO₂ storage projects.

Anthropogenic Sediment Dynamics in Lake Powell/Glen Canyon, Utah, USA

Elizabeth Mahon¹, Cari Johnson¹

¹University of Utah - Geology and Geophysics, Salt Lake City, United States

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Construction of the Glen Canyon Dam in 1963 created Lake Powell, the second largest water reservoir in the U.S. The Colorado and San Juan rivers and other tributaries in Glen and Cataract Canyons were impounded by the reservoir, resulting in the deposition of vast quantities of sediment over a ~650 km² area. These sediments are contextualized by a comprehensive instrument record encompassing virtually the full 60+ year reservoir history. Thus, Lake Powell represents a basin-scale flume-type experiment with excellent constraints on boundary conditions controlling sedimentation. Under regional drought, increased water consumption, and falling reservoir levels, these sediments are now exposed for the first time in several decades. This study focuses on sediment archives in the reservoir-affected zones of the Colorado and San Juan rivers. Results document a complex interplay between depositional and diagenetic processes in these linked (connected) fluvial-deltaic-lacustrine deposits. In some cases, sub-annual timelines can be established through high-resolution surveying (i.e., linking lacustrine beds to known reservoir highstands). Higher resolution event-timelines are also present in some marker beds, such as evidence of major flood events, and tailing pond spills in upstream mining districts. Records of both seasonal-annual cyclicity (i.e., spring snowmelt, summer monsoons) as well as longer term, decadal base-level fluctuations can also be interpreted from sediment archives. Historical imagery and ongoing monitoring efforts illustrate high rates of change throughout the system. In addition to their societal relevance, these sediment archives hold important implications for interpreting analogous systems in the rock record, particularly regarding rates of change and controls/signal preservation.

Geochemical Challenges in Underground Hydrogen Storage: Mineral Reactions, Byproduct Hazards, and Pathways to Mitigation

Dr Muhammad Malik¹, Dr Ahmed Al-Yaseri², Dr Khalid Al-Ramadan¹

¹Department of Geosciences, King Fahd University of Petroleum & Minerals, Al Khobar, Saudi Arabia,

²Center for Integrated Petroleum Research, King Fahd University of Petroleum & Minerals, Al Khobar, Saudi Arabia

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

With global efforts intensifying to find alternate clean and sustainable energy solutions, hydrogen's potential as a future fuel is undeniable. Yet, its safe, large-scale storage remains a critical hurdle. Among the considered storage solutions for underground hydrogen storage (UHS), underground geological storage is so far considered the most viable option. For this purpose, reuse of depleted oil and gas reservoirs offers a promising geological solution, leveraging their proven natural trapping mechanisms over geological timescales. However, these subsurface natural environments are chemically and mineralogically complex with reactive accessory minerals, an underappreciated risk. Pyrite (FeS_2) being earth's most common sulfide mineral, is present in both reservoir rocks and sealing shales. While stable at the surface conditions, pyrite becomes chemically reactive under reservoir temperature/pressure in presence of moisture, and can react with stored hydrogen to form hydrogen sulfide (H_2S). H_2S is a toxic and corrosive gas and beyond immediate safety hazards, its contamination significantly degrades stored hydrogen fuel quality. To address such risks, our research aims to quantify H_2S generation from pyrite under simulated reservoir conditions. Yields are measured by reacting powdered pyrite with hydrogen gas under reservoir-like conditions, with experiments performed using a range of temperature, pressure and geochemical environments representing subsurface reservoirs, including variations in brine and calcite content. Post-reaction mineralogical analyses revealed distinct alterations that confirm the chemical pathways leading to H_2S production providing experimental evidence of pyrite-driven H_2S generation. These findings underscore the need for proactive mitigation measures in UHS. Accordingly, laboratory experiments are being conducted to evaluate the additives that either inhibit pyrite-hydrogen reaction or scavenge H_2S as it forms. The results performed using several industrial as well as green chemicals show promising results with substantial reduction in H_2S generation. This combined approach provides us with vital understanding of geochemical triggers and helps us in developing targeted countermeasures to ensure safety and viability of UHS in complex subsurface geological settings.

Gas Chimney-Facilitated Methane-Rich Fluid Transport in Muddy Sediments: Implications for Gas Hydrate Production and Sedimentary Fluid Dynamics

Dr. Peixiao Mao¹, Dr Wanjun Lu¹, Dr Fulong Ning¹, Dr Nengyou Wu²

¹China University of Geosciences, Wuhan, China, ²Laoshan Laboratory, Qingdao, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Gas chimneys serve as critical migration pathways for methane-rich fluids within marine muddy sediments. These fluids can significantly alter the kinetics of gas hydrate dissociation. However, how they modulate hydrate dissociation, methane production and sedimentary fluid dynamics under conditions of pressure reduction remains poorly constrained. In this study, a conceptual model of a gas chimney-associated, hydrate-bearing muddy reservoir was developed using numerical simulations to systematically investigate the interactions between sedimentary fluids and gas hydrates under different gas chimney-derived methane-rich fluid fluxes, as well as the resulting methane production behavior during depressurization. The results indicated a three-stage methane production pattern in response to methane-rich fluid invasion: initially showing no effect, followed by a phase of decreased methane production accompanied by increased sedimentary fluid release, and finally a sharp increase in methane production. Hydrate dissociation and subsequent methane production are critically governed by the invasion rates of water, methane, and heat in methane-rich fluids. Specifically, a lower water invasion rate coupled with higher heat input enhances both hydrate dissociation and methane production. Conversely, while an increased methane invasion rate elevates methane output, it simultaneously inhibits hydrate dissociation and may even promote hydrate reformation. Crucially, a “1+1>2” synergistic effect occurs under low water/methane invasion rates, where methane production increases by up to 4.3 times compared to the no-invasion case. These findings advance our understanding of methane dynamics in marine gas chimney systems and their implications for gas hydrate exploitation.

Limited Warming of Middle Miocene Arid Low-Latitude Climates: Application of Clumped Isotopes in Sabkha Environments.

Dr Marta Marchegiano¹, Dr Martin Ziegler², Dr Or Bialik³, Dr David De Vleeschouwer³

¹University of Granada, Granada, Spain, ²Utrecht University, Utrecht, The Netherlands, ³University of Münster, Münster, Germany

4B: Carbonate systems and processes (3), Tāwhirimātea C (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

The Miocene represents a warmer-than-present period, with atmospheric CO₂ concentrations between 300 and 600 ppm, making it a useful analogue for future global warming. While high-latitude paleotemperature records from this epoch consistently indicate significantly warmer conditions than today, reconstructions from low-latitude regions remain limited, mainly due to the scarcity of reliable climate archives in hot, arid environments.

In this study, we test low-latitude climate sensitivity by applying the clumped-isotope ($\Delta 47$) paleothermometer to sabkha calcite. Indeed, $\Delta 47$ measured on sabkha calcite might alleviate the above-described data scarcity. We present new $\Delta 47$ paleotemperatures of both modern and Middle Miocene fossil sabkha samples. Our results suggest that sabkha calcite primarily reflects summer half-year temperatures (from 25.2 ± 2.8 to $32.1 \pm 3.0^\circ\text{C}$), chiefly corresponding to the dry season when most calcite precipitation occurs in these environments. Additionally, we reconstructed $\delta^{18}\text{O}_{\text{water}}$ values, ranging between 3.2 ± 1.0 and $5.2 \pm 1.2\text{‰}$, indicative of high evaporation rates consistent with sabkha setting. Despite elevated CO₂ levels during the Mid-to-Late Miocene, the reconstructed temperatures are very similar to modern ones. This observation suggests that low-latitude tropical climate sensitivity is relatively low. In other words, while Earth's climate system exhibits polar amplification, our findings indicate it also demonstrates tropical attenuation of climate change. We conclude that sabkha-calcite clumped isotopes offer a valuable tool for bridging the latitudinal gap in continental paleotemperature reconstructions near the horse latitudes.

Lessons From the Deep on Interpreting Diagenetically Overprinted, Marine Volcaniclastic Successions

Professor Kathleen Marsaglia¹

¹California State University Northridge, Northridge, United States

3F: Diagenesis of volcaniclastic sediments, Rongomātāne C (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

Scientific ocean drilling provides windows into the burial diagenesis of marine volcaniclastic deposits associated with magmatic arcs and seamounts, from the seafloor to subseafloor depths of 1+km. Examination of >1000 core samples from mainly Cenozoic circum-Pacific drill sites associated with Deep Sea Drilling Project (DSDP), Ocean Drilling Program (ODP) and Integrated/International Ocean Drilling/Discovery Programs (IODP) provide insights and allow for generalizations regarding diagenetic processes and products. Impregnation with blue-dyed epoxy for porosity recognition and staining of thin sections for potassium- and calcium-bearing zeolite, feldspar and glass components are essential to deciphering grain/matrix/cement relationships, paragenetic sequences, and original compositional modes and textures. Clay, zeolite and carbonate minerals dominate the authigenic suites. Review of DSDP magmatic arc-related sites shows cementation is limited to below ~400 mbsf (meters below seafloor) in Pliocene or older samples, with backarc sites showing shallower (>100 mbsf) and more common cementation. Subsequent ODP and IODP drilling has reinforced these observations, providing cores from the deepest forearc (Izu Bonin, Oligocene) and backarc (Philippine Sea, Eocene) basin penetrations, as well as an anomalous example of young (Quaternary) forearc cementation (Chile Triple Junction). Reworked pyroclastic (vitric, phenocryst, microlite) and epiclastic components of variable crystallinity, morphology and composition (mafic, intermediate, felsic) in basin fills react differently upon burial. Labile component dissolution, progressing from glass to mineral phases, and alteration is accompanied by inter- and intra-particle cementation: often starting with thin clay mineral rims then zeolite cements. Carbonate may be an early or late authigenic phase controlled by calcareous bioclast content and depositional setting. Deeper holes can be associated with extreme pore-water geochemistry. Deciphering the eruptive, tectonic, and eustatic records of basin fills in these settings requires “seeing through” this diagenetic overprinting. Specific examples are highlighted from offshore Chile, Japan, and New Zealand (ODP Legs 126, 141; IODP Legs 351 and 375).

Late Quaternary Continental Shelf to Slope Depositional Systems in Balingian – Central Luconia Provinces, Offshore Malaysia.

Dr Habibah Hanan Mat Yusoff^{1,2}, Emeritus Professor Howard Johnson², Emeritus Professor Lidia Lonergan², Dr Alexander Whittaker²

¹Universiti Malaysia Terengganu, Malaysia, ²Imperial College London, United Kingdom

4C: Coastal to shelf environments across time and space (4), Tāwhirimātea E (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

The Central Luconia Province was dominated by carbonate deposition during the Mid-Miocene and terminated by prolific Plio–Pleistocene siliciclastic sediments. There is a lack of studies on clastic deposition, regardless of its importance in terminating the carbonate deposition. This study aims to understand the Plio–Pleistocene clastic deposition based on depositional analogue during the Last Glacial Maximum, where this area was a broad and emergent continental shelf (i.e., part of Sunda Shelf). The datasets used in this study consist of regionally extensive 3D seismic volumes, sub-bottom profiles and shallow boreholes. The results show a large number (ca. 8 – 10) of northwards-directed Quaternary incised valleys (ca. 3 – 12 km wide) with variable upstream and downstream distribution. The valley mouths also terminated in two types of deltas: (i) shelf deltas in the western shelf and (ii) shelf-edge deltas in the eastern shelf. The eastern shelf-edge delta is linked to headward incision, numerous small (ca <100 m wide) gullies, and faulting within a north-west/south-east-trending zone of the West Baram Line fault. This LGM palaeogeography map also confirms a substantial siliciclastic sediment source area to the south of the Balingian – Central Luconia provinces (approximately the present-day onshore). This study demonstrates that the LGM depositional systems may provide a useful analogue for Plio–Pleistocene clastic deposition in the Balingian – Central Luconia provinces.

Timing, Formation and Palaeohydrological History of Island Tufas from Northwest Western Australia

Dr Caroline Mather¹, Professor Maurice Tucker², Associate Professor Juraj Farkas³, Dr Vladimir Levchenko⁴, Professor Matthias Leopold¹, Professor Jo McDonald¹

¹The University of Western Australia, Perth, Australia, ²University of Bristol, Bristol, United Kingdom,

³The University of Adelaide, Adelaide, Australia, ⁴Australian Nuclear Science and Technology Organisation, Lucas Heights, Australia

4C: Coastal to shelf environments across time and space (4), Tāwhirimātea E (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

Tufa are terrestrial calcium-carbonate deposits that precipitate from cool to ambient temperature freshwaters in springs, seeps, rivers and lakes. Laminated and well-preserved tufa can provide plentiful palaeoenvironmental archives with seasonal resolution of climatic data over timescales of 1000's of years. This study investigates tufa deposits from Murujuga, a significant rock art province in coastal northwest Western Australia. Here, the tufa are distributed within ephemeral creek systems, supported by surface water and perched seepage. Records of past hydrological conditions are of interest for understanding changes in freshwater sources that would have influenced Aboriginal people known to have been living in the region since ~50 ka. Our aims were to: 1) establish the formation processes and conditions that have led to widespread tufa deposition and; 2) develop age-controlled records of past hydrological and environmental conditions.

Radiocarbon dating has constrained tufa formation to the Holocene, with the earliest formation commencing at ~9.5 ka, which coincides with islandisation of the Murujuga landscape. Greater accumulation of tufa occurred during the mid-Holocene, suggesting wetter conditions, whereas reduced deposition since ~2 ka reflects a shift to aridity in the late Holocene. We will discuss further insights into past conditions based on sedimentological and geochemical/isotopic analysis of the tufa, including stable oxygen and carbon isotope variations ($\delta^{18}\text{O}$ and $\delta^{13}\text{C}$), alongside coupled stable and radiogenic strontium isotope ratios ($^{88}\text{Sr}/^{86}\text{Sr}$ or $\delta^{88}\text{Sr}$, and $^{87}\text{Sr}/^{86}\text{Sr}$, respectively). These Sr isotope tracers inform on the possible source of dissolved Sr cations - and by inference past water sources as well as Ca cations - involved in the formation of these tufa deposits, which are unusually situated within a meta-igneous bedrock terrain. The outcomes of this study demonstrate the potential of tufa archives and multi-proxy isotope approach to inform on changing hydroclimatic and hydrological conditions and contextualise the extraordinary archaeological record of this region.

The Origin and Typology of Pores Associated with Aptian Age Presalt Carbonates from Santos Basin, Brazil

Mr Nilo Matsuda¹, Ms Maria Mutti, Mr Sven Maerz, Mr Crisogno Vasconcelos

¹Petrobras S. A., Rio de Janeiro, Brazil

9B: Carbonate depositional systems from platform, slope to basin (3), Tāwhirimātea C (Level 2),
January 29, 2026, 4:25 PM - 5:55 PM

Aiming to understand the interaction between facies and permo-porosity, Aptian age wells side wall core carbonates samples from the Santos Basin were selected for petrographic and petrophysical analyses. Petrographic studies indicated that they consist of four microfacies, such as spherulites, arborescent stromatolites, crenulated laminates, and disaggregated grainstones and rudstones. In those microfacies, eleven types of pores or micropores were qualified and quantified, as follow intergranular, intragranular, intersphere, intrasphere, intershrub, intrashrub, vug or minivug, intercrystals, intracrystals, solution sear or stylolite, and fracture or microfracture. The samples composed of laminites, stromatolites, spherulites and reworked grainstones and rudstones presented porosity ranging from 3.5 to 22% and, the permeability from 0.0001mD to 1D. The pore throats presented showed between less than 1 µm to up to 50µm.

Digital Image Analysis (DIA) results analyzed on backscattering images from some thin sections revealed that microfacies such as grainstones, rudstones, stromatolites, spherulites containing intergranular, intersphere, intershrub and fracture pore types revealed the best to be considered as potential reservoirs. In laminitic microfacies, the potential reservoir is attractive when the calcites containing dolomites in the cores are dissolved forming the named hollow calcite.

The results of studies from mercury injection analyses and µCtScan images showed good compatibility in the observation of pores throats and rock texture. The samples with spherulitic, stromatolitic and disaggregated textures showed excellent connectivity. In the laminite microfacies, the connectivity measured was relatively low. Important evidence of late pore generation was detected as the dissolution of dolomite in the calcite core, generating a type of pore named "hollow calcite". An aggressive dissolution like stylolite or solution sear was observed in the matrix of some samples, possibly mixed with some organic matter. Such evidence suggests more detailed studies using more sophisticated methods of analysis to understand the possible later pores enlarging on Aptian PreSal carbonates reservoirs.

Burial Diagenesis in Volcaniclastic Rocks of the Nagaoka Area, Central Japan: Implications for Carbonation Potential as Carbon Dioxide Storage Reservoirs

Mr Ryoichi Matsui¹, Ms Miku Takeya¹, Dr Yuki Kobayashi¹

¹Inpex Corporation, Tokyo, Japan

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Mineral carbonation, one of the trapping mechanisms for underground CO₂ storage, is being explored primarily in mafic rocks due to the long-term stability of the carbonate minerals formed. Andesite, an intermediate volcanic rock, also contains a certain amount of mafic minerals, suggesting comparable or subordinate potential for CO₂ mineralization. It commonly occurs in subduction zones at convergent margins, and therefore, it is considered significantly important as a target for CO₂ storage in geological settings such as the Circum-Pacific region. It should be noted, however, that mafic minerals are generally unstable and have a high likelihood of transforming relatively quickly into other mineral types after burial, which suggests that their reactivity with CO₂ and their primary capabilities for carbonation may change accordingly.

In the Nagaoka area of central Japan, volcaniclastic rocks of andesitic to dacitic compositions are distributed across multiple stratigraphic levels of the Quaternary and Neogene succession. Some of these formations are also known as oil and gas reservoirs. Given that these formations have a certain level of porosity and their age-equivalent outcrop samples contain a measurable amount of mafic minerals, they possess the potential to serve as candidates for underground CO₂ storage.

This study evaluated the burial diagenesis and stratigraphic changes in mineral phases of volcaniclastic rocks in the region through analyses focused on X-ray diffraction, X-ray fluorescence, electron probe microanalysis, and mercury injection capillary pressure. The evaluation revealed that while the shallowest andesitic formation generally retains its primary rock texture and mineral phases—when compared to surface samples maintaining the original mineral phases—rapid changes were observed in deeper formations. These changes include the chloritization of mafic minerals and the albitization of calcium plagioclase. Consequently, the study showed progressive deterioration of reactivity with CO₂ of the volcaniclastics with increasing burial depth, providing a stratigraphic constraint for carbonation potential in the region.

Downslope Evolution of Turbidite Channel-Fill and Architecture: Outcrop Examples from the Tachrift System, Taza-Guercif Basin, Late Tortonian, NE Morocco

Dr Adam Mcarthur¹, Prof Fabrizio Felletti², Dr Mattia Marini², Dr George Pantopoulos³, Dr Chiara Zuffetti², Dr Daniele Invernizzi², Dr Simone Reguzzi², Mr Moreno Pizzutto², Prof Imad El Kati⁴

¹University of Leeds, Leeds, United Kingdom, ²University of Milan, Milan, Italy, ³Univerisità di Pavia, Pavia, Italy, ⁴Sidi Mohamed Ben Abdellah University, Taza, Morocco

7A: Applications of Sedimentology for the Green Energy Transition & The role of subaqueous sediment gravity flows in carbon sequestration, Tāwhirimātea A (Level 2), January 29, 2026, 10:15 AM - 11:45 AM

Submarine channels are major conduits for the transfer of sediments, organic matter and pollutants from shallow to deep-water environments. Channel-fills may host important resources and are also targets for energy transition projects, such as carbon capture reservoirs. Despite advances in flow-monitoring and high-resolution 3D-seismic studies, the evolution and resulting architecture of channel-fills remain challenging to predict, particularly regarding sub-seismic scale heterogeneities. Well-exposed outcrop analogues are crucial to address the challenge of predicting reservoir properties, as they offer insights into facies heterogeneity and architecture.

We document the stacking patterns, architecture and facies from the superbly exposed Tachrift channel-levee complexes, which represent part of the Tortonian depositional system of the Taza-Guercif Basin. At least nine sand-rich channel complexes, each up to tens of meters thick and kilometres wide, are isolated within slope marlstones totalling a stratigraphic thickness of ~600 m and outcrop along a ~6 km long down-palaeocurrent transect. 1:5000-scale geological mapping, collection of hundreds of sedimentary logs, photopannels, and reconstructions of the architecture and facies permit documentation of the downslope evolution of channel-fills. These complexes are stratigraphically arranged from shelf-incising to lower slope examples. Generally, upper slope channel-fills are relatively simple, erosion-dominated and lack overbank deposits. Mid slope channel-fills document a complicated arrangement of erosional, laterally migrating, and vertically offset channel-fills, with and without levees and combinations of the above. Lower slope channel-fills are typically arranged into larger channel-levee complexes, which record significant lateral migration and vertical aggradation.

Results document the evolution of these complexes from inception to deactivation, and establish a model for architecture and facies relationships to improve existing deep-water channel-levee models. Outcomes can be applied to aid subsurface interpretations and modelling of analogous sand-rich slope systems, such as predicting up-slope stratigraphic changes and pinch-out geometries.

Reconstructing Climate and Vegetation Change from the Turbidite-Dominated Deep-marine Sediment Core IODP-U1520D

Miss Laura McDonald¹, Associate Professor Lorna Strachan¹, Dr Katherine Holt², Dr Adam McArthur³, Mr Anthony Shorrock¹, Professor Helen Bostock⁴

¹The University of Auckland, Auckland, New Zealand, ²Massey University, Palmerston North, New Zealand, ³University of Leeds, Leeds, UK, ⁴The University of Queensland, Brisbane, Australia

4F: Sedimentary processes in the northern Hikurangi Margin of New Zealand: Insights from IODP Expeditions 372/375, Rongomātāne C (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

In Aotearoa-New Zealand, where continuous records of vegetation and climate change beyond the recent glacial-interglacial cycle are scarce, marine sedimentary records offer unique opportunities to explore climate dynamics over longer timescales. When utilising pollen in marine records for vegetation reconstructions, we need to consider the impact that differing pollen and sediment transport mechanisms could have in biasing a pollen record. On active margins, such as the Hikurangi Margin, the path pollen takes to reach the deep-ocean is far from simple, with transport processes including a mix of wind, ocean currents, gravity flows and reworking by bottom currents. This study aims to understand how these different pollen and sediment transport mechanisms could impact pollen records and therefore paleovegetation interpretations. Using deep-marine (2400-3200 mbsl) records from the Hikurangi Margin, we first investigated how pollen varies within turbidites, finding that pollen taxa are not sorted by size or shape in a range of turbidite facies and that sampling turbidite tails gives the best pollen recovery. We applied these findings to the turbidite-dominated, deep-marine sediment core, International Ocean Discovery Program (IODP) U1520D (Expedition 375), creating a pollen record showing vegetation change in the North Island of New Zealand over the last two glacial-interglacial cycles. The resulting new, high-resolution (~3 ka) record of pollen and vegetation change in the Late Pleistocene is compared with other marine pollen records from New Zealand to assess the influence of different sediment transport processes on vegetation records from marine sediment cores. We find that despite different sediment and pollen transport processes, the turbidite-dominated IODP-U1520D shows remarkably similar pollen assemblage changes to the other marine cores. Our study sheds light on the complexities of reconstructing past climate and vegetation from offshore sediment cores, but also the potential of turbidite-dominated records to provide long paleovegetation and paleoclimate records.

Tephra Dispersal Mechanisms and Seafloor Volcaniclastic Deposits of the 2021 Shallow Submarine Eruption of Fukutoku-Oka-no-Ba, Izu-Ogasawara Arc: Insights from Rapid Response Seafloor Surveys

Dr Iona McIntosh¹, Dr Kenichiro Tani², Dr Teruki Oikawa³, Dr Masashi Nagai⁴, Dr Hiroki Minami⁵, Dr Osamu Ishizuka³, Mr Taisei Ukita⁶, Dr Michihiko Nakamura⁶, Dr Yoshiaki Suzuki³, Mr Tatsuki Mizuno⁷, Dr Fukashi Maeno⁷, Dr Taketo Shimano⁸, Dr Takashi Sano², Dr Hajime Katayama³, Mr Ryoya Sasaki⁹, Dr Kae Tsunematsu⁹

¹Japan Agency For Marine-Earth Science and Technology (JAMSTEC), Yokosuka, Japan, ²National Museum of Nature and Science, Tsukuba, Japan, ³National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan, ⁴National Research Institute for Earth Science and Disaster Resilience, Tsukuba, Japan, ⁵Japan Coast Guard, Tokyo, Japan, ⁶Tohoku University, Sendai, Japan, ⁷The University of Tokyo, Tokyo, Japan, ⁸Kagoshima University, Kagoshima, Japan, ⁹Yamagata University, Yamagata, Japan

5E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (2), Rongomātāne B (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

Explosive submarine to emergent volcanism is an important source of volcaniclastic sediments in subduction zones yet most of their eruption and deposition processes are hidden beneath the sea surface. Rapid response surveys of seafloor deposits are thus essential to constrain eruption dynamics, tephra dispersal processes, and environmental impacts.

We report rapid response surveys following the 2021 shallow submarine eruption of Fukutoku-Oka-no-Ba (FOB) volcano near Minami-Iwoto Island in the Izu-Ogasawara arc. Its daytime subaerial activity was well documented by satellites, including the initial 16 km-high ash plume, extensive floating pumice rafts and their distant dispersal, and transition to phreatomagmatic activity and temporary island formation. To investigate the seafloor deposits we conducted three research cruises: KS-22-5 and KS-22-13 of R/V Shinsei Maru in 2022 and KK24 of R/V Dai-san Kaiyo Maru in 2024. Seafloor observations, volcaniclastic samples and biological specimens were obtained by grab samplings and ROV Hyper-Dolphin dive surveys, in addition to repeated ship-based bathymetric surveys. Volcaniclastics were analysed for grain size, porosity, geochemistry and dissolved volatile contents. We show topographic changes of the edifice and identify and describe in detail three seafloor eruption deposits that correspond to satellite observations: eruption-fed density current deposits, fallout deposits, and abraded pumice raft deposit.

FOB erupts frequently, so repeat surveys of this volcano offer a natural laboratory for investigating submarine eruption processes, volcaniclastic deposits and their modification by the marine environment, and the recovery of seafloor ecosystems. FOB is only 5 km north of Minami-Iwoto Island, a part of the World Heritage of Ogasawara Islands, and marine surveys thus enable us to investigate its past and future impacts on the World Heritage site. Part of this research was supported by the Environment Research and Technology Development Fund (JPMEERF20244M02) of the Environmental Restoration and Conservation Agency provided by the Ministry of the Environment of Japan.

Sedimentary Clay Minerals Archive a Shift in Chemical Weathering Intensity Synchronous with the Palaeozoic Evolution of Land Plants

Dr William McMahon¹, Dr Neil Davies¹, Dr Stefan Loehr², Dr Mohd Tarique³, Dr Yorick Veenma¹, Mr Hamilton Allport¹, Mr James Craig¹, Miss Cassandra Wheeler⁴, Dr Edward Tipper¹, Dr David Wilson⁵, Dr Emily Stevenson⁶

¹University of Cambridge, Cambridge, United Kingdom, ²University of Adelaide, Adelaide, Australia,

³National Centre for Polar and Ocean Research, Goa, India, ⁴Macquarie University, Sydney, Australia,

⁵University College London, London, United Kingdom, ⁶GFZ German Research Centre for Geosciences, Potsdam, Germany

8A: Deep time biogeomorphology (1), Tāwhirimātea A (Level 2), January 29, 2026, 1:40 PM - 3:10 PM

By providing a physical record of deep time weathering reactions, clay minerals have the potential to archive any increase in the contribution of land plants to rock weathering through the Paleozoic. However, validating information drawn from ancient clays can prove challenging, and previously proposed shifts in Paleozoic clay mineral deposition have been alternatively suggested to represent variations in diagenesis rather than genuine shifts in primary production. To more robustly determine any evolution of sedimentary clay minerals coeval with the greening of the continents, and unpick relationships with chemical weathering, we have combined new electron imaging and energy dispersive spectroscopy-based mineral mapping tools with established geochemical proxies for both weathering intensity (Li) and source (Nd). Microscale diagnostic textural criteria enabled us to identify and separate clay minerals of burial diagenetic origin and robustly differentiate the remaining clay-forming minerals as either the product of physical or chemical denudation. Utilizing this approach to 70 contextualized terrestrial and marginal marine mudrocks which span 1400 Ma to 251 Ma, we uncovered a Paleozoic shift in the ratio between chemical denudation and total denudation (weathering intensity). Field contextualization of each sample enables us to rule out extrinsic mechanisms for the observed trend, including climate and tectonic/topographic setting, and our diverse sample sites and isotopic constraints on source rock composition minimize any possible bias from parent-rock lithologies. The greater volume of chemically weathered clay material is therefore interpreted as representing a material geological impact of the evolution of land plants, which are anticipated to have intensified total weathering reactions within thicker and more stable soil profiles.

Flutes at the Forefront: Sedimentology of the Vernagtferner Proglacial Area, Austrian Alps

Paulina Mejías Osorio¹, Ricarda Wohlschlägl¹, Sara Karbacher¹, Thomas M. Vandyk^{2,3}, Daniel P. Le Heron¹

¹University of Vienna, Vienna, Austria, ²Open University, Milton Keynes, UK, ³Birkbeck University of London, London, UK

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Glacier recession is occurring quickly and globally, giving way to the exposure of contemporary sedimentary deposits in the forefields. These areas give us information about the processes operating in the glacial environment and insights into the transport and deposition of sediments associated with rapid retreat. The sediments found here are linked to different landsystems (e.g., supraglacial, subglacial, etc.) and can have varying degrees of preservation, since they are directly affected by hydrological processes and can eventually be completely obliterated by them. The Vernagtferner is a composite glacier in the Austrian Alps that currently consists of several disconnected tongues, and has been consistently monitored from a glaciological viewpoint. However, some of the most prominent features in its proglacial area are flutes that can reach up to 250 m in length, which have not been investigated in detail. In this study, we characterize the flutes at the western and eastern tongues of the Vernagtferner from a sedimentological perspective. These results stem from data collected in the field during the summer of 2023 and 2024, where uncrewed aerial vehicle surveys and sedimentological descriptions were carried out. By investigating these landforms and their characteristics, we aim to further expand on their formation mechanisms and their connection to flutes found in the paleorecord.

Oligocene Black Shale Deposition of the Paratethyan Realm (Transylvania and the Eastern Carpathians)

Prof. Mihaela Melinte-Dobrinescu^{1,2}, Professor Relu-Dumitru Roban², PhD Teodora Babos³, MSc Rares Stoian¹

¹National Institute of Marine Geology and Geo-ecology, Bucharest, Romania, ²University of Bucharest, Faculty of Geology and Geophysics, Bucharest, Romania, ³Doctoral School of Geology, University of Bucharest, Bucharest, Romania

7C: Sedimentology of Black Shales through Phanerozoic (2), Tāwhirimātea E (Level 2), January 29, 2026, 10:15 AM - 11:45 AM

At around 34 Ma, the palaeogeography of the Tethyan Realm changed due to the isolation of the Paratethys Realm from the Mediterranean. This modification is coeval with a climate change from an Eocene Greenhouse to an Oligocene Icehouse. In the Paratethys Realm, the sedimentation regime shifted from an Upper Eocene oxic sedimentation to a Lower Oligocene anoxic one. In both studied Romanian areas, i.e. Transylvania and the Eastern Carpathians, the Eocene turbidites sedimentation, composed of green and red shales interbedded with dm-thick sandstones, was replaced in the Lower Oligocene by hemipelagic sediments, i.e., bituminous marlstones and black radiolarites, followed by black shales. These rocks represent the main oil source rocks in the Eastern Carpathians. In the Upper Oligocene, the hemipelagites are replaced by turbidites, consisting of massive quartzous sandstones and cm-thick black shales and marlstones, regarded as the main reservoir rocks of the Eastern Carpathians. In the Transylvanian area, the Upper Eocene deposits (mainly part of a carbonate platform) are replaced by Lower Oligocene bituminous sediments; as their spatial development is very reduced, comparing with the Eastern Carpathians, their economic potential, as hydrocarbon source rocks, is lower. The change in the sedimentation across the Eocene-Oligocene boundary interval is accompanied by isotope $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ fluctuations. Their excursions show similarities with the global trend, but also recorded regional differences. To summarize, the change in the sedimentary regime at the Eocene-Oligocene boundary in the studied area is due to global factors, such as climate deterioration, from a warm and humid climate to a cooler and possibly arid one, and also regional factors, i.e., the isolation of the Paratethys and the regional tectonics.

Long-term Neogene-Quaternary Drainage Evolution of the Slovenj Gradec Basin (Southern Margin of the Eastern European Alps) with Landscape Evolution Implications

Dr. Eva Mencin Gale¹, Dr. Kristina Ivančič¹, Dr. Mirka Trajanova¹

¹Geological Survey of Slovenia, Ljubljana, Slovenia

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Slovenj Gradec Basin represents one of the most significant localities in the southeastern European Alpine foreland for investigating long-term landscape evolution with preserved Neogene-Quaternary succession. The Miocene succession is over 1200 m thick and characterised by alternation of conglomerate, sandstone, siltstone and marlstone deposited in terrestrial, brackish and shallow marine environments. The Pliocene to Quaternary deposits are up to 20 m thick and represented by gravel and silt, deposited in a terrestrial environment. Provenance of the Miocene succession was interpreted based on sedimentological, petrographic, and geochemical data. Modal composition and whole-rock analysis of major oxides of the sandstones indicate provenance from a recycled orogen, originating from quartzose sedimentary rocks of the Eastern Alps. Provenance of the Pliocene-Quaternary deposits is based on clast lithological analysis. Metamorphic and igneous clasts originate from the Pohorje area located east of the Slovenj Gradec Basin and were transported to the basin by the paleo-Mislinja River and its numerous smaller tributaries. Based on the provenance data and previous research, a long-term Neogene-Quaternary drainage history and landscape evolution was inferred. In the Miocene, the area was established in an extensional regime at the western margin of the Pannonian Basin System, and at the eastern margin of the rising Alpine orogen. The sedimentary input to the basin was from the north-west, west, and southwest, while the lowland in the east allowed for marine transgression. Miocene sedimentation ceased at the end of the Early Miocene due to the regional counter-clockwise rotation along the Labot Fault and the local uplift. In the Miocene-Pliocene transition, the present-day tectonic regime was established, which is characterized by a compressional regime and regional uplift. In the Pliocene the Quaternary Slovenj Gradec Basin was formed, and terrestrial sedimentation continued. The direction of drainage came to conform with the present one.

Ichnology of the Paleocene-Eocene Thermal Maximum (PETM) in the Iberian Peninsula

Dr. Olmo Miguez Salas¹, Dr. Luis Valero¹, Prof. Francisco J. Rodríguez-Tovar², Prof. Victoriano Pujalte³, Prof. Miguel Garces¹

¹Universitat Barcelona, Barcelona, Spain, ²Universidad de Granada, Granada, Spain, ³University of the Basque Country, Bilbao, Spain

9A: Deep time biogeomorphology (2) & Ichnology and sedimentary basin research: assessing environmental conditions, Tāwhirimātea A (Level 2), January 29, 2026, 4:25 PM - 5:55 PM

The Paleocene-Eocene Thermal Maximum (PETM) is one of the most studied climatic events in Earth history, mainly because of its analogies to future climate changes. However, ichnological analyses, a tool in paleoenvironmental interpretations, are comparatively scarce. The PETM is characterized by significant increases in global temperatures (4-8°C) and widespread environmental changes. These changes include ocean acidification, sea level rise, intensification of the hydrological cycle, retreat of ice sheets, and species extinction.

We conducted a comparative ichnological analysis in different sections of the Iberian Peninsula; 4 sections of the Pyrenean Basin (Esplugafreda, Serraduy, Campo and Zumaia), a deep-water gulf opening towards the Bay of Biscay, representing a continental-marine transect, and 2 sections of deep environments (Alamedilla, Rio Gor) from the southern margin of the Iberian Massif, opening towards the Tethys Sea,. The aim of this comparative study was twofold: 1) to understand whether the changes in the tracer community are similar in both areas (i.e., more restricted basin vs. open ocean); and 2) whether differences are observed in contrasting environments (e.g., coastal, shallow, deep-sea).

In the Pyrenean Basin, the onset of the PETM marked the extinction of the tracemaker community. Subsequently, on the platform, before the start of the recovery of the carbon isotope excursion, the trace fossil assemblage is reestablished, whereas in the deep-sea, even after the end of the excursion, trace fossil assemblage only partially recovers. Our results reveal a protracted recovery of the PETM, suggesting that the tracemaker community was under stress for a much longer period in the deep-sea. Surprisingly, different recovery patterns are observed in the deep-sea environments of the southern margin. Comparison with the few other sites worldwide where ichnological analysis has been performed allows a broader picture of this event.

The Usefulness of Neoichnological Experiments for Evaluating Past Environmental Conditions

Dr. Olmo Miguez Salas¹, Prof. Lidya Tarhan²

¹Universitat Barcelona, Barcelona, Spain, ²Yale University, USA

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Sediment-dwelling and burrowing communities are highly sensitive to a wide range of environmental factors. As a result, the trace fossil record is a valuable tool for interpreting past environmental conditions, offering insights into depositional settings, associated processes, and resulting sedimentary products. However, the extent to which burrow features vary under different climate conditions is poorly understood. We conducted four incubation experiments in customized chambers with common burrowing animals from intertidal flats along the western shoreline of Long Island Sound, New Haven, CT, USA. The first set simulated a gradual warming from ambient seawater temperature of 20°C (+2°C per two days until reaching 30°C) while in the second set we implemented a 6-day marine heat wave (a step change from 20°C to 30°C). The third and fourth experiments explored the impact of low-oxygen conditions. The third experiment was conducted at a constant temperature, while the fourth experiment was coupled with a marine heat wave over the same time interval. Burrow morphology was characterized at daily intervals. In particular, we analyzed: Polykladichnus-analogous vertical to oblique lined burrows produced by Nereidinae polychaetes with single or multiple Y-shaped upward-branching; Chondrites-analogous vertical and subvertical central burrows produced by Eunicida polychaetes that branch at depth, forming a dendritic system; Arenicolites-analogous U-shaped burrows produced by amphipods. We observed that the tracemakers responded differently under various simulated environmental conditions. Here, we highlight some major results: 1) Polykladichnus tracemakers produced more horizontal burrows under gradual warming. 2) Chondrites tracemakers reduced their burrowing activities under low-oxygen conditions. 3) Under marine heat wave conditions, Arenicolites tracemakers migrated downward. These results demonstrate the usefulness of experimental neoichnology in establishing correlations between burrow features and environmental conditions that may increasingly impact coastal benthic communities in future, as well as episodes of warmer climate states in Earth's past.

A Millennium Record of Tropical Cyclone Activity Reconstructed from Sinkhole Deposits in the Ogasawara Islands, Japan

PhD Kenta Minamidate¹, Dr Takashi Ishizawa², Dr Yusuke Yokoyama³, Dr Kazuhisa Goto¹

¹Department of Earth and Planetary Science, The University of Tokyo, Tokyo, Japan, ²International Research Institute of Disaster Science, Tohoku University, Sendai, Japan, ³Atmosphere and Ocean Research Institute, The University of Tokyo, Kashiwa, Japan

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Tropical cyclones (TCs) are among the most destructive hydrodynamic hazards affecting global coastal regions, and the associated risks are expected to intensify due to anthropogenic climate change. However, understanding the long-term relationship between TC activity and climate variability remains challenging because satellite-based TC records are limited to the past ~40 years and are temporally inhomogeneous. In contrast, geological archives provide valuable insights into TC variability over timescales ranging from centennial to millennial.

Despite frequent exposure to TCs in the Pacific Islands, paleostorm studies in such isolated oceanic settings remain sparse. This study presents a new sedimentary record from Minamijima Island, which is part of the Ogasawara Islands in the western North Pacific. Sediment cores were collected from Inyo-ike Pond, a coastal sinkhole located in the center of Minamijima Island. Non-destructive X-ray CT imaging and high-resolution XRF core scanning were performed, along with radiocarbon dating, grain size analysis, pollen analysis, and elemental analyses of carbon, nitrogen, and sulfur.

The sedimentary records span the last ~1,200 years or so and comprise two distinct types of sediment facies: organic-rich muds with elevated titanium levels, which are thought to have been deposited in fair weather, and sand layers enriched in calcium and strontium, which are thought to have been transported inland from the beach by overwash. In the absence of significant tsunami damage in the region, and given the frequent occurrence of TCs, the event layers are most likely associated with TC-induced overwash events. Notably, the increased frequency of overwash during the transition from the Little Ice Age to the current warm period suggests a possible link between recent warming and heightened TC activity. These findings highlight the importance of studying the geological records of such remote islands in order to reveal spatio-temporal variability in TC activity across the Pacific.

Determining the Best Core Location to Develop Long, Complete Records of Paleoseismicity from Lake Sediments

Miss Adelaine Moody¹, Dr Jamie Howarth¹, Dr Sean Fitzsimons²

¹Victoria University of Wellington, Wellington, New Zealand, ²University of Otago, Dunedin, New Zealand

9F: Sediment gravity flow deposits in lacustrine basins (1), Rongomātāne C (Level 1), January 29, 2026, 4:25 PM - 5:55 PM

Lacustrine paleoseismology enables detailed and continuous records of seismic activity spanning hundreds of thousands of years. Core sites are typically targeted in lake depocentres, where sediment-laden turbidity currents are focused and considered to provide the most complete record of seismic shaking. However, these records are often constrained by the very nature of earthquake-triggered flows, which can erode underlying deposits and produce thick event beds that reduce the time interval represented per unit length of core. Coring outside the depocentre can extend the temporal coverage but may miss smaller or more distal shaking events. We hypothesise that coring on depocentral margins provides an optimal trade-off between record length and completeness.

This study uses a transect of 6-metre sediment cores to examine the evolution of earthquake-related event deposits across four depositional environments in Lake Rotoroa, South Island, New Zealand. High-resolution ²¹⁰Pb and ¹⁴C dating calibrate the recent earthquake record with sedimentary signatures across the basin. Deposits linked to three historical earthquakes that generated shaking exceeding MMI VII were identified. Their presence, absence, and variation across sites reveal that cores taken ~10 m upslope from the depocentre offer an ideal balance, capturing nearly all events while avoiding the erosion and thick deposits typical of the basin floor. More distal sites, meanwhile, provide more incomplete records of seismic activity.

Targeting these medial depocentral margins yields paleoseismic records up to 4,000 years longer than those recovered from the depocentre for the same level of earthquake detection. Applying this approach to similarly structured, fault-proximal lakes offers the potential to recover complete Holocene-length paleoseismic records without resorting to scientific drilling. These data are critical to improving our understanding of fault behaviour and recurrence intervals for high-magnitude, low-frequency earthquakes.

Contourites on the Subducting Input Section along the N Hikurangi Margin -- How Might they Influence Shallow Subduction Processes?

Prof. Greg Moore¹, Dr. Phillip Barnes²

¹University of Hawai'i, Honolulu, United States, ²NIWA, Wellington, New Zealand

7F: Contourites and Mixed Depositional Systems (3), Rongomātāne C (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

Major deepwater current systems have long influenced sedimentation at the northern Hikurangi margin. Regional 2D seismic sections east of North Island, New Zealand, show abundant evidence for current-influenced sedimentary architecture. On the eastern and northern Hikurangi plateau, these include drifts, fields of sediment waves, and scour and moats around seamounts. These features are primarily in the pelagic facies (Miocene to Pleistocene age) and mainly formed in positions more easterly than present day, having since been carried westward by subduction at the Hikurangi trench. An IODP drill hole in the Hikurangi Trough east of Gisborne provides the basic lithologic and age information of strata in the subducting section. A 3D seismic data volume across the Trough and prism shows details of the stratigraphic architecture, such as sediment waves and scour and moats around seamounts that are filled with younger sediments that onlap against the flanks of basement highs.

The bottom currents have also potentially affected the physical properties and geometry of the strata, potentially adding to localized heterogeneity through winnowing fine fractions from sandy layers and increasing their porosity while depositing those fines over sand beds to create seals that impede dewatering during later compression.

The 3D seismic volume continues west across the toe of the landward trench slope and shows that the contour current affected section is being added to the accretionary prism. We suggest it is important to recognize contourite-modified stratigraphic features to interpret as thrust packets are added to the accretionary prism because onlapping relationships may potentially be misinterpreted as faults after continuing deformation. Additionally, discontinuous, high porosity units sealed by finer layers could develop pockets of high pore fluid pressures that could affect seismogenic zone processes as the thrust packets are carried deeper into the accretionary prism.

Soft-sediment Deformation Structures as Sedimentary Record of Depositional and Tectonic Events

Professor Massimo Moretti¹

¹Università degli Studi di Bari, Bari, Italy

9D: Sedimentary evidence of geohazards (2), Rongomātāne A (Level 1), January 29, 2026, 4:25 PM - 5:55 PM

Soft-sediment deformation structures (SSDS) are key sedimentary features that preserve evidence of syn-depositional and early post-depositional processes. Their analysis provides critical insights into the dynamic interplay between depositional environments and tectonic activity. SSDS typically form under conditions of rapid sedimentation, wave-induced overpressure, abrupt rises in the water table due to artesian springs, and seismic shaking—making them valuable indicators of both sedimentary dynamics and external triggers such as earthquakes.

The identification of SSDS morphologies—mainly load structures, convolute laminations, clastic dikes, and syn-sedimentary faults—along with specific features linked to liquefaction and fluidization processes, enables a systematic interpretation of deformation mechanisms. Detailed facies analysis of deformed layers can help distinguish between seismic and non-seismic origins.

Integrating sedimentological, structural, and geochronological data is essential to constrain the timing of deformation events. This approach is particularly important for seismically induced SSDS, which can provide a reliable sedimentary record of ancient earthquakes. However, the analysis of such structures also reveals significant limitations in their application to paleoseismological studies.

This work aims to synthesize current knowledge of SSDS as a sedimentary archive of depositional and tectonic events, emphasizing methodological approaches and case studies that illustrate their interpretive value. By refining analytical criteria, SSDS studies can enhance reconstructions of paleoenvironmental conditions and tectonic regimes in both ancient and recent sedimentary settings.

Implications of Seamount-Forearc Interactions on Sediment Architecture along the Northern Hikurangi Forearc

Professor Julia Morgan¹, Dr Nathan Bangs², Ms Danqi Jiang²

¹Rice University, Houston, United States, ²University of Texas Institute of Geophysics, Austin, United States

4F: Sedimentary processes in the northern Hikurangi Margin of New Zealand: Insights from IODP Expeditions 372/375, Rongomātāne C (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

The Hikurangi plateau is studded with seamounts of a range of sizes. These interact and perturb the forearc of the northern Hikurangi margin as they approach and are carried beneath the overriding plate. 2D and 3D seismic surveys in the area are revealing the details of these interactions, particularly in the most frontal regions. IODP Expeditions 372 and 375 sampled key features associated with these interactions, providing important ground truth for seismic interpretations. In particular, IODP Site U1518 penetrated a large offset thrust, the Pāpaku fault, which rises from the megathrust fault along the leading edge of a seamount. Drilling results confirm distinct differences in sediment properties and histories within the hanging wall and footwall of the fault. The hanging wall is well-consolidated and significantly deformed due to tectonic compression and uplift. Its surface morphology reveals a history of landsliding, likely due to oversteepening during uplift. In contrast, the footwall block experienced minimal consolidation during overthrusting. Lying in the lee of the subducting seamount, it experienced little tectonic compression. Furthermore, the fault appears to be an effective seal that prevented dewatering of the footwall block. The fault zone is characterized by intensely ductilely deformed sediments best explained by the hanging wall overriding an ancient seafloor covered by chaotic and heterogeneous strata derived from landslide debris. Consistent with these drilling observations, new interpretations of the coincident 3D seismic volume suggest the removal of substantial volumes of sediment adjacent to the fault zone, a consequence of offscraping of hanging wall strata by the seamount and landslide scouring of strata in the future footwall. In combination, seamount-forearc interactions can have significant implications for the preservation of the stratigraphic record, which therefore must be interpreted within the context of the seamount collision and its associated spatial variations in sedimentary units and physical properties.

Origin and Diagenetic Priming of a Potential Slow-Slip Trigger Zone in Volcaniclastic Deposits Flanking a Seamount on the Subducting Plate, Hikurangi Margin, New Zealand

Professor Julia Morgan¹, Professor Kathleen Marsaglia², Dr Sydney Allen¹, Ms Alison Franco²

¹Rice University, Houston, United States, ²California State University, Northridge, Northridge, United States

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

One of the primary goals of IODP Expeditions 372 and 375 was to investigate the processes and in situ conditions that contribute to the occurrence of subduction zone slow-slip events (SSEs) along the northern Hikurangi Trough. A leading hypothesis is that the SSEs in the area are associated with seamount subduction, however the mechanisms responsible remain poorly understood. One possibility is the presence of phyllosilicates that undergo dehydration at depth to create local zones of overpressure. IODP Expedition 375 cored along the flank of Tūranganui Knoll, a Cretaceous seamount east of the subduction zone containing units analogous to intervals associated with subducted seamounts. Detailed investigations of the volcaniclastic Unit V at Site U1520, based on scanned core images, petrographic observations, point-counting, and μ XRF mapping, reveal that it is a mafic volcaniclastic succession rich in clay minerals which are products of a multiphased history of diagenetic alteration. This unit is interpreted as resulting from downslope transport of volcaniclastic debris from submarine eruptions. In contrast, most volcanic clasts recovered at the nearby Site U1526, near the top of Tūranganui Knoll, are interpreted as products of subaerial eruptions reworked by wave action. This shallow water sedimentary package experienced minimal clay-mineral alteration and more extensive early carbonate cementation. Differences in the clast origins, depositional settings and diagenetic histories of these volcaniclastic units highlight the heterogeneity of volcanic systems on the Hikurangi Plateau. However, the presence of voluminous hydrous clays within thick, altered flanking volcaniclastic units at Site U1520 provides a ready source for excess pore fluids that may enable slow-slip events along the Hikurangi subduction zone.

Internal Waves and their Impact on Mesophotic Carbonate Systems

Michele Morsilli¹

¹Dipartimento di Fisica e Scienze della Terra, Università di Ferrara, Ferrara, Italy

7B: Carbonate depositional systems from platform, slope to basin (1), Tāwhirimātea C (Level 2),
January 29, 2026, 10:15 AM - 11:45 AM

Internal waves (IWs), propagating along oceanic density gradients, are a powerful yet underexplored driver of sedimentary and ecological dynamics in mesophotic carbonate systems (30–150 m depth). This study investigates their role through detailed analysis of selected Mesozoic and Cenozoic carbonate platforms, integrating sedimentological and paleoecological evidence to reconstruct IW-related processes in ancient mesophotic settings. Facies distribution, sedimentary structures, and fossil assemblages document a strong imprint of episodic energy inputs, expressed in sediment resuspension, facies architecture, and habitat heterogeneity in mid- to outer-ramp successions.

To contextualize these patterns, comparisons were made with well-studied modern analogues from the Caribbean, Red Sea, and Indo-Pacific provinces, where IW-driven processes modulate nutrient cycling, temperature, oxygenation, and sediment dynamics. In both fossil and modern settings, IWs promote dynamic facies architectures and foster ecologically complex mesophotic communities. Furthermore, their periodic nature can buffer mesophotic ecosystems, such as coral assemblages, from thermal stress, enhancing resilience to climate-driven bleaching events.

The persistence of IW-driven sedimentological and ecological processes through geological time underscores their fundamental role in carbonate platform evolution. The recognition of IW-related sedimentary signatures provides valuable insights into paleoceanographic conditions and informs interpretations of both ancient and modern carbonate systems. This work highlights the importance of integrating IW dynamics into models of carbonate sedimentation, with implications for paleoenvironmental reconstruction and the identification of mesophotic carbonate systems in the geological record.

Chondrodonta Bivalves as a Proxy for Environmental Stress During Cretaceous Oceanic Anoxic Events: Insights from Shallow-Water Carbonate Platforms

Michele Morsilli¹, Gabriella Del Viscio¹, Renato Posenato¹, Gianluca Frijia¹

¹Dipartimento di Fisica e Scienze della Terra, Università di Ferrara, Ferrara, Italy

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The opportunistic bivalve *Chondrodonta* may represent an increasingly valuable proxy for tracking episodes of environmental stress across Cretaceous Oceanic Anoxic Events (OAEs). A review of its stratigraphic distribution in shallow-water settings worldwide reveals that major *Chondrodonta* proliferations consistently occur at the onset of OAEs, particularly during the Selli Event (OAE1a).

Chondrodonta displays a wide range of depositional settings, having been documented from inner platform lagoons to platform margins, and often co-occurs with rudist communities. However, during phases of maximum environmental disturbance, it is frequently found in quasi-monospecific accumulations, highlighting its exceptional tolerance to dysoxic, nutrient-rich, and potentially acidified conditions that excluded less resilient taxa.

A full analysis of its time–facies distribution further indicates that during the early Aptian, *Chondrodonta* was particularly abundant whereas rudists and other stenotopic organisms declined. This spatial pattern likely reflects the occurrence of environmental stress gradients across shallow platforms during OAE1a.

Overall, the recurrent pattern of *Chondrodonta* proliferation, its ecological flexibility, and its capacity to dominate benthic communities under stress underscore its utility as a bioindicator of pre-OAE instability in shallow marine systems. Importantly, the variable impact of OAEs in the shallow-water realm—evident in the differing ecosystem responses during the OAE1a and OAE2 and other minor events—remains an open research frontier, to which the study of *Chondrodonta* paleoecology and stratigraphic distribution, together with other bivalves such as Rudists, offers valuable new insights.

Source-to-Sink Dynamics during a Multi-Stage Rifting, Mid-Norwegian Continental Margin

Ms Tereza Mosociova^{1,2}, Dr. Christophe Serié^{1,3}, Mr. Jan David Wagner¹, Israel Polonio⁴

¹University of Oslo, Department of Geosciences, Oslo, Norway, ²The University Centre in Svalbard, Department of Arctic Geology, Longyearbyen, Norway, ³Vår Energy, Norway, ⁴Aker BP, Norway

2A: Next Generation Sediment Provenance (2), Tāwhirimātea A (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

An array of Carboniferous to Permo-Triassic rift basins formed during continental extension leading to the Greenland–Norway breakup. These basins preserve sediments that record transport pathways and depositional depocentre shifts due to tectonic, environmental, and climatic changes. A regional 3D seismic dataset covering over 35000 km² of the mid-Norwegian continental margin was analysed for paleotopography and sediment routing systems. The high-resolution data allowed for generation of basin morphology reconstructions through time based on the interpreted seismic stratigraphy and attributes using Paleoscan. This brings an understanding of the source-to-sink system development and the tectonic and erosional influence on the landscape. The Carboniferous and Permo-Triassic successions have been penetrated by only a few wells targeting paleogeographic highs with condensed stratigraphic records. Consequently, the tectono-sedimentary evolution of the paleotopographic lows remains poorly understood. Recent advances in high-resolution seismic acquisition permitted detailed assessment of geomorphological features. Basin-wide tectono-stratigraphic models were developed by integrating the new geomorphological and structural reconstructions with sedimentological information from available cores and findings from analogue outcrops in Eastern Greenland.

The basin fill comprises a mixed siliciclastic–evaporite–carbonate system from marine and terrestrial settings, leading to complex sedimentary architectures. Siliciclastic input originated mainly from the remnants of the Caledonian mountain belt and Devonian molasse, entering carbonate-dominated basins as alluvial fans, fan deltas, and submarine fans. In the Late Permian, reactivation of inherited basement structures altered basin-floor topography. Increased tectonic activity and fault block rotation during the Early Triassic led to partial restriction from the Boreal Ocean, resulting in evaporite and terrestrial facies in the Middle Triassic. By the Late Triassic, a fluvio-lacustrine system developed, coinciding with a shift from semi-arid to humid conditions and a reduction in subsidence. These observations provide an enhanced understanding of sediment transport development during a multi-stage rifting activity and tectonic influence on sediment pathways.

Fault-controlled Karstification within a Mixed Siliciclastic-Carbonate-Evaporite Rift Basin, Billefjorden Trough

Ms Tereza Mosociova^{1,2}, Dr. Tom Kibblewhite³, Prof. Kim Senger², Assoc. Prof. Aleksandra Smyrak-Sikora⁴

¹University of Oslo, Department of Geoscience, Oslo, Norway, ²University Centre in Svalbard, Arctic Geology Department, Longyearbyen, Norway, ³University of Bristol, School of Earth Sciences, Bristol, UK, ⁴Norwegian University of Science and Technology, Department of Geoscience, Trondheim, Norway

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Faults play a crucial role in facilitating the infiltration of freshwater into the subsurface, which promotes chemical and mechanical karstification of the host rocks. In tropical coastal settings, karstification is influenced not only by the dissolution of rocks through meteoric fluids, but also by the effects of seawater and degradation from marine biota. Here we examine an extensive deep-time paleokarst system within the basin fill of the Billefjorden Trough, Svalbard, focusing on the architecture and evolution related to mixed siliciclastic-carbonate-evaporite systems.

Field data analyses of the evaporite-dominated Minkinfjellet Formation and carbonates of the Wordiekammen Formation reveal the scales, origins, and timing of karstification in relation to the area's tectonic development. Multiple phases of karstification occurred during the late syn-rift and early post-rift stages (Late Carboniferous to Early Permian) in response to growth faults activity. The outcrops in Svalbard showcase a multi-level paleokarst system formed by the local dissolution of evaporites and carbonates, along with collapse-related brecciation. The multi-stage karstification resulted from repeated subaerial exposure of a partially restricted marine warm-water carbonate platform situated at low paleo-latitudes.

The Billefjorden Trough, a half-graben bounded to the west by the Billefjorden Fault Zone (BFZ), experienced variable subsidence rates controlled by fault activity. A mega-breccia developed adjacent to the BFZ in the main basin depocenter, likely due to tectonic and/or solution-induced collapse. The hanging wall of the BFZ was intersected by several west-dipping intra-basinal faults. These faults led to penecontemporaneous gypsum solution karstification and collapse, which are preserved within the carbonate beds as westward-thickening horizontal stratiform breccias. These breccias connect to deeper vertical breccia pipes formed within the evaporites along footwall blocks of the cross-cutting antithetic faults. We conclude that the karstification pulses were triggered by subaerial exposures influenced by tectonics, subsidence, climate, and glacio-eustatic variations associated with the Late Paleozoic Ice Age.

Holocene Braid Deltas: Where Do they Occur and How May they Be Classified?

Dr Jason Muhlbauer¹, Dr Christopher Fedo²

¹Boise State University, Boise, United States, ²University of Tennessee, Knoxville, Knoxville, United States

6D: The complexity of braided rivers that reach the base level, Rongomātāne A (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

Braid deltas, environments that form where braided rivers enter standing water, are more important on Holocene Earth than previously appreciated. A world-wide survey identified 786 braid deltas with feeder systems greater than 500 m wide. Braid deltas occur at all latitudes except those encompassing Antarctica, but are most abundant by land area in 45°S-to-60°S and 60°N-to-90°N latitude bands. Marine-associated braid deltas comprise 71% of the dataset, with the remainder in marginal lacustrine settings. Half of the observed braid deltas do not form radial terminal delta-plain geometry. Hierarchical clustering analysis separates braid deltas into 9 clusters that define a 5-group classification scheme: (1) marine-perennial systems, (2) marine-intermittent systems, (3) fjord-land braid deltas, (4) bayhead braid deltas, and (5) lacustrine braid deltas. Drivers of differentiation include basin type, embayment, sediment supply, and flow intermittence of the feeding braided river. The classified dataset provides analogues to ancient, non-vegetated deltaic environments and the essential framework for development of braid-delta facies models.

Past Glacio-fluvial Braided River Deposits from Seismic Reflection Data of Vincennes Bay, East Antarctica

Mr Timo Mühlberger-Krause^{1,2,4}, Karsten Gohl¹, Katharina Hochmuth^{3,4}, Rachel Barrett⁵, German Leitchenkov⁶, Chiara Tobisch⁵, Johann P. Klages¹, Sebastian Krastel⁵

¹Alfred Wegener Institute Helmholtz-Centre for Polar and Marine Research, Bremerhaven, Germany,

²University of Bremen, Bremen, Germany, ³Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Australia, ⁴Australian Centre for Excellence in Antarctic Science, Australia, ⁵Kiel University, Kiel, Germany, ⁶St. Petersburg State University, St. Petersburg, Russia

1F: Earth's sedimentary record of glaciation (1), Rongomātāne C (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

The East Antarctic Ice Sheet (EAIS) has long been assumed to remain relatively stable under current climate forcing. However, recent improvements in subglacial topographic data and observations of increased mass loss have challenged this assumption. The extent of the early EAIS remains relatively unconstrained throughout East Antarctica. Glacial-marine sediments and pro-glacial environments such as glacio-fluvial systems that were deposited on the continental shelf record past ice sheet expansion and retreat periods that have occurred since the onset of major Southern Hemisphere glaciations. The presence of buried glacio-fluvial systems indicates a terminating glacial outlet further upstream at the time of deposition. We use relatively deep-penetrating offshore reflection seismic data collected in early 2024 and pre-existing data to characterise the continental shelf in Vincennes Bay by constructing a seismic stratigraphic model. This allows us to reconstruct past depositional environments. The new seismic data reveal multiple generations of braided river systems in the Oligocene (~34-24 Ma). These systems are characterised by imbricated progradation patterns contained within an otherwise well-stratified, parallel reflector package which transitions into fluvial prograding delta structures further seaward. The first major grounding line advances onto the continental shelf occur during the Oligocene-Miocene Transition (~24 Ma), which marks the end of recorded coastal-terrestrial glacio-fluvial deposition in the area. These signatures differ significantly from earlier fluvial channel systems on the proximal continental shelf (~34-65 Ma) as well as the later occurring subglacial channel systems outlining the different depositional systems during these periods. These braided river systems are the earliest indications of an advancing EAIS close to the continental shelf in Vincennes Bay and are interpreted as a glacio-fluvial outwash plane. This further constrains the extent of the Oligocene EAIS further upstream in the vicinity of the most landward part of the Vincennes Bay continental shelf.

Stalked Crinoids: From Skeleton to Sediment

Mr Matthew Musso¹, Dr. Arnoud Slootman¹, Dr. Zane Jobe¹, Dr. Lesli Wood¹

¹Colorado School of Mines, Golden, United States

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Stalked crinoids (i.e., sea lilies) were dominant producers of carbonate skeletal sediment during the middle-late Paleozoic. Through post-mortem decay and disarticulation, the skeletal remains of these organisms formed sedimentary rocks consisting almost entirely of crinoidal debris. These 'encrinites' range from thin, centimeter-scale lenses, to thick, meter-scale beds extending hundreds of square kilometers. Encrinites have been proven hydrocarbon reservoir and source rocks, serve as important paleoclimatic indicators, and hold key insights into the paleontological evolution of life through time. However, despite the significance of stalked crinoids as abundant sediment producers in the past, the characteristics of the sediment grains they produce remain enigmatic. This work aims to identify the different crinoid skeletal products generated through disarticulation of the endoskeleton of a modern stalked crinoid, *Neocrinus decorus*. Bleach bath experiments generated five types of skeletal particles; the stalk produced columnals and cirrals, and the crown fell apart into brachials, pinnulars, and lappets. All disarticulated grains from this single crinoid ($n = 135,661$) were characterized in terms of composition, size, and shape. The columnals (i.e., the main stalk elements) account for 50.6% of the total crinoid volume yet contribute only 0.03% of the total particles. Analysis of the lengths and diameters of these approximately cylindrical particles has shown a multimodal distribution of sediment sizes from a single organism. Using equivalent diameter (i.e., the diameter of a sphere with the same volume as the grain), these particles range from fine sand to pebbles. Under the assumption of normal distribution of crinoid body size, the grain-size distribution of the crinoid skeletal elements has been upscaled to the local meadow, where stalked crinoids thrived in ancient depositional environments. Through crinoid particle generation and grain-size quantification, further insights into the nature of crinoidal sediment and encrinite deposits can be more accurately interpreted.

Channel Stabilization of the Downstream Alluvial System via Steady Sea-Level Cycles: An Inevitable Outcome of Stratigraphic Convergence

Dr Tetsuji Muto¹, Prof. Junhui Wang²

¹Nagasaki University, Nagasaki, Japan, ²China University of Petroleum (Beijing), Beijing, China

3C: Coastal to shelf environments across time and space (3), Tāwhirimātea E (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

Conventional stratigraphy assumes that the stratigraphic response of the downstream alluvial system is specifically determined by the phase of the eustatic or relative sea-level cycle on a reasonable scale, and that the system repeats a particular response when the sea level cycles into the same phase. Recent advances in experimental stratigraphy and autostratigraphy have brought a fundamentally different perspective to this question. In principle, the alluvial response to steady sea-level cycles can change drastically as the system expands, making it impossible to maintain the same specific response over time. Eventually, however, the mature system acquires a particular stratigraphic architecture, after which there is no further significant change in the sediment stacking pattern. This process toward the final stable state is referred to as ‘stratigraphic convergence.’ Our physical experiments provide further insight into how alluvial channel activities change through stratigraphic convergence. During the rising stage of the early cycles, a small-extent downstream alluvial system may experience deltaic regression. As the cycle progresses and the system expands, only non-deltaic transgression can occur accompanied by the intense stabilization of alluvial channels, which are no longer subject to avulsion and lateral migration. During the falling stage of early cycles, the downstream alluvial system usually experiences deep valley incision. In later cycles, however, the system can undergo aggradation without system-wide incision. In a highly mature aggradation-sustainable phase, the alluvial channels are virtually aggradational, yet they are close to a graded state, in which they simply extend downstream with little/no avulsion or lateral migration. Therefore, regardless of whether the sea level is rising or falling, the alluvial channels will become intensely stabilized after many cycles. Recognizing the effects of system growth and stratigraphic convergence is essential to understanding the stratigraphic response of downstream alluvial systems to known or unknown sea-level changes in the geologic record.

High Spatial and Temporal Resolution Geochemical Records in Varved Sediments – Towards Seasonally and Event-Resolved Records of Ecosystem, Environmental and Climate Change

Dr Sebastian Naeher¹

¹Lincoln University, New Zealand

10E: Varved and high-resolution lacustrine sequences as records of climate change, anthropogenic impact and extreme events, Rongomātāne B (Level 1), January 30, 2026, 11:00 AM - 12:30 PM

Varved sediment records offer unique opportunities to study ecosystem disturbances, environmental and climatic changes at high temporal resolution. Age models derived from varves combined with radiometric approaches (e.g. ^{210}Pb , ^{137}Cs and ^{14}C dating) can result in exceptional sediment core chronologies down to annual or even sub-annual resolution.

In addition to typically well-constrained age models in varved sediments, innovative sediment core scanning techniques facilitate rapid, non-destructive and high spatial resolution analysis of inorganic (e.g. trace metals/elements) and organic (e.g. pigments, biomarkers) indicators. X-ray fluorescence (XRF) core scanning has enabled widespread, high-resolution analyses of trace and transition elements for reconstructions of productivity, terrestrial input/runoff, redox conditions and to detect event deposits (including microturbidites). Organic pigments (chlorophylls, carotenoids) can now be analyzed at high spatial resolution using hyperspectral imaging (HSI), revealing changes in productivity and organic matter sources, phytoplankton community shifts, water-column stratification/mixing and redox conditions from sediment records. Ultra-high resolution mass spectrometry and mass spectrometry imaging has advanced the high-resolution analysis of organic biomarkers for paleoclimate reconstructions beyond traditional approaches.

Most varve studies to date focus on Europe and North America, in this presentation, I provide an overview of the relatively few case studies available from New Zealand (e.g. Lake Ohau, Maar crater lakes) and Australia (e.g. Lake Barrine, also ancient varve records of Precambrian and Carboniferous age from Western Australia and New South Wales, respectively). I will explore opportunities for varve chronologies to improve sediment core dating and high-resolution proxy reconstructions of environmental and climate changes. I will also demonstrate why varved systems appear rather scarce in this part of the world, what we learnt from them about short-term climate variations and how they provide evidence of extreme events and ecosystem disturbances.

Microtextural Characterization of Spaced Stratification Using CNN Image Analysis and Comparison with Flume Experimental Deposits

Mr Takumi Nagato¹, Professor Hajime Naruse¹

¹Division of Earth and Planetary Science, Graduate School of Science, Kyoto University, Kyoto, Japan

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Spaced stratification (SS), also known as traction-carpet deposits, is a sedimentary structure characterized by stratified, inversely graded bands. This structure is observed in deposits of various sediment gravity flows, including turbidites, hyperconcentrated flow deposits, and pyroclastic density current deposits. Understanding the formative mechanisms of SS is crucial for interpreting the flow dynamics that produce these deposits. However, the formation mechanisms remain poorly understood due to the limited number of detailed descriptions and experiments.

Analysis of grain-scale microtextures and comparison with experimental deposits can provide clues to the formative mechanisms of SS. We employed a convolutional neural network-based image analysis to automatically detect sand grains in high-resolution images of scanned sandstone cross-sections (>10 cm²). This method enabled rapid and accurate quantification of grain parameters with micrometer precision. Hierarchical cluster analysis of grain long-axes distributions indicated two types of grain fabric of inversely graded bands: unimodal and bimodal angle distributions. This result raises the question of whether a single or multiple mechanisms form these two types of bands, which becomes key to interpreting SS as an indication of depositional environments.

We further conducted flume experiments of upstream-migrating antidunes, which produced deposits with an appearance similar to SS. Imbrication angles within the experimental inversely graded bands also showed bimodal distributions, and the cluster analysis grouped those fabrics into the actual samples exhibiting a bimodal angle distribution.

These findings suggest that upstream-migrating antidunes are one of the mechanisms responsible for the formation of spaced stratification. However, existing studies have suggested that antidunes may exhibit an unimodal imbrication angle. The implication of differences in particle arrangement for differences in formation conditions remains an intriguing topic for future investigation. The findings of this study shed light on the long-standing question of SS formation conditions and provide important insights into the depositional process of sediment gravity flows.

Reconstruction of Turbidite Formation Processes Using Numerical Modeling Based on Instrumentally Observed Earthquakes in the Ryukyu Trench

Dr Ryo Nakanishi¹, Hajime Naruse², Arata Kioka³, Ren Tsuneoka³, Karin Nemoto³, Seiya Fujishima², Ryusei Sato², Atsuko Amano¹, Akira Ijiri⁴, Juichiro Ashi³, Yusuke Yokoyama³

¹National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan, ²Kyoto University, Kyoto, Japan, ³The University of Tokyo, Tokyo, Japan, ⁴Kobe University, Kobe, Japan

2D: Controls on sedimentation at submarine active margins (2), Rongomātāne A (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

Clarifying prehistoric earthquake histories through geological evidence is essential for understanding the recurrence intervals and maximum magnitudes of large earthquakes. Conventional studies of seismic turbidites have primarily focused on reconstructing a recurrence history of earthquakes. However, no study to date has successfully reproduced the full sequence—from slope failure induced by seismic shaking, through the generation and transport of turbidity currents, to the eventual deposition of turbidites. To bridge this gap, it is necessary to gain a deeper understanding of turbidite formation processes triggered by earthquakes with known epicenters and magnitudes, and to apply this knowledge to paleoseismic reconstructions. This study aims to reproduce the entire process from seismic shaking to turbidite deposition for instrumentally recorded earthquakes. We employed core sampling during research cruises and conducted numerical modeling to achieve this objective. The study area is around Kikai Island in the central Ryukyu Trench. Surface sediment cores collected by research vessels revealed the spatial distribution of turbidites. Two turbidite layers, deposited within the past 150 years, were identified in cores from two small basins. Radiometric dating using Pb-210 and Cs-137 isotopes correlated these layers with two observed earthquakes. Slope stability was assessed using the simplified Bishop method to estimate the seismic acceleration required to trigger slope failure. The identified unstable slope areas were then treated as potential sources of turbidity currents in numerical simulations using the “turb2d” model (Naruse, 2020), which computed the resulting turbidite distributions. Our findings indicate that the spatial extent of the turbidites can be well explained by the strong seismic intensities of observed earthquakes inferred from the depositional ages. This approach suggests the potential to develop a method for reconstructing paleoseismic intensities as an inverse problem, using turbidite distributions as input data.

Distribution and Age of Tsunami Deposits on Tongatapu Island, Kingdom of Tonga

Mr Koki Nakata¹, Dr Takashi Ishizawa², Dr James Goff³, Ms Savelinga Faoliu⁴, Mr Penikolo Vailea⁴, Mr Mafoa Penisoni⁴, Dr Yuya Ikenaga⁵, Mr Katsumi Kasai¹, Dr Yusuke Yokoyama¹, Dr Yosuke Miyairi¹, Dr Kazuhisa Goto¹

¹The University of Tokyo, Bunkyo, Japan, ²Tohoku University, Sendai, Japan, ³ University of New South Wales, Sydney, Australia, ⁴Tonga Geological Services, Nuku'alofa, Tonga, ⁵National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan

9D: Sedimentary evidence of geohazards (2), Rongomātāne A (Level 1), January 29, 2026, 4:25 PM - 5:55 PM

Tongatapu island is at risk from large tsunamis because of its closeness to the Tonga trench at its east and submarine volcanoes at its west. Indeed, in 2022, Hunga Tonga-Hunga Ha'apai volcano erupted and generated a large tsunami (Borrero et al., 2023). However, paleotsunami research on Tongatapu Island remains limited (Frohlich et al., 2009; Lavigne et al., 2021) and the paleotsunami history of the island is still not well understood.

Recently, we conducted paleotsunami surveys at Kanokupolu and Kala'au on the western side of Tongatapu Island, and at Haveluliku on the eastern side (Nakata et al., 2024, 2025 JpGU). At Haveluliku, our investigation was carried out at the same site as Lavigne et al. (2021). At all sites, we excavated trenches beneath tsunami boulders and discovered tsunami deposits directly below them. In this study, to obtain high-precision age of each event, we conducted multiple radiocarbon dating. We selected more than 10 samples of coral and shell fragments found within each tsunami deposit, then measured and calibrated them.

As a result, the tsunami deposits at Kanokupolu and Kala'au were dated to the 16–19th centuries. On the other hand, the tsunami deposits at Haveluliku were dated to the 13–15th centuries. The results of Haveluliku are consistent with Lavigne et al. (2021). Although further measurements are required, our preliminary results may suggest that a large tsunami attacked in the west of Tongatapu Island in the 16–19th centuries, and another in the east in the 13–15th centuries. Based on the relative locations of Tongatapu Island, the Tonga Trench, and submarine volcanoes, we suspect that the 16-19th century tsunami might have originated from a submarine volcanic event, whereas the 13-15th century tsunami might have originated from an earthquake along the Tonga Trench.

Acknowledgments: This research was supported by SATREPS, JST/JICA and JSPS.

An Internationally Endorsed Approach to Marine and Coastal Classification: Glossaries and Tools to Support Consistent Mapping of Diverse Geomorphologies

Dr Rachel Nanson¹, Dr Riccardo Arosio², Dr Joana Gafeira³, Dr Mardi McNeil¹, Dr Dayton Dove⁴, Dr Lilja Bjarnadóttir⁵, Dr Margaret Dolan⁵, Dr Janine Guinan⁶, Dr Alix Post¹, Professor John Webb⁷, Dr Scott Nichol¹, Dr Zhi Huang¹, Ms Jasmin Wells¹

¹Geoscience Australia, Kingston, Australia, ²University College Cork, Ireland, ³Kelpie Geoscience,

⁴British Geological Survey, Edinburgh, UK, ⁵Geological Survey of Norway, Trondheim, Norway, ⁶Trinity College Dublin, Ireland, ⁷La Trobe University, Australia

9C: Mapping marine sediments in the world (1), Tāwhirimātea E (Level 2), January 29, 2026, 4:25 PM - 5:55 PM

Facies and environmental interpretations provide critical context for many of the marine and coastal landforms that underpin geomorphic mapping in environments shaped by complex hydrodynamic, sedimentary, tectonic, and biogenic processes. As the global ocean economy expands, geomorphology maps are increasingly recognised as critical datasets for evidence-based marine and coastal planning and decision-making. These maps offer valuable context for a broad range of users, and standardised, multi-scalar, inter-jurisdictional approaches enable consistent data representation across local, regional and international scales. However, the development of seabed geomorphology maps is challenged by the heterogeneous coverage, resolution, and quality of bathymetric and stratigraphic data.

To help address this challenge, the International Seabed Geomorphology Mapping Working Group (ISGM)—comprising representatives from geoscience agencies and universities in the United Kingdom, Norway, Ireland, and Australia—developed a two-part mapping approach. This method separates morphological mapping from geomorphic interpretation, constraining the uncertainty inherent to interpreting processes and stratigraphy to a second, dedicated step. In Part 1, bathymetric shapes are mapped and classified using standardised Morphology Feature terms (Dove et al., 2020: <https://zenodo.org/record/4071940>). In Part 2, a standardised database framework and glossary, containing over 400 terms structured across 11 overlapping depositional environments and geological domains, is used to name these shapes with their geomorphic interpretation (Nanson et al., 2023: <https://zenodo.org/record/7804019>). The two-part framework was developed using an Ocean Best Practice approach and incorporates established literature and terminology.

The implementation of the two-part mapping approach is supported by published open-access digital vocabularies (Wells et al., 2025: <https://doi.org/10.26186/150006>), bespoke GIS analysis tools (GA-SaMMT: <https://doi.org/10.3389/fmars.2023.1236788>; CoMMa: <https://doi.org/10.1016/j.geomorph.2024.109227>), and a cartographic style file (in prep) that supports consistent symbolisation of mapped geomorphologies. We will present applied examples that demonstrate the utility of this approach across various marine environments. These two-part mapping reports and implementation tools are available for download at <https://www.geomorph.org/international-seabed-geomorphology-mapping-working-group/>.

A Continental Review of Australia's Cenozoic Megafans and Associated Large Accretionary Fluvial Systems

Professor Gerald Nanson¹, Dr Rachel Nanson²

¹University of Wollongong, Wollongong, Australia, ²Geoscience Australia, Canberra, Australia

4D: The continental sedimentary successions and their ability in understanding the present and forecasting the future of the Earth's surface (1), Rongomātāne A (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

Australia is the world's lowest and flattest continent with the most negative water balance. Gentle Cenozoic tectonism has formed numerous moderately depressed basins, mostly on the eastern half of the continent, that have accumulated substantial alluvium across diverse climatic zones. While megafans predominate, a minority are axial systems confined in large valleys. We propose the generic term large accretionary fluvial systems (LAFS) to describe all that are $> \sim 1000 \text{ km}^2$. Australia has 61 LAFS totaling $480,000 \text{ km}^2$ or 6.3 % of the continent. Divisible into two primary types, Type 1 ($n = 51$) are laterally unconstrained, hence are megafan in planform with distributive flow networks and cover $400,000 \text{ km}^2$. Type 2 ($n = 10$) are valley confined, cover $81,000 \text{ km}^2$, and are dominated by semi-parallel anabranching channels. Both can be further differentiated by their distal components into three subtypes: terrestrial; coastal delta; playa delta. Type 1 has the most variable gradients and those in arid central regions are the steepest. Type 2 has some of the lowest gradients, even in arid regions. The largest catchments tend to form the largest Type 1 LAFS whereas valley confinement means this does not apply to Type 2. The largest LAFS form in more humid regions and the smallest in arid regions. Australia's LAFS have primarily been constructed by overloaded, avulsing, low sinuosity, anabranching and braided rivers, mostly during enhanced fluvial episodes of the Quaternary. Meandering is an essentially incisional process except in tidal reaches. In Australia's monsoon north, LAFS remain weakly aggradational and are continuing to prograde. The remainder are largely relict but yield chronostratigraphic evidence of pronounced growth during the Pleistocene. Australian LAFS range from thin single storey to multistorey, reaching depths of several hundred metres. They are potential sources of groundwater and often feature aeolian dunes and lunette lakes.

Marine and Coastal Spatial Planning; the Need for Standardised Geomorphology Mapping Methods and Tools

Dr Rachel Nanson¹, Dr Andrew Carroll¹, Dr Mardi McNeil¹, Dr Scott Nichol¹, Dr Zhi Huang¹, Ms Donna-marie Audas¹, Ms Jasmin Wells¹, Mr Aero Leplastrier¹, Dr Ross Whitmore¹, Ms Stephanie Morrish¹, Mr Jonah Sullivan¹

¹Geoscience Australia, Kingston, Australia

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Australia's extensive ocean estate offers significant opportunities for emerging industries, including offshore renewable energy, carbon capture and storage, and hydrogen storage, which are critical to achieving the nation's net zero targets. However, only 35% of the continental shelf has been mapped in sufficient detail to inform government and industry decisions. Pre-competitive geoscience data, including bathymetry compilations and seabed geomorphology maps, help identify areas suitable for offshore infrastructure and provide crucial regional context for environmental impact assessments. This information is vital for reducing investment risk and ensuring compliance with government policies and regulations.

Australia's seabed is characterised by diverse and often overlapping geomorphologies that have evolved via processes operating at varying spatial and temporal scales. Effective marine and coastal geomorphic interpretation requires the integration of high-quality bathymetric, sediment, and subsurface data. Resulting geomorphology maps synthesise these complex datasets into accessible formats, supporting informed decision-making across scientific, industrial, and policy domains.

To ensure quality map products it is imperative that they are produced using consistent methods for various stakeholder groups — within and beyond Australia's Exclusive Economic Zone. To this end, Geoscience Australia has co-led the International Seabed Geomorphology Mapping Working Group (ISGM) — a collaborative initiative with partners in the UK, Norway, Ireland, and Australia. This group has developed a novel, globally applicable mapping approach (Dove et al., 2020: <https://zenodo.org/record/4071940>; Nanson et al., 2023: <https://zenodo.org/record/7804019>). The implementation of this approach is supported by bespoke GIS analysis tools (Huang et al., 2022: <https://dx.doi.org/10.26186/146832>), open-access digital vocabularies (Wells et al., 2025: <https://doi.org/10.26186/150006>), and an Esri cartographic style file (in prep) to support consistent visual representation of geomorphic complexity. These resources are available via the ISGM webpage (<https://www.geomorph.org/international-seabed-geomorphology-mapping-working-group/>).

This poster presents an overview of the ISGM method and its supporting tools. We welcome discussions on how these resources can support your mapping initiatives.

Triggering Mechanism of the Turbidity Current Associated With the 2011 Tohoku-oki Earthquake: Numerical Modeling Towards the Inverse Analysis of Geologic Records

Dr. Hajime Naruse¹, Dr. Ryo Nakanishi²

¹Kyoto University, Kyoto, Japan, ²AIST, Tsukuba, Japan

2D: Controls on sedimentation at submarine active margins (2), Rongomātāne A (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

The 2011 Tohoku-Oki earthquake and tsunami generated turbidity currents in the Japan Trench, as evidenced by ocean-bottom pressure (OBP) records and turbidite distributions. Understanding the initiation mechanisms of these flows is essential for reconstructing sediment transport processes associated with megathrust earthquakes. In this study, we integrated turbidity current simulations, Delft3D-based tsunami modeling, and deep learning inversion to examine the formation and propagation of these currents.

Initial forward modeling using a Python-based 2D turbidity current simulator evaluated two mechanisms: (1) sediment liquefaction by seismic shaking and (2) tsunami-induced seabed erosion. While both scenarios produced flows reaching the trench axis, neither could independently explain the observed timing of the ocean bottom pressuremetry (OBP) transport three hours after the tsunami passage. Thus, simulations of the 2011 tsunami-induced turbidity currents revealed that wave-induced suspension could not provide the sediment concentrations required to initiate large-scale turbidity currents. However, a scenario involving tsunami backwash acceleration in shallow waters (<100 m depth) produced flow characteristics consistent with the observed OBP signals, including realistic timing and velocity. This suggests that tsunami backwash likely enhanced or triggered the downslope transport of earthquake-loosened sediments? a hybrid mechanism combining seismic and tsunami forcings.

This integrated modeling approach underscores the complex interplay of tectonic and hydrodynamic processes in shaping deep-sea sediment records. It provides a methodological framework for interpreting paleo-seismicity through turbidite stratigraphy using inverse analysis by the deep neural network.

Impact of Ash Fall and Tube-Fed Transitional Lava Flow on Terrestrial Sedimentation in the Changing Environment of Western Saudi Arabia's Monogenetic Volcanic Fields

Prof Karoly Nemeth¹, Mr Abdulrahman Sowaigh¹, Mr Mahmoud Ashor¹

¹Saudi Geological Survey, Jeddah, Saudi Arabia, ²Institute of Earth Physics and Space Science, Sopron, Hungary, ³Volcanic Risk Solutions, Massey University, Palmerston north, New Zealand

4E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (1), Rongomātāne B (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

Monogenetic volcanic fields are composed of numerous individual volcanoes that form over a short geological period, ranging from days to months, which is much shorter than the field's overall history that can span millions of years. They leave minimal geological footprints due to their small source material volume, typically less than 0.05 km³ dense rock equivalent. Maar craters, which are phreatomagmatic monogenetic volcanoes, are effective at trapping sediments within terrestrial settings, making them valuable for high-resolution paleoenvironmental reconstruction of continents. Conversely, scoria cones, which are more common monogenetic landforms, often disappear from the sedimentary records quickly over millions of years. These volcanic fields can also have high-intensity eruptions in the sub-Plinian range (Volcanic Explosivity Index 3-4) that produce significant ash plains covering areas of over 100 km². Although the volume of individual eruptions is small, multiple eruptions can collectively contribute substantial ash volumes. In the Lunayyir volcanic field in western Saudi Arabia (0.6 Ma – early Holocene), sub-Plinian eruptions produced extensive ash plains. Erosion along narrow, valley-captured lava flows, and their tube networks often served as effective pathways for sediment-laden runoff water capable of transporting volcanoclastic sediments over tens of kilometers. The common slabby and rubbly pahoehoe lava flow also provided source material that was transported away from the lava flow, adding detritus to growing volcanoclastic fans. Despite its arid conditions since the Pleistocene, the size and number of debris flows and debris fans suggest frequent high-intensity rainfalls since the late Pleistocene, indicating rapid environmental changes in western Arabia. During pluvial periods, freshly deposited highly vesicular scoriaceous ash can be easily removed from steep hills, and substantial amounts of volcanoclastic particles transported far from the source volcanoes, gradually building intramountain basins in the marginal regions of the volcanic fields.

Sedimentology Geoheritage and the Role of IAS within its Conceptual Aspects of Inventory Building, Geodiversity Estimates and Geoconservation

Prof Karoly Nemeth¹, Professor Daniel Ariztegui²

¹Saudi Geological Survey, Jeddah, Saudi Arabia, ²Department of Earth Sciences, University of Geneva, Geneva, Switzerland

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Geoheritage is now recognized as an important component of Earth science education, facilitating connections between the Earth and people through scientific, educational, and cultural values. It offers insights into Earth's past events and serves as a link between natural phenomena and human understanding of Earth's processes. Geodiversity has been proposed to be treated as the "numerical density" of abiotic elements within a specific area, like the framework applied to biodiversity. Abiotic elements on Earth appear in various geoforms and carry qualitative features such as rock types, minerals, and structural architecture. These qualitative elements have relative abundance that can be measured at global, regional, or local scales. Geoconservation aims to protect geoheritage, including geological specimens, documents, maps, objects, and sites from degradation caused by factors such as urban expansion and weathering. A significant portion of Earth's geoheritage is associated with sedimentary processes including stratigraphy, paleontology, tectonic geomorphology, or erosion. The International Union of Geological Sciences (IUGS) recently established its Commission on Geoheritage with the specific aim to identify and locate globally significant geosites. In 2022, IUGS completed the First then in 2024 the Second 100 IUGS Geological Heritage Site program and aims to complete subsequent projects in 2026 2028, and 2030, respectively. These projects aim to build a major global inventory of the most significant geological heritage sites on Earth, recognizing the diversity of geosciences. Sedimentological geoheritage sites receive elevated focus in these programs. The International Association of Sedimentologists (IAS) has officially joined these programs to facilitate the generation of a global inventory on sedimentology geoheritage that can be used for territorial planning, conservation, geotourism, or geoeducation, supporting awareness programs on sustainability or developing resilience against various geohazards. Here, we provide a conceptual framework for how IAS can participate in such programs and discuss sedimentology geoheritage from local to global scales.

From Fluvio-Deltaic to Coastal Environment in the Kem Kem Beds of Southern Morocco: A Possible Response to the Mid Cretaceous Temperature Increase?

Mr Jacopo Nesi¹, Professor Marco Benvenuti¹, Professor Giorgio Basilici^{2,3}, Professor Anna Breda⁴, Dr Gabriele Gambacorta¹

¹Department of Earth Science, University of Florence, Florence, Italy, ²Departamento de Geologia e Recursos Naturais, Instituto de Geociências, Universidade Estadual de Campinas, Campinas, Brazil,

³Centro Regional de Investigaciones Científicas y Transferencia Tecnológica / CONICET, Anillaco,

Argentina, ⁴Department of Geosciences, University of Padua, Padua, Italy

5D: The continental sedimentary successions and their ability in understanding the present and forecasting the future of the Earth's surface (2), Rongomātāne A (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

Southern Morocco provides extensive exposures of a clastic-carbonate succession developed between the Albian? and the Early Turonian. The so-called Kem Kem beds represent the lower portion of this succession and are characterized by a sandy-dominated unit at the base passing upward into coastal mudstones and marls. A robust chronological constraint is available only for the uppermost part of the succession, the Akrahou Formation, which records the establishment of a carbonate platform during the late Cenomanian–Early Turonian. This research aims at investigating the basal unit, known as Ifezouane Formation, that testifies the transition from a river to a large delta system draining toward the Thetis Ocean to the north and the coastal muddy Aofous Formation right above. Fieldwork focused on high-resolution (bed-by-bed) stratigraphic logging, facies analysis, photo-geologic mapping and paleocurrent measurement allow to reconstruct an articulated stratigraphic and depositional framework based on the recognition of unconformity-bounded sub-units. Different facies associations support the picture of an evolving depositional environment with an increase of marine influence and a significant presence of evaporites upward in the succession along a south-north regional gradient. A fluvial-deltaic environment with a deep hydrographic network reorganization hinting to efficient surface runoff under moist conditions that shifts into a coastal mud-plain area attesting to more arid conditions, is here interpreted as the response to climate variations. The discussion opens to understanding the role of the mid Cretaceous temperature increase in affecting basin sedimentation and how important is applying this kind of approach also to modern scenarios.

Investigating Tectonic Influence on Contourite Deposition

Dr Zhi Lin Ng¹, Shan Liu¹, Hui Chen¹, Shaoru Yin², F. Javier Hernández-Molina³, Ming Su¹

¹School of Marine Sciences, Sun Yat-sen University, Zhuhai, China, ²Key Laboratory of Submarine Geosciences, Second Institute of Oceanography, Ministry of Natural Resources, Hangzhou, China,

³Instituto Andaluz de Ciencias de la Tierra, Consejo Superior de Investigaciones Científicas (IACT-CSIC), Granada, Spain

5F: Contourites and Mixed Depositional Systems (1), Rongomātāne C (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

Contourite depositional systems are commonly easily recognised along passive continental margins, primarily on the continental slope, rises, and adjacent abyssal plains. A thorough review of the literature suggests that such systems may be more prevalent along active margins than previously thought. However, their complex nature makes them more difficult to identify, as the development of contourite drift morphology and the evolution of bottom current circulation under tectonic influence are yet to be fully understood. We compiled a comprehensive list of tectonically-influenced contourite systems across the globe and present three representative analogues from the South China Sea to support our findings, especially on their depositional features, which consists of confined drifts in the North Luzon Trough, fault-controlled drifts in the Beikang Basin, and obstacle-controlled drifts in the Xisha Trough, through morphologic characterisation, morphometric quantification, and statistical correlation between the structural and drift parameters. Other than structural influences, contourite drifts are also influenced by tectonic movements, where we introduce both uplift- and subsidence-controlled drifts. These motional influences are also able to affect both the external geometries and internal configurations of the drifts. Based on these insights, we propose a new classification system for contourite drifts, initially distinguishing them by morphology, followed by their associated tectonic controls. This approach allows for better representation of the complex nature of contourite drift deposition. Regional tectonic evolution also plays a crucial role on contourite development, governing their evolutionary phases, including the onset-, growth- and buried-stages, of both ancient and modern contourite systems. Their long-term evolution is controlled by global events associated with oceanic gateways and circulation patterns, which are constrained by the coupling of astronomical and tectonic processes, as well as the modulation of sedimentation by orbital parameters. Understanding the role of tectonics in contourite deposition has significant conceptual and economic implications.

Sedimentological and Paleoceanographic Changes at the Tūranganui Knoll over the Last 1.3 Ma

Ms Natasha Ngadi¹, Associate Professor Lorna Strachan¹, Professor Helen Bostock², Doctor Bruce Hayward³

¹University of Auckland, Auckland, New Zealand, ²University of Queensland, Brisbane, Australia,

³Geomarine Research, Auckland, New Zealand

4F: Sedimentary processes in the northern Hikurangi Margin of New Zealand: Insights from IODP Expeditions 372/375, Rongomātāne C (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

The majority of deep-sea cores collected from the Hikurangi Subduction Margin, located offshore NE New Zealand have been dominated by frequent sediment gravity driven downslope processes. While hemipelagic sediment has been identified in several cores in the region, the studies have been limited to ~18 ka. These event beds disrupt the accumulation of hemipelagic or contouritic sediments, making it challenging to study the background sedimentation processes. Due to this, the long term background sedimentation and paleoenvironmental processes over the Pleistocene have not been well studied on the northern Hikurangi Subduction Margin. IODP Hole U1526B drilled on top of the Tūranganui Knoll seamount, which is elevated ~600 m above the Northern Hikurangi Trough, limiting the influence of sediment gravity flows, thus provides a unique opportunity to study background sedimentation and paleoceanographic processes on this active margin.

This study integrates several sedimentology, granulometry, CT scans, foraminiferal analyses, stable isotopes, and geochemical analyses, to investigate the sedimentation and paleoceanographic record at IODP Hole U1526B over the last 1.3 Ma. The sediment was identified to be deposited primarily by contourite and hemipelagic processes, with additional minor input from turbidity currents and primary tephra deposition. Sedimentation rate has increased while grain size decreased through time at Hole U1526B, influenced by the tectonic position of the seamount, which has converged towards the Hikurangi Subduction Margin over the last 1.3 Ma. The study found that sediment grain size, foraminiferal assemblages and stable isotopes are also influenced by long term changes in oceanography and climate, with evidence of changes over glacial/interglacial cycles and across the Mid Pleistocene Transition.

Erosion and Deposition Below the Kuroshio Current: New Insights on Current Dynamics from Offshore Japan and Taiwan

Dr Uisdean Nicholson¹, Dr Debora Duarte², Professor Andrew Tien-Shun Lin³, Dr Naohisa Nishida⁴, Professor Dorrik Stow¹

¹Heriot-watt University, Edinburgh, United Kingdom, ²Andalusian Earth Sciences Institute, Granada, United Kingdom, ³National Central University, Zhongli, Taiwan, ⁴Tokyo Gakugei University, Koganei, Japan

7F: Contourites and Mixed Depositional Systems (3), Rongomātāne C (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

Ocean currents play an important role in sediment routing in continental margins, but their role in shaping structurally and bathymetrically complex active margins are less well understood than in passive margins. The Kuroshio Current (KC) is the main (surface) western boundary current in the northern Pacific, beginning east of the Philippines and then flowing in a north-eastward direction along the margins of Taiwan and Japan. It transports warm subtropical waters from the Indo-Pacific Warm Pool to mid-latitudes and plays an important role in modifying the regional climate of NE Asia. This region is also tectonically active, with several subduction zones, volcanic arcs and backarc basins, that form a structurally complex seabed across the region. Here we document the impact of the KC on the continental shelf and slope offshore Taiwan and Japan. We focus on two areas that are investigated using 2D seismic, multibeam bathymetry, seabed sediment samples and ocean reanalysis models: i) the Penghu Channel/Taiwan Strait and ii) the Ryukyu Arc.

Our results show that the KC interacts with elevated bathymetry that constrain and accelerate the current, causing pronounced seabed erosion. The Penghu channel is the focus of the shallow Kuroshio Branch Current, with evidence of pronounced bottom current erosion and sediment transport to the north. The main branch of the Kuroshio flows to the east of Taiwan, deeply eroding the Ryukyu Arc as it crosses to the Okinawa Trough. There, the Kuroshio and associated currents interact with the complex topography of the Ryukyu Arc further to the NE to form discrete areas of erosion, mud and sand deposition, including the development of an extensive contourite sand sheet in the eastern Okinawa Trough. These results have important implications for seafloor infrastructure in these areas, particularly offshore windfarms, as well as highlighting the potential renewable energy resource of ocean currents.

Coseismic Remobilization of Surficial Slope Sediment in Chilean Lakes

MSc Markus Niederstätter^{1,2}, Katleen Wils^{2,3}, Valentina Moreno Allende², Maarten Van Daele³, Jürgen Konzett⁴, Ariana Molenaar², Jean Nicolas Haas⁵, Renaldo Gastineau⁶, Karen Fontijn⁷, Daniel Melnick⁸, Marc De Batist³, Roberto Urrutia⁹, Mario Pino¹⁰, Jasper Moernaut²

¹School of Geography, Environmental and Earth Sciences, Victoria University of Wellington, Wellington, New Zealand, ²Institute of Geology, University of Innsbruck, Innsbruck, Austria, ³Renard Centre of Marine Geology, Department of Geology, Ghent University, Ghent, Belgium, ⁴Institute of Mineralogy and Petrography, University of Innsbruck, Innsbruck, Austria, ⁵Department of Botany, University of Innsbruck, Innsbruck, Austria, ⁶EDYTEM, Université Savoie Mont-Blanc, CNRS, Le Bourget-du-Lac, France, ⁷Laboratoire G-TIME, Department of Geosciences, Environment and Society Université libre de Bruxelles, Brussels, Belgium, ⁸Instituto de Ciencias de la Tierra, Universidad Austral de Chile, Valdivia, Chile, ⁹Faculty of Environmental Sciences, University of Concepción, Concepción, Chile, ¹⁰Fundación para los Estudios Patrimoniales Pleistocenos de Osorno, Osorno, Chile

7D: Shaking across the land-to-sea boundary, Rongomātāne A (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

Strong seismic shaking (intensity > V½) can remobilize surficial slope sediment in lacustrine environments. The resulting turbidite deposits allow reconstructing past earthquake recurrence patterns and evaluating potential rupture locations and magnitude. A promising advancement towards quantitative paleoseismology is the identified link between turbidite volume (or thickness in multiple cores) and shaking intensity of recent earthquakes. This relationship has been proposed using lacustrine sedimentary records in south-central Chile and was linked to the remobilization of surficial (few centimetres) slope sediment. However, besides slope morphology and shaking strength, remobilization depth and hence resulting turbidite thickness, is potentially also affected by time-dependent factors such as changes in lithology or sedimentation rate. As a result, their impact needs to be assessed to allow for robust quantification of past earthquake source parameters.

Along the Valdivia Segment of the Chilean Subduction zone, major megathrust earthquakes in the last ~1000 years are known from historical reports (~500 years) and from correlated paleoseismic studies using seismo-turbidites, tsunami deposits and indicators of land-level changes. By multi-proxy sediment core analysis in a transect of seven lakes, we detect and characterize turbidites and correlate them over the different basins. Based on radionuclide dating and identification of regional tephra markers, the coseismic sedimentary signatures were attributed to major megathrust earthquakes. We found that larger turbidite volumes are related to stronger seismic shaking in all seven lakes. Moreover, we identified 1.5 to 6 cm thick stratigraphic gaps in slope sediment sequences, which can be related to successive surficial remobilization by strong seismic shaking. The remobilization depth appears to be sometimes restricted by layers with relatively high density and coarse grain size such as tephra deposits, potentially leading to relatively thinner turbidites in the basin. This lithological control should thus be considered when trying to quantify shaking intensity for paleoearthquakes based on turbidite volume.

Earth's Obliquity as a Potential Driver of the Sedimentation Regime: A Case Study from the Plio–Pleistocene Transition at Monte San Nicola, Sicily

Dr Igor Niezgodzki^{1,2}, Dr Wiesława Radmacher¹, Dr Christian Stepanek², Fernanda Matos², Prof. Martin Head³, Prof. Alfred Uchman⁴

¹Institute of Geological Sciences PAS, Kraków, Poland, ²Alfred Wegener Institute, Bremerhaven, Germany, ³Brock University, St. Catharines, Canada, ⁴Institute of Geological Sciences, Jagiellonian University, Krakow, Poland

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Global boundary Stratotype Section and Point marks the onset of the Quaternary and the base of the Gelasian Stage. It is dated to 2.58 Ma, and is located at Monte San Nicola near Gela, Sicily. A key feature of this section is the presence of six dark sapropelic layers, formed primarily under the influence of Earth's precessional cycles. While the role of precession in Mediterranean sedimentation is well known, the impact of obliquity has received less attention. Among the sapropelic layers, only the uppermost A5 layer (Nicola bed) and the underlying A4/5 layer preserve laminated sediments. The lower part of A5 is undisturbed by bioturbation, whereas its upper part is characterised by presence of the trace fossil Chondrites. In contrast, A4/5 laminations are thinner and less distinct, and bioturbation structures are present throughout the entire interval. Although both layers were deposited under similar eccentricity and precession configurations, they differ in obliquity forcing, offering a valuable case study to examine the influence of obliquity on environmental conditions conducive to sapropel formation. We use state-of-the-art Earth System Model simulations to explore obliquity-driven impacts on the Mediterranean climate during the Pliocene–Pleistocene transition. Preliminary results suggest that during periods of precession minima combined with obliquity maxima (layer A5), increased regional precipitation led to enhanced freshwater discharge from the rivers. Coupled with greater inflow of low-salinity Atlantic water, this strengthened stratification, suppressed vertical mixing, and promoted preservation of organic-rich sapropelic sediments. Conversely, the co-occurrence of precession and obliquity minima (layer A4/5) resulted in weaker stratification and reduced organic matter preservation. These findings complement sedimentological and ichnological analyses, enhancing our understanding of the climatic controls on sapropel formation and broader climate–sediment interactions during the Neogene–Quaternary transition.

Acknowledgements:

Participation of in and WR was supported by the Polish National Science Centre, Grant number DEC-2022/47/D/ST10/01103.

Plant-Pedogenic Carbonate Interactions: A Biogeochemical Feedback System Through Deep Time

Assoc. Prof. Meng Ning¹, Jingru Luo¹, Ziheng Liang¹, Pu Huang², Bing Shen³

¹ Institute of Sedimentary Geology, Chengdu University of Technology, Chengdu, China, ²Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing, China, ³ School of Earth and Space Sciences, Peking University, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 Pm - 4:25 Pm

Pedogenic carbonate (PC), a key component of the terrestrial inorganic carbon pool, serves as both a climate archive and an active participant in terrestrial biogeochemical cycles. The mid-Paleozoic colonization of land by plants triggered a fundamental transformation of Earth's surface environments, driving atmospheric changes, enhancing chemical weathering, and promoting PC formation. The geological record reveals a strong coupling between pedogenic carbonate (PC) formation and plant evolution. Significant PC accumulations first appeared during the Silurian-Devonian period, coinciding with the initial radiation of vascular land plants. The subsequent development of deep-rooting systems in the Devonian-Carboniferous further enhanced PC precipitation and witnessed the development of rhizoliths (root-associated carbonate structures). This co-evolutionary pattern suggests a feedback loop where early plants promoted PC formation through rhizosphere processes (e.g., root respiration, exudation, and microbial activity), while the resulting changes in soil properties (e.g., porosity, pH, and nutrient availability) imposed selective pressures that drove further plant adaptation. Over geological timescales, the plant-carbonate feedback system exemplifies the deep interconnectedness of Earth's biological and geological systems. From microbial mats to forests, life has continuously influenced carbonate precipitation and dissolution, while these mineral reactions have, in turn, shaped biological evolution. Pedogenic carbonates function as both paleoclimate recorders and active carbon cycle regulators, providing crucial insights for interpreting past climate transitions and future climate change.

Mapping Organic and Inorganic Carbon Stocks and Potential Vulnerability in Marine Sediments Around Aotearoa New Zealand

Dr Scott Nodder¹, Dr Sally Watson^{1,2}, Ms Grace Frontin-Rollet¹, Dr Sam Davidson¹, Dr Susi Woelz¹, Dr Richard Bulmer³, Dr Dana Clark⁴, Dr Rachel Hale⁵, Dr Sean Handley⁵, Dr Daniel Leduc¹, Dr Carolyn Lundquist⁶, Dr Katherine Maier^{1,7}, Dr Alan Orpin¹, Dr Sarah Seabrook¹, Dr Andrew Swales⁶, Dr Sebastiaan van de Velde^{1,8}, Dr James Williams⁹, Dr John Zeldis¹⁰, Dr G Lamarche^{2,11}

¹NIWA Taihoro Nukurangi, Wellington, New Zealand, ²University of Auckland, Auckland, New Zealand, ³Tidal Research, Auckland, New Zealand, ⁴Cawthron Institute, Nelson, New Zealand, ⁵NIWA Taihoro Nukurangi, Nelson, New Zealand, ⁶NIWA Taihoro Nukurangi, Hamilton, New Zealand, ⁷Pacific Northwest National Laboratory, Richland, USA, ⁸Department of Marine Science, University of Otago, Dunedin, New Zealand, ⁹NIWA Taihoro Nukurangi, Auckland, New Zealand, ¹⁰NIWA Taihoro Nukurangi, Christchurch, New Zealand, ¹¹Parliamentary Commissioner for the Environment, Wellington, New Zealand

10C: Mapping marine sediments in the world (2), Tāwhirimātea E (Level 2), January 30, 2026, 11:00 AM - 12:30 PM

Marine sediments are one of the largest repositories of organic (OC) and inorganic carbon (IC) on Earth and help regulate climate by modulating oceanic CO₂ uptake and sequestration. For the first time across the Aotearoa New Zealand Exclusive Economic Zone (EEZ), a compilation of marine sediment OC and IC data has enabled an estimate of sedimentary carbon stocks. Statistical methods provided relationships between %OC and other parameters (e.g., water depth, %mud, %total organic matter, %calcium carbonate) to expand the OC database with LASSO Generalised Linear Models delivering the most robust estimates. Using kriging interpolation, the OC and IC content in the top 10 cm of marine sediments in the EEZ were mapped across the EEZ, with as much as 2240±290 Mt OC estimated for surface sediment OC stocks. These stocks are mostly in deep-water sediments (66% >1500 m depth), with continental shelf environments (0-200 m) accounting for ~7%, compared to the global shelf average of ~12%. Continental slopes (200-1500 m) represent a substantial repository for OC (~26%), four-times higher than global slope averages. IC stocks may be up to five times higher than OC values based on overseas studies. Shallow embayments, such as the Firth of Thames and Fiordland fjords, host the highest OC contents and densities, with the fjords alone accounting for ~8% of NZ's total OC stocks (157–187 Mt OC).

A vulnerability index for OC to bottom trawling highlights regions in the EEZ most susceptible to potential OC remineralisation due to seafloor disturbance. There are many other cumulative natural and anthropogenic activities that potentially disturb seabed stocks of OC and IC, including waves, currents, seabed mining, dredging, and anchoring. Mapping the distribution and size of these stocks is the first step to understanding their potential vulnerability, and determining the management tools needed to protect such ecosystem services.

Near-bed Sediment and Organic Carbon Transport in Deep-sea Kaikōura Canyon and Hikurangi Channel, Aotearoa New Zealand: Implications for Carbon Deposition and Sequestration

Dr Scott Nodder¹, Dr Jess I.T. Hillman¹, Dr Stacy Deppeler¹, Dr Catherine E. Ginnane², Dr Sebastian Naeher^{2,3}, Dr Jocelyn C. Turnbull², Dr Katherine L. Maier⁴

¹NIWA Taihoro Nukurangi, Wellington, New Zealand, ²GNS Science, Lower Hutt, New Zealand,

³Victoria University of Wellington, Wellington, New Zealand, ⁴Pacific Northwest National Laboratory, Richland, USA

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Kaikōura Canyon and Hikurangi Channel are key pathways for laterally transporting sediment and organic carbon from near-shore environments to the deep-ocean on the eastern continental margin of Aotearoa New Zealand. The near-instantaneous offshore deposition of sediments due to the 2016 Mw7.8 Kaikōura Earthquake has been well-documented. These events, however, operate on centennial timescales while the importance of sediment transport over shorter timescales is poorly constrained, especially in deep-water environments.

To explore sediment transport under prevailing oceanographic conditions, three benthic landers and three near-bed sediment trap moorings, with associated oceanographic instrumentation (current meters, turbidity, temperature-salinity), were deployed for one year (2022-23) in lower Kaikōura Canyon (1400 m water depth) and along the Hikurangi Channel at ~3000 m depth, ~300 km and ~700 km northeast from Kaikōura.

Near-bed particulate mass fluxes ranged from 0.2-2 g/m²/d in the moored sediment traps (15 m above seafloor) deployed in the Hikurangi Channel, with 2-2.5 times this amount observed close to the seabed (lander traps, 2 m). Furthermore mass fluxes in lower Kaikōura Canyon were up to an order of magnitude higher than in Hikurangi Channel, ranging from 3-23 g/m²/d. Seasonality in sediment fluxes was apparent in the channel, while fluxes in the canyon were more variable with little seasonality. Particulate organic carbon and nitrogen fluxes were also measured to provide indications of the relative contributions from marine versus terrestrial components based on C:N molar ratios. Sediment core samples of the turbidite deposit from the 2016 Kaikōura Earthquake indicate that the transported organic carbon was young (<12 ka) and dominated by refractory and terrestrial organic compounds. The relationships between modern observations of sedimentary processes and those that occur on longer geological timescales are critical factors in assessing carbon sequestration pathways in deep-sea environments.

Big & Bizarre: Giant Ooids in Low-oxygen Neoproterozoic Oceans

Brennan O'Connell^{1,2}, Dr Malcolm W. Wallace², Ashleigh v.S. Hood

¹University of Cambridge, Cambridge, United Kingdom, ²University of Melbourne, Parkville, Australia

3B: Carbonate systems and processes (2), Tāwhirimātea C (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

Ooids are concentric, abiotic, shallow-marine carbonate grains that contribute to calcium carbonate production in the ocean. They are important paleoenvironmental indicators of water depth, pH, temperature, and depositional energy. Most modern and ancient ooids are small (<1–2 mm in diameter), but the Neoproterozoic Era has an enigmatic abundance of giant ooids (>2mm). The mechanisms driving giant ooid formation are not well understood, particularly their growth rates, growth processes, and links to marine ocean chemistry.

This study investigates giant ooids from the Cryogenian Angepena and Trezona formations in South Australia using sedimentological observations and trace element geochemical data (iron, rare earth elements + yttrium; REE+Y). Tidal sedimentary structures are common and include lime mudstone with desiccation cracks, wavy, flaser, and lenticular bedding, bi-directional crossbedding, and mud-drapes on cross-bed foresets. Giant ooids have strange non-spherical forms, including elongate, triangular, and capsule-like shapes. These forms are likely caused by frictional abrasion via sliding and rolling during bedload transport.

Some ooid laminae show thin-thick couplets of iron-oxide-rich and iron-oxide-poor laminae which progressively thicken and thin outward. These couplets may represent tidal rhythmites(?) – if so, they suggest rapid ooid growth during tidal cycles. Rapid growth rates likely required extremely carbonate-supersaturated ocean conditions. Intervals of rapid(?) growth are interrupted by erosional surfaces/unconformities, corresponding to intervals of ooid erosion, abrasion, and/or non-deposition.

Shale-normalized REE + Y profiles of giant ooids show enrichment in middle rare earth elements, a conspicuous Europium peak, and depletion of heavy rare earth elements. There is no negative cerium anomaly in averaged REE+Y profiles, unlike the strong negative cerium anomaly seen in ooids that precipitate from modern oxidic seawater. REE+Y patterns suggest giant ooids formed in low-oxygen Cryogenian oceans. Ocean anoxia is associated with extreme carbonate supersaturation, which may explain the rapid(?) growth and unusual abundance of giant ooids in the Neoproterozoic.

Investigating Flash-flood-induced Litter Deposition on Coastal Areas Using Unmanned Aerial Imagery Machine Learning: A Case Study from Northeastern Sicily, Southern Italy

Mr Jun Oh^{1,2}, Prof Dr Marcello Gugliotta², Carolin Leluschko³, Dr Christoph Tholen³, Prof Dr Giovanni Randazzo⁴

¹University of Bremen, Bremen, Germany, ²Martin Luther University Halle-Wittenberg, Halle, Germany, ³German Research Centre for Artificial Intelligence, Oldenburg, Germany, ⁴University of Messina, Messina, Italy

10B: Plastic Pollution in Sedimentary Systems, Tāwhirimātea C (Level 2), January 30, 2026, 11:00 AM - 12:30 PM

Understanding the distribution and dynamics of plastic litter in the environment remains an important yet underexplored area. This study examines plastic litter accumulation along a segment of the northeastern coast of Sicily, southern Italy. The research aims to quantify and classify litter, identify mechanisms driving its deposition, and the potential sources. A multidisciplinary approach was used, combining meteorological data, manned and unmanned aerial systems imagery, and a high-performance machine learning algorithm. Among the machine learning algorithms tested, segmentation algorithms proved to be the most effective for accurately identifying and classifying litter. Aerial imagery shows that plastic litter tends to accumulate primarily on beaches near river mouths, likely as a result of flash flood events. In the study area, at least seven distinct flash floods that deposited plastic debris were identified between March 2015 and February 2025. Two of these events, occurring in October 2024 and February 2025, were examined in greater detail using unmanned aerial imagery, each covering six different river mouths. Analysis using machine learning on unmanned aerial imagery revealed a dominance of polystyrene, polyurethane, and polyethylene terephthalate bottles. It also highlighted variations in both the composition and quantity of litter across different river mouths and time periods. Analysis of meteorological data indicates that intense rainfall, resulting flash floods, and wind patterns are the main factors driving litter accumulation along the coast. The litter distribution and composition near river mouths suggest that this originated predominantly from nearby urban areas and was delivered to the coast via riverine input during flash floods. These findings highlight the critical role of fluvial processes in shaping plastic pollution patterns and demonstrate the potential of aerial imagery and machine learning to help address this problem.

Sedimentary Records of Surf-zone Uplifted By the 2024 Noto Peninsula Earthquake in Japan

Dr Hiroko Okazaki¹, Prof Masatoshi Yuhi², Prof Tsuyoshi Haraguchi³, Prof Noritaka Endo², Dr Yusuke Suzuki³, Prof Shinya Umeda², Prof Junichi Ninomiya², Prof Mamoru Arita², Prof Keisuke Futagi², Dr Tetsuji Konno³

¹Fukada Geological Institute, Bunkyo-ku, Tokyo, Japan, ²Kanazawa University, Kanazawa, Ishikawa, Japan, ³Story Co. Ltd., Ichiki-Kushikino, Kagoshima, Japan

5C: Coastal to shelf environments across time and space (5), Tāwhirimātea E (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

On the Kaiso Coast along the Sea of Japan in central Japan, the seafloor was uplifted by about 4 meters due to the Noto Peninsula Earthquake on January 1, 2024, resulting in the near-instantaneous emergence of surf-zone stratigraphy on land. We conducted a large-scale trenching survey of the newly emerged seafloor, spanning over 100 meters alongshore and 130 meters cross-shore, which enabled quasi-three-dimensional observations through multiple trench exposures. The surf zone is one of the most dynamic coastal environments, making direct observation of its sedimentary deposits almost impossible. However, orthophotography of the trench walls reveals the transitions among diverse sedimentary structures that comprise beach systems formed under oscillatory and combined flow regimes. These exceptional sedimentary successions at Kaiso Coast provide new insights into coastal morphological behavior and dynamic processes. We also compare these deposits with Pleistocene beach strata of the Shimosa Group in central Japan, which form part of elevated marine terraces tens of meters above present sea level. The comparative analysis between the recent trench sections and the Pleistocene strata offers a detailed sedimentological interpretation of ancient beach facies and stacking patterns.

2023 Cyclone Gabrielle event deposit on the Te Matau a Māui/Hawke Bay and Tairāwhiti/Gisborne continental shelves, central Hikurangi margin, New Zealand

Dr Alan Orpin¹, Dr Andrew Swales², Prof Clark Alexander³, Dr Daniel Leduc¹

¹NIWA, Wellington, New Zealand, ²NIWA, Hamilton, New Zealand, ³Skidaway Institute of Oceanography, University of Georgia, Savannah, USA

2D: Controls on sedimentation at submarine active margins (2), Rongomātāne A (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

In February 2023, Cyclone Gabrielle caused devastating and widespread impacts in catchments and the coastal zone of the Te Matau a Māui/Hawkes Bay and Tairāwhiti/Gisborne regions. The magnitude and duration of the storm event suggest that the extent and nature of impacts on marine ecosystems are potentially significant. However, direct observations offshore were logistically challenging to achieve in the aftermath, and only recently have they been formally documented.

Fisheries New Zealand commissioned several studies to evaluate the impacts of Cyclone Gabrielle on marine habitats and the fisheries they support. NIWA conducted boat-based surveys at priority coastal and shelf environments off Te Matau a Māui and Tairāwhiti to document changes in seabed geomorphology, cyclone-related sedimentation, fresh debris, and fisheries habitats and benthic communities. The survey effort mainly targeted priority areas where pre-cyclone multibeam bathymetry and biological data were available for baseline information. We extended our survey to unsampled areas on the outermost continental shelf to map the possible extent of the cyclone impact.

In this presentation, we summarise the results from these NIWA response surveys, including characterisation of the cyclone event beds recovered from shelf settings offshore of river systems impacted by intense rainfall and soil erosion. We identify the combination of flood dispersal and benthic responses to ocean storms. We also capture evidence of geomorphic and habitat change, together with new benthic and satellite imagery. An important element of our approach is regional, seasonal and inter-annual context for the scale of disturbance. We also summarise an initial investigation to trace the contributions of major rivers to marine sedimentation associated with Cyclone Gabrielle.

The Record of the Submarine Volcanic Activity During the OAE 2 Event (Cenomanian Turonian Boundary) in the Apennines (Italy)

Miss Marta Palarz¹, Dr Michał Rakociński¹, Professor Leszek Marynowski¹, Dr Dorota Staneczek¹, Professor Zofia Dubicka², Dr Wojciech Krawczyński¹

¹Faculty of Natural Sciences, University of Silesia in Katowice, Sosnowiec, Poland, ²Faculty of Geology, University of Warsaw, Warsaw, Poland

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Bonarelli event (OAE 2; ~94 Ma) is the second-order extinction event with ~ 26% of marine genera loss, starting from single-celled foraminifera, numerous marine invertebrates, and ending with the top predators of marine reptiles - ichthyosaurs. Increased submarine volcanic activity is believed to have been the main cause of global climate warming and palaeoceanographic change. Many magmatic centres were active during this period, such as the Caribbean-Columbian Large Igneous Province (LIP), the High Arctic LIP, the Madagascar LIP, the Kerguelen LIP and the Ontong-Java LIP. The close age correspondence between LIPs and biotic overturn suggests that large-scale volcanism could be the main driver of mass extinction. However, some researchers have questioned this explanation due to uncertainties in radiometric age dating compared to biostratigraphic age sedimentary records in crucial intervals. The identification of mercury anomalies in sedimentary records has helped researchers to overcome the difficulties associated with radiometric age dating. We found huge Hg spikes (>1500 ppb) in the OAE 2 interval in the classical Bottaccione Gorge and Vispi Quarry in Gubbio and (>460 ppb) in Furlo in the Apennines, Italy. Recently, Hg anomalies were found in the Mentelle Basin, which suggests a regional influence of the Kerguelen LIP located in the Southern Hemisphere. However, our findings of Hg spikes in the Tethys area indicate that the volcanic scenario may be more complex and that the event may be associated with the activity of several, rather than a single, magmatic province. These results are a starting point for research on potential bacterial biomethylation during OAE 2 and the influence of toxic methylmercury on aquatic life, especially top predatory marine reptiles.

This project was financially supported by the grant of the National Science Centre in Poland (2023/49/B/ST10/00505).

Investigating the Preservation Limits of Chlorite Coatings: Experimental and Modeling Insights from the Xihu Sag, East China Sea Basin

Chunpeng Pan¹, Prof. Guanghui Yuan¹

¹China University of Petroleum (East China), Qingdao, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Chlorite coatings are widely recognized for their crucial role in preserving high-quality sandstone reservoirs, primarily by inhibiting quartz cementation and enhancing resistance to mechanical compaction. However, the upper limits of chlorite stability under complex subsurface conditions (e.g., elevated temperature and CO₂-rich fluids) remain poorly constrained, which hampers accurate reservoir evaluation and prediction of long-term diagenetic evolution. This study focuses on the Xihu Sag of the East China Sea Basin and aims to determine the preservation thresholds of chlorite coatings through an integrated approach combining geochemical modeling and experimental validation. Formation water compositions were obtained from measured data, and core samples were used for high-temperature water-rock-CO₂ interaction experiments under controlled CO₂ conditions. Simulations were performed using Geochemist's Workbench (GWB) to validate the stability of chlorite coatings under varying temperature (200 °C and 230 °C) and CO₂ conditions. The results reveal that under simulated formation water without CO₂, chlorite coatings remain largely intact at 200 °C. In contrast, at 230 °C, partial chlorite dissolution occurs, accompanied by the formation of secondary minerals. Additionally, the introduction of CO₂ at 200 °C also leads to partial dissolution, indicating that both elevated temperature and CO₂ presence critically impact chlorite stability and thereby compromise stability and integrity of the reservoir. These findings provide valuable insights into the diagenetic evolution of chlorite in sandstone reservoirs under thermochemical perturbations and its influence on reservoir quality. The study also offers a methodological reference for integrating experimental and modeling techniques in sedimentological research, particularly when assessing mineral-mediated reservoir preservation under dynamic subsurface conditions.

Geochemical and Li Isotopic Compositions of Quaternary Sediments in Northern Beibu Gulf, South China Sea: Implication for Paleoclimate and Sea-level Change

Chongjin Pang¹, Ke Fan¹, Chao Chen¹, Zhongxu Lu¹, Zhigang Liu², Lu Chao², Jida Huang², Bryan Krapež²

¹Guilin University of Technology, Guilin, China, ²Guangxi Institute of Marine Geological Survey, Beihai, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Quaternary sediment in northern Beibu Gulf provides an excellent opportunity to characterize source-to-sink processes in northern South China Sea. Sediments analysed for this study are from two drill cores retrieved in northern Beibu Gulf, part of Guangxi Province, China. The drill sediments comprise Lower Pleistocene Zhanjiang Formation and the overlying Holocene series. The Zhanjiang Formation is composed of gravel, sand and clay, making up several upward-fining cycles, which represent fluvial deposits during the early Pleistocene. The Holocene series consist of dark-grey clayey sand and clay with marine bivalves. The ¹⁴C dating results show that the flooding events in the studied area occurred at ca. 8.6 ka BP. Therefore, the studied sediments well record the Quaternary global sea-level rising. Rare Earth Element concentration and distribution patterns of the sediments are identical to that of granites formed by the Indosinian magmatic event (ca. 260-240 Ma) in southeastern Guangxi Province. Furthermore, U-Pb ages of detrital zircon grains from sediments are mainly concentrated at 257-253 Ma, comparable to that of granitic rocks. This suggested that the Quaternary sediments were mainly sourced from the Indosinian granites in southeastern Guangxi. According to geochemical and Li isotopic compositions, paleoclimate and associated weathering processes can be summarized as followed: 1) during early Pleistocene, there were strong winter monsoon and low precipitation, which inhibited rock weathering; 2) during early Holocene, this period was characterized by a strong summer monsoon and a warm-humid climate, which enhanced weathering; 3) during Mid-Holocene, summer monsoon gradually weakened, whereas winter monsoon was stronger, leading to reduce precipitation and thereby weakened weathering; 4) during late Holocene, the summer monsoon became strengthened and climate was warm and humid, resulting an increase in weathering intensity. This study is of great significance to understanding the weathering process and paleoclimate evolution in South China during Quaternary.

A Review on the Advance in Logging Evaluation of Fine-Grained Sedimentary Rocks

Dr Xiaojiao Pang¹, Professor Guiwen Wang¹

¹China University of Petroleum Beijing, Beijing, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

As the source rock and reservoir of tight/shale oil and gas, fine-grained sedimentary rocks have become the focus and frontier of research. Logging evaluation of fine-grained sedimentary rocks plays an important role in selecting sweet spots in the exploration and development of unconventional oil and gas. However, the conventional logging evaluation of fine-grained sedimentary rocks is restricted by their complex composition, small particle size, complex pore structure, poor connectivity between pores and throats, strong heterogeneity, different fluid occurrence states in various reservoir spaces, and diverse assemblage of sources and reservoirs. By analyzing the research progress of fine-grained sedimentary rocks in geological research and logging evaluation, the key points of logging prediction for fine-grained sedimentary rocks are summarized, including: cyclostratigraphy, source rock, reservoir property, oil-bearing, mobility, and fracability. The logging estimation methods of key geological and engineering parameters such as total organic carbon content, effective porosity, laminae density index, oil saturation, mobile fluid saturation, brittleness, in-situ stress, and fracture toughness are discussed in detail. The important role and application of new technology in the classification and assessment of sweet spots are elucidated. The application and innovation of well logging, especially new log techniques in fine sediment in recent years, are described. This approach further underpins decision making towards technical studies on sweet spots, which also provides guidance into the exploration and development of new energy and helps to achieve carbon-neutral earlier.

A Continuous 12 Ma Eruption Record Based on Marine Tephra from Deep Ocean Drilling East of New Zealand

Dr Katharina Pank¹, Dr. Steffen Kutterolf¹, Dr. Julie Schindlbeck-Belo¹, Dr. Jenni Hopkins², Dr. Kuo-Lung Wang^{3,4}, Dr. Hao-Yang Lee³, Dr. Axel Schmitt^{5,6}

¹Geomar Helmholtz Centre For Ocean Research Kiel, Kiel, Germany, ²School of Geography Environment and Earth Science, Victoria University of Wellington, Wellington, New Zealand, ³Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan, Taipei, Taiwan, ⁴Department of Geosciences, National Taiwan University, Taipei, Taiwan, Taipei, Taiwan, ⁵John de Laeter Centre, Curtin University, Perth, WA, 6845, Australia, Perth, Australia, ⁶Institut für Geowissenschaften, Universität Heidelberg, Heidelberg, Germany, Heidelberg, Germany

4F: Sedimentary processes in the northern Hikurangi Margin of New Zealand: Insights from IODP Expeditions 372/375, Rongomātāne C (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

Volcanic ash from explosive eruptions (tephra) can travel far away from volcanic sources, depositing eruption-synchronous marker beds in sedimentary records. Marine sediments, often medial to ultra-distal from volcanic source, may even preserve millions of years of undisturbed sedimentation and therefore comprise an invaluable record of volcanic activity. The combination of onshore and offshore, proximal and ultra-distal tephra records is crucial for the understanding of the volcanic evolution of volcanic systems and will ultimately enable hazard assessment.

We combine the tephra records from medial to distal and ultra-distal deep ocean drilling campaigns (IODP Exp. 372/375 and 329, ODP Leg 181, DSDP Leg 90) and present an integrated and continuous marine tephrochronostratigraphy of New Zealand's explosive volcanism. Furthermore, we start to combine the new marine tephra record with the existing onshore tephra record, establishing a framework for future tephra studies in New Zealand.

The established volcanic record is the most continuous record to date and gives unique insights into the volcanic evolution of the Neogene Coromandel Volcanic Zone (CVZ) and Quaternary Taupō Volcanic Zone (TVZ). Our data shows a compositional transition from CVZ to TVZ volcanism, and reveals long-term variabilities in the eruption frequency with varying repose times over the last 12 Myr, and detailed short-term variances over the last c. 2 Myr revealing phases of increased volcanic activity and potential phases of volcanic quiescence. The integration of the offshore and existing onshore records enabled to ground truth previous interpretations of some allegedly big eruptions (e.g. Kidnappers-B/Potaka); we propose pulsed volcanic activity lasting several kyrs, rather than one voluminous event, for some TVZ eruptions. This finding will ultimately shape our understanding of "big" eruptions and their eruption dynamics, as well as potential volcano-climate, volcano-tectonic links.

Deep-drilled Marine Tephra Record Preserves Multiple-tempo of Arc Volcanism: IODP Expedition 398 Hellenic Arc Volcanic Field.

Dr Katharina Pank¹, Steffen Kutterolf¹, Abigail Metcalfe², Tim Druitt², Axel Schmitt^{3,4}, Kuo-Lung Wang^{5,6}, Hao-Yang Lee⁵, Jonas Preine³¹, Thomas Ronge⁷, Sarah Beethe⁸, Alexis Bernard⁹, Carole Berthod¹⁰, Hehe Chen¹¹, Shun Chiyonobu¹², Acacia Clark¹³, Susan DeBari¹⁴, Ralf Gertisser¹⁵, Christian Hübscher¹⁶, Raymond Johnston¹⁷, Christopher Jones¹⁸, Kumar Batuk Joshi¹⁹, Günther Kletetschka²⁰, Olga Koukousioura²¹, Xiaohui Li²², Michael Manga²³, Molly McCanta²⁴, Iona McIntosh²⁵, Antony Morris²⁶, Paraskevi Nomikou²⁷, Ally Peccia²⁸, Tatiana Fernandez Perez²⁹, Paraskevi Polymenakou³⁰, Masako Tominaga³¹, Adam Woodhouse³², Yuzuru Yamamoto³³

¹Geomar Helmholtz Centre For Ocean Research Kiel, Kiel, Germany, ²University Clermont-Auvergne, Laboratoire Magmas et Volcans, Clermont-Ferrand, France, ³John de Laeter Centre, Curtin University, Perth, Australia, ⁴Institut für Geowissenschaften, Universität Heidelberg, Heidelberg, Deutschland, ⁵Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan, ⁶Department of Geosciences, National Taiwan University, Taipei, Taiwan, ⁷International Ocean Discovery Program, Texas A&M University, College Station TX, USA, ⁸College of Earth, Ocean, and Atmospheric Sciences, Oregon State University, , USA, ⁹Laboratoire des Fluides Complexes et leurs Réservoirs, Université de Pau et des Pays de l'Adour, , France, ¹⁰Institut De Physique Du Globe De Paris, Centre National de la Recherche Scientifique (CNRS), , France, ¹¹School of Ocean Sciences, China University of Geosciences, , China, ¹²Faculty of International Resource Sciences, Akita University, Akita Prefecture, Japan, ¹³School of Natural Sciences/CODES, University of Tasmania, Hobart, Australia, ¹⁴Geology Department, Western Washington University, Bellingham, USA, ¹⁵School of Geography, Geology and the Environment, Keele University, Keele, UK, ¹⁶Institute of Geophysics, University of Hamburg, Hamburg, Germany, ¹⁷School of Geosciences, University of South Florida, Tampa, USA, ¹⁸Department of Earth and Planetary Sciences, University of California, , USA, ¹⁹Solid Earth Research Group, National Centre for Earth Science Studies, Kerala, India, ²⁰Geophysical Institute, University of Alaska Fairbanks, Fairbanks Alaska, USA, ²¹Key Laboratory of Submarine Geoscience and Prospecting Techniques, Ocean University of China, Qingdao, China, ²²School of Geology, Aristotle University of Thessaloniki, Thessaloniki, Greece, ²³Department of Earth and Planetary Science, University of California, Berkeley, USA, ²⁴Department of Earth and Planetary Sciences, University of Tennessee, Knoxville, USA, ²⁵Japan Agency for Marine-Earth Science and Technology, Yokosuka Kanagawa, Japan, ²⁶School of Geography, Earth and Environmental Sciences, Plymouth University, Plymouth, UK, ²⁷Department of Geology and Geoenvironment, National and Kapodistrian University of Athens, Athens, Greece, ²⁸Lamont-Doherty Earth Observatory, Columbia University, Palisades, USA, ²⁹Department of Geology, Kent State University, Kent, USA, ³⁰Institute of Marine Biology, Biotechnology and Aquaculture, Hellenic Centre for Marine Research, Heraklion, Greece, ³¹Department of Geology and Geophysics, Woods Hole Oceanographic Institution, Woods Hole, USA, ³²School of Earth Sciences, University of Bristol, Bristol, UK, ³³Graduate School of Science, Kobe University, Kobe, Japan

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The establishment of continuous volcanic time series, a key to understanding the volcanic behaviour of arc systems or volcanic complexes, is often hindered because of discontinuous volcanic archives on land. Erosion or inaccessibility of volcanic deposits are major obstacles where the field of marine tephra studies has shown great potential to overcome these issues. Growing steadily over the past decades, as marine drilling techniques advances, it enabled the recovery of continuous and undisturbed marine sediment records. Drilling close to volcanically active environments often provides the most complete eruptive archive possible, which can unravel the volcanic and magmatic

behaviour of volcanic systems over geologically long periods of time. Furthermore these long and continuous records enable multi-disciplinary studies, such as the establishment of volcano-tectonic or volcano-climate relationships.

IODP Expedition 398 drilled the marine sediments in the basins of the Christiana-Santorini-Kolumbo Volcanic Field (CSKVF) with the aim to expand our knowledge about its volcanic evolution, and its interaction with tectonics and climate. The CSKVF belongs to the South Aegean Volcanic Arc (Greece), and particularly Santorini is known for its highly explosive volcanism and caldera-forming eruptions since about c. 650 ka. Santorini's young eruptive history (<200 kyr) is well-established based on the onland record, but the early volcanic history lacks a continuous eruption record.

Here, we present the revised tephrochronostratigraphy of Santorini using the marine basin sediments drilled during IODP Expedition 398. Geochemical fingerprinting of tephras enabled the identification of most Plinian eruptions of young Santorini, as well as numerous "new" volcanic events. Furthermore, the established volcanic time series shows the multiple-tempo of arc volcanism, each about 300 kyr long and closely related to major rift pulses identified in the seismic profiles across the CSKVF.

Our findings highlight the importance of complementary and multi-disciplinary studies to reveal the most complete picture of arc volcanism.

Stratigraphic Architecture Where Tide and River Coexist - Holocene Evolution of the Seomjin River Estuary, Southern Coast of Korea

Yechan Park¹, Dr Dong Il Lim², Dr Jaesoo Lim³, Professor Tae Soo Chang¹

¹Department of Geological and Environmental Sciences, Chonnam National University, Gwangju, South Korea, ²Library of Marine Samples, Korea Institute of Ocean Science and Technology, Geoje, South Korea, ³Quaternary Environment Research Center, Korea Institute of Geoscience and Mineral Resources, Daejeon, South Korea

5C: Coastal to shelf environments across time and space (5), Tāwhirimātea E (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

Estuaries exhibit dynamic morphology and complex depositional patterns formed by the interaction of tidal and river processes. When interpreting tide-influenced estuaries with spatially complex developments, it is necessary to consider not only down-dip profiles reflecting transgressive–regressive phase in facies changes, but also along-strike variability to fully understand the system. This study documents the sedimentary facies and stratigraphic architecture of the Seomjin River estuary, southern coast of Korea, where tidal and river processes interact. To understand the spatio-temporal development of the estuary, five borehole cores were obtained along both down-dip and along-strike transects. Radiocarbon and OSL dating were used for stratigraphic correlation and estimation of sedimentation rates. Facies analysis revealed 27 sedimentary facies, grouped into four depositional units: DU1) mudflat/mixed flat, DU2) central bay, DU3) delta front, and DU4) mouth bar. Stratigraphically, the estuarine tidal flats occur at the base, followed by central bay muds, and capped by delta front and mouth bar facies. Multi-proxy analysis of sediment cores shows four depositional stages based on changes in sedimentary facies and sedimentation rate, suggesting transition from estuary to delta. Between 10 and 7 ka BP, rapid transgression led to infill of estuarine tidal flats, primarily along the margins of the estuary. From 7 to 4 ka BP, tidal influence remained significant, although the sedimentation rate slightly decreased. It allowed continued deposition in deeper parts of the estuary. However, abrupt facies changes with about 3,000-year time gap occur only at the depocenter since ca. 1.3 ka BP. Increasing dominance of river processes led to a shift in the depocenter, and eventually deltaic sedimentation was initiated. Notably, during the same period, the estuary margins continued to undergo transgressive deposition under tidal conditions. This suggests that the transition from transgressive to regressive systems was asynchronous, with different depositional systems developing simultaneously within an estuary.

Revisiting the Aptian-Albian Opening of the Equatorial Atlantic Gateway: Insights from the Guinea Plateau

Dr. Debora Filipa Pascoal Duarte^{1,2}, Prof. Dr. Uisdean Nicholson², Elisabetta Erba³, Cinzia Bottini³, Benedict Aduomahor², Thomas Wagner⁴, Tom Dunkley Jones⁵

¹Andalusian Earth Sciences Institute (IACT–CSIC), Granada, Spain, ²School of Energy, Geoscience, Infrastructure and Society (EGIS), Heriot-Watt University, Edinburgh, United Kingdom, ³Dipartimento di Scienze della Terra "A. Desio", Università degli Studi di Milano, Milan, Italy, ⁴The Lyell Centre, Heriot-Watt University, Edinburgh, United Kingdom, ⁵School of Geography, Earth and Environmental Sciences, University of Birmingham, Birmingham, United Kingdom

5F: Contourites and Mixed Depositional Systems (1), Rongomātāne C (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

Ocean gateways, controlled by the divergence or convergence of tectonic plates, play a crucial role in influencing global climate and ocean circulation throughout Earth's history. One of the most important gateways of the Mesozoic Era was the Equatorial Atlantic Gateway (EAG), which opened in several stages along the oblique rift and transform margins of Africa and South America, linking the North and South Atlantic Oceans. Its formation was triggered by a major reorganization of global ocean circulation, influencing climate, marine biotic evolution, and deep-ocean oxygenation. However, the EAG's temporal and spatial evolution remain poorly constrained. In this study, we present new 2D seismic reflection data and biostratigraphic ages from DSDP Site 367, integrated with tectonic reconstruction models, to constrain the sedimentary response to the evolution of the gateway.

Seismic analysis identifies five stratigraphic units (U1 to U5) documenting tectonic and oceanographic changes along the Guinea Plateau margin, on the northern pinch-point of the opening gateway. Our results identify a two-stage evolution of the EAG: i) large sediment waves interpreted as overflow deposits from western equatorial basins into the Central Atlantic (U3, ~117–113 Ma); and ii) contourite drift development indicating a sustained, less restricted connection from ~113 Ma onwards (U4). These findings suggest an earlier onset of gateway opening than previously recognised, with the establishment of a marine connection around 117 Ma, coinciding with the onset of global climate cooling. These findings show the dynamic interplay between gateway opening, ocean circulation, and climate change during the middle Cretaceous, highlighting the critical role of ocean gateways in Earth's climate system.

Contourite System Evolution During and After Continental Breakup: Insights from the Peniche Basin, Northwest Iberian Margin

Adam Kirby¹, **Dr Debora Filipa Pascoal Duarte**², F. Javier Hernández-Molina²

¹Geology and Geophysics Team, Geowynd, London, UK, ²Andalusian Earth Sciences Institute (IACT-CSIC), Granada, Spain

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Contourite features are increasingly recognised in seismic data, but mechanisms controlling their formation associated with continental breakup remain poorly understood. This study used 2D and 3D seismic data from multiple surveys to interpret the distribution of contourite depositional and erosional features which formed during and after continental breakup of the northwest Iberian Margin.

Our analysis identified three seismic units (SU1-SU3), bound by four discontinuities (D1-D4), revealing a three-stage evolutionary history for the Contourite Depositional System (CDS). The initial onset stage (SU1 – late Aptian) records weak bottom currents channelled through underfilled and disconnected rift basins resulting in the deposition of sheeted deposits. The subsequent growth stage encompasses two sub-stages: the first (SU2 – Albian to Cenomanian-Turonian) reflects persistent, vigorous, bathymetrically confined bottom currents generating mounded drifts and erosional/mixed along-slope features, while the second (SU3 – Cenomanian-Turonian to Maastrichtian/Paleocene) marks a global intensification of bottom currents following the opening of the Central Atlantic Gateway. This caused lateral migration of the mounded drifts and generated contourite channels. The CDS was then buried by a new along-slope system which developed under a different oceanographic regime during the Cenozoic. The evolution of this Cretaceous CDS documents a complex interaction between bottom current activity and syn-rift bathymetry. Northward-flowing bottom currents moved within confined seaways between rifted basement blocks, producing large mounded drifts and erosional features indicative of focused deep-water circulation and locally enhanced current velocities.

We propose a conceptual model linking the evolution of the CDS to stages of continental rifting and breakup. The framework offers new insights into how tectonic and oceanographic processes interact to shape deep-marine sedimentary systems and may inform future studies of ancient and modern contourite systems.

Marine Isotopic Stage 3: How Luminescence May Contribute to Solve High Frequency Climate Fluctuations?

Professor Vincenzo Pascucci¹, PhD Giulia Cossu¹, PhD Myriam Stelletti¹, PhD Daniele Sechi², Marta Lai¹, Giulia Laura Faedda¹, Professor Mario De Luca¹, Professor Stefano Andreucci²

¹University of Sassari, Alghero, Italia, ²University of Cagliari, Cagliari, Italy

6A: Sedimentology and Luminescence keys to tune late Quaternary tectonic, climate and eustatic events, Tāwhirimātea A (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

Marine Isotope Stage 3 (MIS 3), 60 to 27 ka, was a cold interglacial characterized by extreme climate instability with rapid high-frequency warm and cold fluctuations: colder Heinrich (H) and warmer Dansgaard–Oeschger (DO). These fluctuations are documented through Greenland ice cores and assigned to Atlantic Meridional Overturning Circulation (AMOC) variability.

However, in comparison to ice core data, the terrestrial MIS 3 record lacks sufficient details. To better constraint MIS 3 events, a detailed sedimentological and chronological (luminescence and 14 C) study on similar sites have been done: Lanzarote (Canary Island – Atlantic), Balearic and Sardinia islands (Central Mediterranean), and Tuscany (western Mediterranean).

All sites show that sedimentation during MIS 3 started (about 60 ka) with dunes forming wide aeolian fields. At about 45 ka, alluvial fans became the dominating depositional system and lasted up to 22 ka (early MIS 2). Fans are characterized by coarse-to fine grained conglomerates, which in Tuscany, Sardinia and Balear have been interpreted as deposited during DO events.

Lanzarote provides a complete alluvial fan succession constrained between 23.6 ± 1.5 and 43.45 ± 0.7 ka and interpreted as the sedimentary response to warm DO 12-2 events. According to this evidence, during warmer peaks of late MIS 3, deposition was controlled by a humid climate characterized by frequent storms and associated floods.

Whatever is the cause of MIS 3 climatic fluctuations, terrestrial data indicate that from about 45 up to 22 ka, relative warm and humid climates established in the Mediterranean and nearby Atlantic regions. These conditions favoured vegetation blooming, fluvial networking, soils development and also the migration of mammals including early modern humans from Africa to Europe.

This study confirms that undoubted MIS 3 serves as a critical analogue for abrupt climate changes, for which luminescence dating can provide a robust chronological framework.

Cross-flow Facies Distribution Asymmetry of Foredeep Turbidites and Its Relationship to Inherited Structures: An Example from the Latium-abruzzo Sector of the Apennines (central Italy)

Dr Marco Patacci¹, Dr Anas Abbassi², Prof Domenico Cosentino², Prof Paola Cipollari²

¹Università degli Studi dell'Aquila, L'Aquila, Italy, ²Università degli Studi Roma Tre, Rome, Italy

3D: Controls on sedimentation at submarine active margins (3), Rongomātāne A (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

The Apennine fold and thrust belt and its associated retreating-collisional foreland basin system represent a world-class natural laboratory for understanding deep-water turbidite facies and architecture and their interaction with active tectonic structures. The Latium-Abruzzi “turbidite complex” is a relatively understudied sector of the foredeep. It extends along a NW-SE band around 50km wide and over 150km long in the central Apennines, with palaeoflow overall toward SE. The basin substrate is represented by the Latium-Abruzzi carbonate platform, which is divided into a series of fault-bound blocks with long-lived relative vertical motion. The integration of data from the Italian state geological mapping project (CARG), subsurface data and new sedimentological fieldwork allowed a new facies association map to be built for the earliest foredeep (upper Tortonian), which crops out east of the Ruffi-Prenestini Mts. and in the Valle Latina. In the more proximal areas, the results illustrate the asymmetric distribution of turbidite facies associations along a cross-flow transect, with the more internal sectors of the foredeep characterised by medium- and thin-bedded sandstones (lobe fringes), while the more external sectors display thick and amalgamated sandstone sequences (channels and proximal lobes). This distribution can be followed from the more proximal areas toward the more distal ones – although the determination of the full extent of this trend is ongoing. Additionally, almost all the sediment is axially fed, with very limited material sourced by the substrate or by the advancing orogeny. These observations are in contrast with the architecture of other parts of the foredeep (e.g. Marnoso-Arenacea and Laga systems). A preliminary interpretation suggests that basin geometry was characterised by a relatively steep outer margin controlled by a series of long-lived structures, with the topography focussing the flows toward the more external part of the foredeep resulting in the observed asymmetric facies distribution.

Seismic Stratigraphy and Seismic Geomorphology of Mass-transport Complexes in Carbonate Depositional Environments: Insights from the Cenozoic Margin of the Exmouth Sub-basin (Northwest Shelf, Australia)

Dr. Victorien Paumard¹, Ms Samantha Dykmans¹, Prof Myra Keep¹, Dr Rosine Riera¹, Prof Simon Lang¹

¹The University of Western Australia, Perth, Australia

8B: Carbonate depositional systems from platform, slope to basin (2), Tāwhirimātea C (Level 2),
January 29, 2026, 1:40 PM - 3:10 PM

The seismically active Australian North West Shelf (NWS) hosts a 170 km-long carbonate platform in the Exmouth Sub-basin, where Cenozoic mass-transport complexes (MTCs) with multiple slip surfaces were mapped using a high-resolution 3D seismic dataset covering 11,731 km². These data were interpreted using full-volume seismic interpretation workflows to establish a high-resolution seismic stratigraphic framework calibrated by the well Ravensworth 1/CH1. Within this framework, four MTCs ranging from 40 to 185 km³ in volume were geomorphologically and quantitatively characterized using a range of seismic attributes. This analysis reveals that these MTCs display a down-slope continuum of deformation along a basal shear surface comprising coherent slide blocks up to 3.3 km long near the headscarps, slide blocks hundreds of meters long and amorphous debris flows. Run-out distances range from 11 to 80 km, controlled by paleotopography and rheology. Headscarps, locally hard linked to underlying, frequently inverted faults, indicate fault reactivation as a potential triggering mechanism. Retrogressive headscarps suggest present-day instability on the shelf, likely linked to seismicity, accompanied by proto-slumps, crown cracks, and pockmarks, which can lead to the development of MTCs in the future and represent significant geohazard risks. Quantitative relationships between different morphometric parameters show that MTCs in the Exmouth Sub-basin are comparable to other passive margin-attached mass-transport systems, including the MTCs of the Great Bahama Bank. Our high-resolution morphometric data, which includes detailed measurement of headscarps, provides new insights into the development of MTCs in carbonate depositional environments, which is critical to the assessment of geohazards.

Sedimentology and Geomorphology of Dryland River Deltas Impacted by Various Tidal Ranges in Western Australia

Dr. Victorien Paumard¹, Prof Simon Lang¹, Dr John Shepherd¹, Mr Alexander Sullivan¹, Mr Andrew Winch¹, Dr Ulysse Lebre¹, Mr Thomas Cotel¹, Prof John Holbrook², Mr Henry Henk², Mr Matthew Kelly², Mr Jacinto Garza², Mr Trip Smith², Prof Stephen Hasiotis³

¹The University of Western Australia, Perth, Australia, ²Texas Christian University, Dallas, USA, ³Kansas University, Lawrence, USA

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The arid tropical coast of Western Australia has many examples of dryland rivers developed during the Holocene that flow only during ephemeral flood events. Along the north west coast of Australia, the Gascoyne Delta and the De Grey Delta are affected by tidal ranges up to 3 m and 7.8 m, respectively. These two systems are natural laboratories to study the impact of increasing tidal ranges on the sedimentology and geomorphology of dryland river deltas. We use a multiscale quantitative approach using remote sensing tools (e.g., LIDAR, drone surveys, satellite-derived bathymetry) to map depositional elements at element complex scale. Field investigations (e.g., trenches, auger holes) allow the sedimentological characterization of these elements. Results show that sedimentation is associated with intense tropical cyclones that produce high discharge over a few hours or days, typically resulting in extensive floodplain inundation via over-topping of levees and splay avulsion channels. Storm waves rework the delta front and shoreface, while storm surges construct laterally extensive beach ridges and inundate the lower delta plain. Tidal ranges play a key role in reworking the delta fronts, with mouth bar complexes becoming more extensive with increasing tidal range. Tidal-reworked, fine-medium sands are pumped up the tidal distributary channels. High evaporation rates lead to high salinity in the lower delta plain and shallow offshore. On the De Grey Delta, ooids have formed within the vast distal delta-front tidal shoal attached to an extensive mouth-bar complex. The ooids have been reworked >10km along the tidal distributary channel complex, and into the late Holocene beach ridges. This study provides useful analogues for framing the scales and juxtaposition of depositional elements as input for subsurface modelling of comparable ancient systems, incorporating a range of geomorphologies developed under various hydrodynamic regimes.

Meiofaunal Bioturbation in Oxygen-deficient Organic-rich Mudstone: Using Tuffs as Taphonomic Windows to Propose a Genetic Model

Dr Maximiliano Paz¹, Dr Luis A. Buatois², Dr Maria Gabriela Mángano², Dr Patricio R. Desjardins³, Dr Daniel Minisini^{4,5}, Dr Federico González Tomassini⁶, Dr Maximiliano N. Rodríguez^{7,8}, Martin N. Rogel^{7,8}, Dr Juan Jose Ponce^{7,8}, Dr Noelia B. Carmona^{7,8}, Dr Egberto Pereira⁹

¹Oberlin College, Oberlin, USA, ²University of Saskatchewan, Saskatoon, Canada, ³Shell Exploration and Production Company, Houston, USA, ⁴ExxonMobil Technology and Engineering, Houston, USA, ⁵Rice University, Houston, USA, ⁶Phoenix Global Resources, Buenos Aires, Argentina, ⁷Universidad Nacional de Rio Negro, General Roca, Argentina, ⁸CONICET, General Roca, Argentina, ⁹Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brazil

1B: Transport of Mud and Deposition of Mudstones, Tāwhirimātea C (Level 2), January 26, 2026, 10:15 AM - 11:45 AM

In ancient successions, mudstone affected by dysoxia during deposition shows the development of banded fabrics produced by meiofaunal (<500 µm-sized animal) bioturbation. However, details on this fabric are currently unknown, mainly because mudstone commonly does not preserve discrete trace fossils. The Vaca Muerta Formation (Upper Jurassic-Lower Cretaceous) of Argentina is host to trace fossils in volcanic tuffs regularly intercalated within organic-rich mudstone. The tuff prevents trace fossil compaction during diagenesis due to early carbonate cementation, providing a taphonomic window to analyze organism-sediment interactions in an ancient seafloor. An ichnological analysis consisting of assessing ichnodiversity, bioturbation index, penetration depth, tiering, and trace-fossil ethologies was conducted in 1,093 m of cores and 148 m of outcrop comprising mudstone deposited in mixed shelf-margin, subaqueous clinoforms. The study suggests that banded mudstone fabric occurs interbedded with tuff having meiofauna and small macrofauna bioturbation, whereas massive mudstone fabric is intercalated with tuff hosting macrofauna bioturbation. A genetic model is proposed, where meiofauna to small macrofauna produces shallow mixed layers generating laminae and/or bed thickening, interruptions, gradational contacts, and a decrease in sediment contrast. After compaction, these mixed layers become the banded mudstone fabric. The model indicates that: (1) in contrast to previous interpretations, the banded fabric is not a transition to the massive fabric, but the final product of meiofaunal bioturbation, (2) banded mudstone is 100% bioturbated, (3) only macrofaunal bioturbation can create massive fabrics in primarily laminated mudstone, and (4) the absence of discrete trace fossils is not evidence of dysoxia. Only 25.6% of the measured succession contains banded fabrics, whereas 55.9% is unbioturbated. Therefore, although this study supports the existence of hidden bioturbation, most of this succession does not record true bioturbated banded fabrics, so caution should be taken when interpreting meiofaunal bioturbation in ancient deposits.

Tracing Metamorphic Conditions from Mineral Inclusions in Detrital Rutile and Titanite

Dr Inês Pereira¹, Nuno Grácio¹, Dr. Emilie Bruand²

¹University of Coimbra, Geoscience Center, Coimbra, Portugal, ²Geo-Ocean Lab, CNRS/Ifremer/Université de Bretagne Occidentale, Brest, France

1A: Next Generation Sediment Provenance (1), Tāwhirimātea A (Level 2), January 26, 2026, 10:15 AM - 11:45 AM

Detrital minerals provide information regarding the age and evolution of the crust they derived from. Recent provenance studies now rely on the acquisition of U–Pb ages from multiple minerals to reconstruct the geology of the source area. These age distributions provide valuable information about magma crystallisation or crustal reworking through metamorphic events. However, in order to place stronger constraints on the metamorphic history of the source area, additional information (e.g. pressure and temperature) must be retrieved from detrital heavy minerals other than age probabilities. Rutile and titanite are Ti-bearing phases that are commonly present in both felsic and mafic metamorphic rocks, their elemental compositions enable discrimination between igneous- and metamorphic-derived source rocks, and these minerals survive weathering and are found in modern sediments. Zirconium concentrations in these minerals have been calibrated as geothermometers and are now commonly employed to detrital grains. However, in order to obtain further information regarding their crystallisation pressures, a combination of other tools must be used. Mineral inclusions in garnet have been used extensively to obtain insights into the metamorphic evolution of rocks, but little attention has been paid to rutile or titanite mineral inclusions, particularly when out of petrological context. Here we present and discuss mineral inclusion data from rutile and titanite from a variety of metamorphic rocks (e.g. amphibolite, granulite, eclogite) to evaluate the applicability of this approach. We also present data of mineral inclusions found in detrital rutile and titanite from different alpine rivers, and evaluate the occurrence and abundance of index-minerals, as well as other mineral inclusions that can indicate approximate grade conditions (e.g., kyanite, clinopyroxenes, amphiboles).

This research is supported by a fellowship to IP (doi.org/10.54499/2021.01616.CEECIND/CP1656/CT0006), and by the European Research Council (FINGER-PT, 101117053).

How Contourite Channels and Moats Unravel the Behaviour of Bottom Currents

Mr Watcharaphong Phothadee^{1,2}, F. Javier Hernández-Molina¹

¹Andalusian Earth Sciences Institute (IACT-CSIC), Granada, Spain, ²University of Granada, Granada, Spain

6F: Contourites and Mixed Depositional Systems (2), Rongomātāne C (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

Contourite channels and moats are well-represented features of Contourite Depositional Systems (CDS) in deepwater sedimentary environments as they are directly related to the action of the bottom currents' core. Contourite channels and moats on the northern middle slope of the Gulf of Cádiz, shaped by the Mediterranean Outflow Water (MOW), are assessed for their variability in morphology and internal geometry during Pliocene and Quaternary due to a wide range of tectonics, oceanographic processes and changes in sediment supply. Evident evolution through time of wide and shallow channels with a predominantly aggradational sedimentary stacking pattern to narrower and deeper moats in both aggradational and progradational configurations with incision and infill phases suggests a long-term intensification of bottom current, interrupted by shorter periods of intermittent activity on millennial and sub-millennial timescales. Seafloor irregularities including slope trends, diapirism, and submarine canyons also play a significant role controlling their associated oceanographic and sedimentary processes. These cause the complex distribution of coarse-grained (sandy) deposits within and along channels and moats. Further oceanographic and sedimentological research of modern-day systems is necessary for a better understanding of their sedimentary facies distribution.

Salt Control on the Evolution of the Deep-water Depositional Systems in the Gulf of Cadiz, SW Iberia Margin

Débora Duarte¹, F. Javier Hernández-Molina¹, Vitor Hugo Magalhães^{2,3}, Cristina Roque^{3,4}, **Mr Watcharaphong Phothadee**¹

¹Andalusian Earth Sciences Institute (IACT-CSIC), Granada, Spain, ²Portuguese Institute for Sea and Atmosphere (IPMA), Lisbon, Portugal, ³Institute Dom Luiz (IDL), University of Lisbon, Lisbon, Portugal,

⁴Portuguese Task Group for the Extension of the Continental Shelf (EMEPC), Paço d'Arcos, Portugal

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The role of halokinetic deformation in shaping deep-water depositional systems is still not well understood. The SW Iberian continental margin is one of the key areas to investigate this interaction, since it underwent a complex tectonic evolution, related to its proximity to the Eurasian-African plate boundary and the Betic-Rif Orogen. The Algarve, Doñana, Sanlucar and Cadiz Basins developed on the Betics' foreland, and their sedimentary infill is composed of deep-water deposits comprising a dominant Miocene turbiditic-hemipelagic sequence and Pliocene-Quaternary bottom-currents (contourite) deposits. This study uses regional 2D and 3D seismic reflection data, integrated with borehole chronostratigraphy, to investigate the effect of regional tectonics on salt-related structures, and their influence on deep-water sedimentation.

Extensive salt tectonics is recorded with many structures showing evidence of associated fluid flow. Two types of salt structures – squeezed walls and columnar diapirs – are observed in areas with compressional deformation, while salt-cored faults occur where the overburden deformation is mainly extensional. Their evolution since the late Miocene underwent eight episodes of salt reactivation, some related to regional tectonic episodes, while others were only local movements. Deep-water sedimentation was influenced by i) salt-related seafloor relief, controlling down- and along-slope current circulation, and thus the sediment distribution and architecture and ii) changeable accommodation space, through time, laterally to salt structures. Therefore, the contourite deposits are strongly affected by the halokinetic activity, with changes in flanking depocenter characteristics impacting drift geometry and size. A transition from sheeted to mounded to confined drifts is recorded as the salt tectonics intensified. Thus, this study emphasizes the importance of an integrated basin analysis of deep-water systems, considering the effect of tectonics and related salt movement as well as short-term climatic, sea-level and sediment supply variations.

Recurrence Intervals of Great Earthquakes Along the Northern Manila Subduction Zone Over the Last 24kyrs: Insights from Event Beds in Perched Basins Offshore SW Taiwan

Dr Radha Krishna Pillutla¹, Dr Lin Andrew Tien-Shun^{1,2}, Mr Yeh Jen-Chu¹, Dr Ratzov Gueorgui³, Dr Babonneau Nathalie⁴, Dr Hsu Shu-Kun¹, Dr Su Chih-Chieh⁵, Dr Lallemand Serge⁶, Dr Löwemark Ludvig⁷, Dr Wang Shing-Lin⁷

¹Department of Earth Sciences, National Central University, Zhongli, Taiwan, ²Carbon Storage and Geothermal Research Center, National Central University, Zhongli, Taiwan, ³Université Côte d'Azur, CNRS, Observatoire de la Côte d'Azur, IRD, Géoazur, , France, ⁴UMR6538 Laboratoire Geosciences Océan, IUEM, Université de Brest, , France, ⁵Institute of Oceanography, National Taiwan University, , Taiwan, ⁶Géosciences Montpellier, Montpellier University, CNRS, , France, ⁷Department of Geosciences, National Taiwan University, , Taiwan

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

In offshore SW Taiwan, the subduction plate interface (i.e., megathrust) and the splay fault are considered as the primary sources of major seismic events. Three giant piston cores - MD18-3548 (20.08 m), MD18-3552 (45.98 m), and MD18-3547 (35.27 m) - were retrieved from perched basins offshore southwestern Taiwan to investigate event beds and assess recurrence intervals of great subduction-zone earthquakes.

A total of 71 event beds were identified across the three cores, comprising 21 homogenites, 24 silty turbidites, and 26 thin silty layers, along with three intervals of seismic quiescence. We have documented the occurrence of homogenites, interpreted as products of earthquakes greater than Mw 8. The origin of silty turbidite and thin silty layers are attributed to result from smaller magnitude earthquakes, probably less than Mw 7. A total of 49 radiocarbon (¹⁴C) AMS dates were obtained from planktonic foraminifera. Depositional ages of the event beds were interpolated based on sedimentation rates of hemipelagites, with the youngest event dated to ~70 BP cal yrs (recent event, silty layer) and the oldest to around 23 BP cal yrs. The average thickness of homogenite units is ~100 cm, ranging from a minimum of ~40 cm to a maximum of ~225 cm. We attribute the formation of homogenite units to great earthquakes, as evidenced by the absence of homogenites following the nearby 2006 Hengchun doublet earthquake (Mw 7.1) in the study area.

These events are clustered into three major groups with two additional outliers, each reflecting distinct intensities of seismic activity. The recurrence interval for homogenites ranges from ~200 to ~2000 years, while turbidites and thin silty layers exhibit recurrence intervals of ~200 to ~500 years. When considering all event beds across the three cores, the average recurrence interval is ~534 years. Focusing solely on homogenites-interpreted as indicators of great earthquake shaking - three distinct clusters are observed, separated by hiatuses, yielding an average recurrence interval of ~864 years for great earthquakes.

What Is an Event Deposit? New Insights from Facies Analysis in a Hadal Trench Environment

Mishelle Muthre¹, Dr. Jean-Nöel Proust², **Dr Charlotte Pizer**¹, Dr. Ken Ikehara³, Dr. Jyh-Jaan Huang⁴, Dr. Hajime Naruse⁵, Dr. Michael Strasser¹

¹Department of Geology, University of Innsbruck, Innsbruck, Austria, Innsbruck, Austria,

²Géosciences-Rennes, CNRS, Université Rennes, Campus de Beaulieu, 35042 Rennes, France, Rennes, France, ³National Institute of Advanced Industrial Science and Technology, Geological Survey of Japan, Japan, Tsukuba, Japan, ⁴Institute of Oceanography, National Taiwan University, Taipei, Taiwan, Taipei, Taiwan, ⁵Division of Earth and Planetary Sciences, Graduate School of Science, Kyoto University, Kitashirakawa Oiwakecho, Kyoto, 606-8502, Japan, Kyoto, Japan

2D: Controls on sedimentation at submarine active margins (2), Rongomātāne A (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

Hadal trenches preserve extensive sedimentary archives that chronicle giant earthquakes across millennial timescales, yet no facies framework tailored to these settings currently exists. We bridge this gap by constructing a process-oriented framework from Japan Trench cores containing well-documented event deposits linked to four historical megathrust earthquakes (CE 2011 Tohoku-Oki, CE 1454 Kyotoku, CE 869 Jōgan and ~2.3 ka). By integrating Visual Core Description (VCD) with 2D and 3D analysis using X-ray Computed Tomography (XCT), high-resolution X-ray Radiography, X-ray fluorescence (XRF) and grain-size measurements, we characterise physical, geochemical, and biogenic structures up to millimetre scales to define twelve event-internal facies (F1-F12). Grain-size thresholds at 32 and 63 μm separate cohesive from non-cohesive sediments and suspended-load from bed-load transport, clustering facies into turbidites (F1–F7, F10–F12), homogenites (F8–F12) and hemipelagic facies (F0). Ripple migration patterns capture the erosion–deposition balance, producing Type-A ripples under limited sediment supply and Type-B ripples when bedload transport and rapid fallout dominate. Type-A and Type-B convolute laminations further distinguish between Rayleigh–Taylor and Kelvin–Helmholtz instabilities. Facies stack hierarchically into pulses, sub-units and upper–lower units that form multi-pulsed or amalgamated successions, revealing each deposit as a cascade of quasi-synchronous flows rather than a single flow.

Basin physiography controls facies and deposit thickness: basin highs undergo energetic erosion–deposition, while depocenters favour ponding of the turbid water mass in prolonged sediment suspension, producing thick, homogeneous units. A distinctive transitional facies (F8) forms where subsequent flows encounter a still-settling sediment cloud, a mechanism persistent in depocenters but absent on highs. Our facies framework robustly interprets complex event-internal and post-event deposition in hadal environments. Applied to Japan Trench deposits, it distinguishes sedimentary imprints of mainshocks versus aftershock sequences of giant megathrust earthquakes, enables new hypotheses on flow direction and source, and enhances the use of hadal trench stratigraphy as a natural archive of geological processes.

Do Tsunami Deposits and Turbidites Hold Similar Information on the Size/Extent of Past Earthquakes?

Dr Charlotte Pizer¹, Prof. Michael Strasser¹, Prof. Hajime Naruse², Prof. Jamie Howarth³

¹University of Innsbruck, Austria, ²Kyoto University, Japan, ³Te Herenga Waka - Victoria University of Wellington, New Zealand

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

With decades of pioneering research dedicated to documenting deposits from past earthquakes, the Japan Trench subduction zone is an excellent natural laboratory for examining the relationship between megathrust earthquakes and triggered hydrodynamic flows captured in the sedimentary record. Both destructive tsunamis and trench-reaching turbidity currents were generated by the 2011 Tōhoku-oki and 869 CE Jogan earthquakes, which are inferred to have had similar rupture characteristics (in terms of magnitude and extent) based on sedimentological analysis and hydrodynamic models of onshore tsunami deposits. However, the offshore sedimentary imprints from the associated turbidity currents from both earthquakes exhibit very different characteristics. That is, if both turbidites were examined in a pre-historical record, we would likely infer very different earthquake scenarios for each event based on their offshore sedimentary imprints, in contrast to the similar scenarios that have been inferred from their onshore sedimentary imprints. These case studies therefore raise questions such as; Do tsunami deposits and turbidites hold similar information on the size/extent of past earthquakes? Would onshore and offshore records, if interpreted independently, reconstruct consistent paleoseismic histories? We aim to provoke discussion on such topics that challenge the underlying principles of paleoseismology.

Microplastic Pollution in Low-depositional Ox-bow Lakes, Danube Delta, Romania

Dr Iulian Pojar-Vintila¹, Dr Rareș Șuvăilă¹, Miss Teodora Baboș¹, Mrs Oana Dobre¹, Mr Sorin Ujeniuc²

¹INCD GeoEcoMar, Bucharest, Romania, ²IFIN-HH, Măgurele, Romania

10B: Plastic Pollution in Sedimentary Systems, Tăwhirimātea C (Level 2), January 30, 2026, 11:00 AM - 12:30 PM

In order to better understand sedimentary microplastic pollution and attempt picturing its dynamics, within Erenciuc and Gorgoștel, both located in Danube Delta, Romania, a new study integrates bathymetric profiling, geomorphological context, and advanced spectrometric techniques. Bathymetric surveys using a 200 kHz single-beam echosounder revealed shallow lake depths (0.9 – 3.2 m) and sediment accumulation zones influenced by the Danube River and several channels input, showing typical ox-bow lacustrine depositional processes. Several sediment cores were collected and analyzed for microplastic concentrations and for gamma spectrometry with Hyper-Pure Germanium (HPGe) detectors to assess radionuclide-specific activity patterns. However, low dry sample masses and equilibrium issues with Rn decay products limited precise chronological resolution via ²¹⁰Pb and ¹³⁷Cs dating.

Despite dating constraints, vertical microplastic (MPs) distribution in sediment cores indicated increasing pollution over the past decade. Sediments underwent multistep preparation, such as density separation, chemical digestion, and filtration, followed by microscopic and spectrometric (micro-RAMAN) evaluation. Particle concentrations peaked at 1240.2 MPs/kg in the 0-5 cm interval, decreasing to 569 MPs/kg in the 16-21 cm interval, the particles being predominantly consisted of synthetic fibers (91.3%), with dimensions of smaller than 1 mm accounting for 55%. Spectrometric polymer identification confirmed the presence of polyethylene (PE), polymethyl methacrylate (PMMA), polypropylene (PP), and polyester (PES).

Results emphasize the importance of correlations between bathymetric and geomorphological insights with spectrometric analyses to assess recent microplastic deposition trends in deltaic lacustrine environments. The integration of physical lake mapping and isotopic tools offers an innovative approach to understand sediment dynamics and microplastic accumulation, particularly in shallow, low-energy aquatic systems. Continued refinement of isotopic dating protocols and spectrometric resolution will enhance temporal accuracy and pollutant source attribution for acknowledging the beginning of the microplastic pollution in this region.

Basement Nature and Basin Physiography Controlling Sedimentary and Petrologic Variability of a Coastal Transgressive Succession (upper Eocene, Ebro Basin)

Miquel Poyatos-Moré¹, David Gómez-Gras¹, Joana Fusté¹, Marta Roigé¹

¹Universitat Autònoma De Barcelona, Barcelona, Spain

2C: Coastal to shelf environments across time and space (2), Tāwhirimātea E (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

Coastal transgressive successions can form very good reservoirs or aquifers, but are sometimes condensed and challenging to interpret in the subsurface. Consequently, outcrop studies are key to understand them in detail. Here we present a detailed sedimentological and petrographic characterization of the Folgueroles Sandstone Formation, which is part of a middle Eocene alluvial to shallow-marine succession of the Ebro Basin.

Twelve sedimentary logs were measured, sampled and correlated across a 10 km along-margin profile. The unit is 6-80 m thick, and its composition is granitic, with minor metamorphic and sedimentary components. It shows a sharp, basal surface, and includes 3 mappable packages: 1) fine/medium-grained sandstones, with small-scale cross bedding, abundant glauconite and reworked bioclasts; 2) medium/very coarse-grained sandstones, with large-scale planar, tangential and trough cross-bedding with northward paleocurrents; 3) fine-grained bioturbated sandstones. We interpret the basal erosive surface and lower package formed during a reduction in the accommodation/sediment supply ratio, followed by an increase in accommodation and development of the intermediate and upper packages, more regionally spread, and deposited along a dominantly high-energy coastline, with alongshore reworking of nearby alluvial deposits forming an extensive sandwave complex.

The studied succession onlaps a Paleozoic granitic/metamorphic basement to the southeast, and a Triassic karstified paleorelief to the southwest, where the Folgueroles Sandstones are replaced by bioclastic calcarenites. This suggests the development of the Folgueroles Sandstones was strictly controlled by the basement configuration, as they are only found near the areas where the weathered granitic basement was exposed, and delivered sediment to the adjacent coastal systems.

The strong alongshore reworking suggested by their sedimentary structures was possibly resulting from a narrowing of the basin towards the upper Eocene, constricted by the Pyrenean frontal thrust in the north, and the basement highs in the south.

The Role of Alongslope Bottom Currents and Downslope Processes in Constructing a Lower Mississippian Carbonate Platform in North America – Time to Re-evaluate Ramp Models?

Dr C. Robertson Handford¹, **Buddy Price**², Dr. Zak Lasemi³

¹Consultant, Owens Cross Roads, USA, ²Devon Energy, Oklahoma City, USA, ³Illinois State Geological Survey, Urbana-Champaign, USA

7F: Contourites and Mixed Depositional Systems (3), Rongomātāne C (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

Carbonate ramp models, initiated in the 1970s, highlight construction by wave, storm, tidal and sediment-gravity flow processes, which predominantly transport sediment downslope forming seaward prograding low-angle clinothems. However, recent oceanographic studies show contour currents play a significant role in clinothem construction and progradation of outer continental shelves and slopes. Thus, the possible impacts of alongslope bottom currents on construction of ancient carbonate ramps have not been fully assessed.

This study re-evaluates Mississippian (Tournaisian-Visean) carbonate strata, which form a shelf-to-starved basin profile extending 3,000 km along the southern margin of Laurussia from the southeastern to southwestern U.S.A. Depositional interpretations historically have been based on standard carbonate shelf and ramp models focused on downslope sedimentation. We present evidence (stratigraphic, biostratigraphic, sedimentological, and geochemical) that downslope and along-slope sediment transport was synchronous and that contour current influence increased basinward along the platform.

Convergence of Laurussia and Gondwana during Early Mississippian time narrowed the Rheic Ocean into a deep seaway of east-to-west equatorial throughflow. Warm seawater flowed westwardly from the Paleotethys through a gateway, separating southeastern Laurussia (N. America) and western Gondwana, and into the southwest Panthalassa Ocean. Outflowing currents mixed with Panthalassa seawater in southern Laurussia, setting the stage for the construction of the Early Mississippian platform by mixed downslope and along-slope currents.

Large- and small-scale features suggestive of mixed processes along the outer ramp and slope include: linear carbonate drifts (10s km), sediment waves (100s m), sheeted drifts, delta drifts, mass transport deposits, stratal truncation by currents, condensed sections, turbidites, bidirectionally graded and burrowed sequences, flaser and lenticular beds, current ripples, and Cruziana-Zoophycos-Nereites ichnofacies.

Our observations indicate that (1) bottom currents are as important, if not greater than wave and gravitational processes in driving clinothem progradation, (2) they are not unique to this ancient platform, and (3) long-established depositional models should be re-evaluated.

Sedimentological and Stratigraphic Architecture of a Prograding Pennsylvanian Mud-dominated Carbonate Slope: Examples from the Bird Spring Formation, Marble Canyon, Death Valley, USA

Graduate Research Assistant Joshua Malone¹, Dr. Xavier Janson¹, **Buddy Price**²

¹Bureau of Economic Geology, University of Texas at Austin, Austin, United States, ²Devon Energy, Oklahoma City, United States

8B: Carbonate depositional systems from platform, slope to basin (2), Tāwhirimātea C (Level 2), January 29, 2026, 1:40 PM - 3:10 PM

This study presents an outcrop characterization of a prograding, mud-dominated slope system within peak icehouse conditions during the Late Paleozoic Ice Age (LPIA). Very few outcrop examples of mud-dominated slopes exist, thus there is a significant gap in knowledge concerning the internal facies distributions and stratigraphic architecture of mud-dominated slope systems. Outcrop exposures of the Pennsylvanian (Morrowan-early Missourian) Bird Spring Formation in Marble Canyon, Death Valley, USA allow for the opportunity to document the degree of channelization, lateral/vertical extent of mass-transport complexes, flow rheology transitions, and variations in facies architecture within a mud-dominated slope formed within an icehouse regime. Measured section data (12 sections; ~3000 m), described at the decimeter scale, were tied to interpreted Gigapans and field observations collected in Marble Canyon to document the deposits and architecture of the Bird Spring slope. Outcrop observations highlight shifts in stratigraphic packaging, sediment composition, and along-strike variability within the context of the LPIA and changes in temporally equivalent facies patterns in shelf and basin strata. The result of this project is an ancient prograding mud-dominated slope system deposited during the final stages of the Paleozoic passive margin system of Laurentia that enhances our understanding of depositional models and predictive relationships within carbonate slopes. The results also provide evidence for both point-sourcing and line-sourcing mechanisms delivering sediment to slope settings, mass-transport complexes (MTCs) being more common in mud-dominated successions than previously recognized, and newly revised depositional models detailing changes in stratigraphic architecture and facies distributions of mud-dominated carbonate slope systems.

Fingerprinting Landscape Response to Global Warming from Source to Sink During the PETM in the Southern Pyrenees (Spain)

Dr Marine Prieur¹, Dr Alexander C. Whittaker², Prof Jean Braun³, Prof Sébastien Castelltort¹

¹University of Geneva, Geneva, Switzerland, ²Imperial College, London, United Kingdom, ³GFZ Helmholtz Center, Potsdam, Germany

9D: Sedimentary evidence of geohazards (2), Rongomātāne A (Level 1), January 29, 2026, 4:25 PM - 5:55 PM

Sedimentary systems lie at the interface between the Earth and the atmosphere and are, therefore, impacted by tectonics and climate. Given modern climate change and increased recurrence and intensity of geohazards, it is crucial to understand and quantify surface processes' sensitivity to temperature and precipitation changes. Past global warming events can provide key narratives to help understand modern trends in landscape changes. Source-to-sink studies consider the continuity of sedimentary systems and the propagation of the response signal following sediment transport from the mountain to the sea.

The Paleocene-Eocene Thermal Maximum (PETM, ~56 Ma) corresponded to global disruptions of temperature and the hydrological cycle caused by the abrupt release of carbon into the atmosphere over 20kyrs. In the Southern Pyrenees (Spain), the PETM significantly modified the landscape, from the amalgamation of alluvial rivers to the delivery of fine-grained siliciclastic sediments to deep-marine turbidites. Our multidisciplinary study investigates (1) the mode and rate of erosion in mountainous catchments and (2) the response of flood intensity and river dynamics. Calculating sedimentary volumes shows a doubling of sediment flux to the Tremp Basin at the PETM. Numerical erosional models suggest this increase in Q_s was mainly due to the intensification of extreme rainfall events. At the PETM, fluvial bodies either enlarged or multiplied in the floodplains, leading to an 8-fold widening of the river systems' channel belts. Finally, enhanced river mobility and runoff led to the preferential reworking of floodplain sediments to the ocean.

This source-to-sink approach allows us to draw a quantified evolution scheme of the South Pyrenean landscape at the PETM. This integrated narrative of a sedimentary system's response to global warming contributes to our understanding of potential landslide and flood hazards in a changing climate.

This research is part of the S2S-FUTURE European Marie Skłodowska-Curie ITN (grant agreement No 860383).

Response of Fluvial Systems to the Toarcian Jenkyns Event in the Central High Atlas Basin (Morocco)

Dr Marine Prieur¹, Ph.D. Gustav Skjernov², Prof Sébastien Castelltort¹, Prof Stéphane Bodin²

¹University of Geneva, Geneva, Switzerland, ²University of Aarhus, Aarhus, Denmark

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Natural hazards are accentuated in a warming climate. As most of the population lives near rivers, changes in precipitation rates and extreme event frequency lead to enhanced flood risks worldwide. The major challenge is predicting the intensity of future floods to mitigate the associated risks. To do so, studying the adjustment of past fluvial systems during extreme global warming events provides concrete narratives of how rivers' morphology adapts to changes in rainfall.

The Jenkyns Event, also called the Toarcian Oceanic Anoxic Event (~183 Ma), shows similarities with modern global warming concerning temperature increases and enhanced ocean acidity. It is extensively described in marine sediments, particularly in the Central High Atlas Basin (Morocco), where detailed stratigraphy drawn from outstanding outcrops informs on a major siliciclastic pulse from shallow-marine environments to deep-basin turbidites. Recent chemostratigraphy studies have identified the Jenkyns Event in the alluvial record upstream of the well-studied marine stratigraphy within this basin (Krencker et al., 2022). These new data pave the way for assessing the impact of the Jenkyns Event on fluvial systems for the first time worldwide.

Here, we extensively describe the alluvial sediments pre-dating, coeval, and post-dating the Jenkyns Event in the Central High Atlas Basin. Field-based facies analyses, grain size measures, and the estimation of channel dimensions bring qualitative and quantitative information on channel bankfull sediment flux and the subsequent adaptation of fluvial channels across the Jenkyns global warming event. This comprehensive narrative is highly informative on continental surface processes' sensitivity to climate change, which is urgently needed to face modern global warming.

Reference:

Krencker, F. N., Fantasia, A., El Ouali, M., Kabiri, L., & Bodin, S. (2022). The effects of strong sediment-supply variability on the sequence stratigraphic architecture: Insights from early Toarcian carbonate factory collapses. *Marine and Petroleum Geology*, 136.

Submarine Fresh Groundwater Controlled by Deltaic Facies Architecture in the Guadalfeo Continental Shelf, Southern Iberian Peninsula

Dr Ángel Puga Bernabéu¹, Dr Francisco J. Lobo², Dr Carlos Duque¹, Dr Fernando Sola³, Sanimed-2024 Scientific Party²

¹Universidad de Granada, Granada, Spain, ²Instituto Andaluz de Ciencias de la Tierra-CSIC, Granada, Spain, ³Universidad de Almería, Almería, Spain

4C: Coastal to shelf environments across time and space (4), Tāwhirimātea E (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

Recent investigations have revealed the presence of offshore freshened groundwater (OFG) within submarine sediments of the Guadalfeo River delta, off southern Spain. Freshened waters were identified in porewater samples collected from sediment cores retrieved during the SANIMED-2024 survey, 1–2 km from the shoreline within the subaqueous portion of the deltaic system. Electrical conductivity measurements confirm low-salinity pore fluids at multiple locations across the continental shelf, suggesting a laterally extensive distribution of OFG beyond a modern coastal aquifer. The integration of sediment cores with high-resolution sub-bottom acoustic profiles indicates that OFG occurs at two distinct stratigraphic levels, each associated with specific facies. The upper occurrence lies within reflective to stratified facies with undulations overlain by discontinuous transparent sheets, acting as semi-confining units. The lower occurrence lies above a major erosional surface formed during the LGM and is sealed by aggradational Holocene early highstand shelf deposits. The distribution of OFG is closely linked to the facies architecture and the spatial arrangement of permeable and confining units within the deltaic succession. The occurrence of OFG is likely sustained by active meteoric groundwater discharge from the onshore aquifer, enhanced by fluvial and irrigation recharge. The identification of OFG within presumably Late Holocene deltaic facies features a highly dynamic deltaic system where active recharge is coeval to episodes of rapid sediment supply, likely controlled by sea-level and climatic fluctuations that triggered sediment gravity flows of varying intensities (mudflows and hyperpycnal flows), shaping the internal facies architecture of the shelf. These processes have controlled the lateral and vertical distribution of permeable sandy layers and the intercalation of finer-grained, low-permeability units that act as effective barriers to fluid migration. Understanding the temporal and spatial variability of these depositional dynamics is key to reconstructing the history and evolution of offshore freshwater bodies in small, active deltaic settings.

Variations in Carbonate Slope Redeposition Along an Active Tectonic Setting, Miocene Prebetic, Betic Cordillera

Dr Ángel Puga Bernabéu¹, Dr Juan Carlos Braga¹, Dr Julio Aguirre¹, Mr. Tomás Alberjón-Peñas², Dr José Noel Pérez-Asensio¹, Dr Jesús Reolid¹

¹Universidad de Granada, Granada, Spain, ²Universidad Autónoma de Barcelona, Barcelona, Spain

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

We present the facies and architectural variability of three carbonate slope systems developed along 65 km of the Prebetic platform margin of the Betic Cordillera during the Middle Miocene. The western sector (Huesa) preserves a 70-80 m thick, transgressive mesophotic ramp-to-slope system characterised by bioclastic deposits dominated by coralline algae and large benthic foraminifera. The progressive steepening of the ramp enhanced sediment transport and redeposition in the adjacent base-of-slope-apron. In the central sector (Castril), a 475 m-thick succession records the gravitational collapse of a steep, lithified carbonate platform margin. It includes a basal megabreccia with clasts up to 20 m sourced from mixed stratigraphic levels; a middle unit of bioclastic limestones with sheet-like and channelised geometries; and an upper unit of interbedded marls and breccias. This architecture reflects the tectonic destabilisation of the platform margin, followed by sustained slope resedimentation in a transgressive context. The eastern sector (San Clemente reservoir and La Puebla de Don Fadrique) comprises a 450-500 m thick redeposited succession dominated by lobe deposits and subordinate channel fills intercalated within marls and capped by transgressive marls. The San Clemente section includes bioclastic packstones to rudstones arranged in sheet-like bodies cross-cut by small-scale channels. The La Puebla section includes coralline-algal rudstones and floatstones forming large compound lenticular bodies tens of metres thick and hundreds of metres wide. The eastern sector indicates redeposition linked to well-developed turbiditic systems with a proximal part incised in a narrow, shallow-water carbonate ramp. Strike variability of slope architecture and facies in the Prebetic domain during the Middle Miocene was controlled by the margin morphology under the influence of active tectonics in a transgressive context. Carbonate production mainly took place on a low-production mesophotic platform. Slope and basin deposits only significantly accumulated when reworked sediments were directly supplied by point-sourced systems and debris-dominated linear sources.

Extracting Geometric Data from Virtual Outcrops for Improved Sedimentological Understanding

Dr Jessica Pugsley¹, Prof John Howell¹, Dr Kachalla Aliyuda^{1,3}, Dr Simon Buckley², Dr Dimitrios Charlaftis^{1,3}, Dr Nicole Naumann², Mr Guillermo Bello Marabe¹, Ms Iuliia Kapustina¹

¹University of Aberdeen, Aberdeen, United Kingdom, ²Fonix Geoscience, Bergen, Norway, ³Badley Ashton and Associates Ltd, Horncastle, United Kingdom

5A: Can Forward Stratigraphic Modeling enhance geological understanding of the subsurface and predict sedimentation through time and space? (2), Tāwhirimātea A (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

The geometry and architecture of sedimentary bodies are the fundamental control on fluid flow in subsurface reservoirs, aquifers and repositories (RARs). In the subsurface, data acquisition is typically limited to wells and boreholes, which provide limited insight to the critical geometry beyond the immediate vicinity of the borehole. Outcrop analogues provide critical datasets for characterising sedimentary architecture, offering key inputs for constructing geostatistical models aimed at predicting fluid flow and storage capacity in the subsurface. With advances in remote sensing and photogrammetry, virtual outcrops have become a standard tool for capturing high-resolution analogue datasets. Virtual outcrops facilitate the extraction of quantitative information on geobody dimensions, spatial relationships, and facies distributions.

For subsurface RARs, geobodies are modelled using several statistical methods including, Boolean (object-modelling) approaches which require accurate object dimensions; indicator simulations that depend on the derivation of variograms; and multiple-point geostatistics or texture-based methods which utilise training images. In this presentation we illustrate systematic approaches to extracting all of these data types from virtual outcrops.

In addition, we describe a novel method for quantifying facies proportions from virtual outcrop data. This technique computes the distribution of facies proportions and displays them as probability density functions (PDFs). The spread of each PDF reflects the degree of lateral variability within the system: narrow distributions suggest laterally persistent, tabular geometries ("layer-cake" architecture), while broader distributions indicate heterogeneous systems with a high degree of facies variability and equates to greater subsurface heterogeneity.

These approaches are illustrated with examples of data extracted from a range of virtual outcrops from continental, shallow marine and deep water clastic depositional systems.

Assessing Lava Palaeoflow Using Tree Fossils

Dr Jessica Pugsley¹, Dr Bartosz Kurjanski¹, Prof David Jolley¹, Prof Malcolm Hole¹, Dr John Millett^{1,2}, Prof John Howell¹

¹University of Aberdeen, Aberdeen, United Kingdom, ²Volcanic Basin Energy Research, UK

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Understanding lava flow propagation is essential for reconstructing the emplacement history of large igneous provinces, though such information is often elusive in the geological record. Common palaeoflow indicators such as inclined vesicles, lava tubes, ropy surface textures, and internal flow banding typically provide only localised data. Tree fossils preserved in lava flows, both modern and ancient, have also been used as palaeoflow indicators, but prior studies have focused on small, localised populations. Here, we present a regionally extensive dataset of over 300 tree fossils identified through detailed field mapping along a ~25 km coastal section of the Palaeogene Mull Lava Field, Scotland, UK. The trees, preserved throughout the exposed stratigraphy, occur in a range of forms including moulds, casts, and mineralised examples and are predominantly sub-horizontal, with rare vertical examples. These previously undocumented tree fossils provide a significant palaeoflow dataset in an area where syn- and post-volcanic faulting has hindered traditional flow correlations. The widespread occurrence of intra-lava sediments and tree fossils further indicates episodes of volcanic hiatus, locally and possibly regionally. Lava flows in this region are thought to originate from multiple fissures, though their precise locations have remained uncertain. By combining fossil orientation data with other palaeoflow indicators, such as vesicle alignment, we identify radial flow patterns originating from a linear zone. This is interpreted as a potential fissure system, likely the source of many flows in the northwestern Mull Lava Field. This study demonstrates the potential of tree fossils as reliable palaeoflow indicators at both individual flow and field-wide scales. We suggest that similar analyses could be applied in other lava fields. Future work examining flow structures around individual or clustered trees may further refine palaeoflow reconstructions.

Distribution, Sources and Burial of Sedimentary Organic Carbon in the Continental Margin Seas: The Bohai Sea, Yellow Sea and East China Sea Example

Professor Shuqing Qiao¹, Prof. Xuefa Shi¹, Dr. Bin Wu¹, Prof. Zhengquan Yao¹, Prof. Limin Hu², Dr. Jie Sheng¹

¹Laboratory of Marine Geology and Metallogeny, First Institute of Oceanography (FIO), Ministry of Natural Resources (MNR), China, Qingdao, China, ²Key laboratory of Submarine Geosciences and Technology, College of Marine Geosciences, Ocean University of China, Qingdao, China

9C: Mapping marine sediments in the world (1), Tāwhirimātea E (Level 2), January 29, 2026, 4:25 PM - 5:55 PM

The ocean is the largest active carbon reservoir on Earth. Organic carbon (OC), as the primary form of carbon sequestration in the ocean, plays an important role in the global carbon cycle through its deposition and burial. Among the ocean regimes, ~ 86% sedimentary organic carbon accumulates in the continental margins. In this study, sedimentary OC data from 5796 stations, relevant geochemical and sedimentological parameters in the Bohai Sea, Yellow Sea, and East China Sea (BYES) were used to finish the 1:2,500,000 distribution map of sedimentary organic carbon, elucidate the distribution and burial patterns of sedimentary OC, and evaluate the carbon sink effect of sedimentary OC burial. This study is based on the published 1:1,000,000 Sediment Type Map of the BYES and the results of the modern sediment budget. The results show that the OC content in the sediments of the BYES ranges from 0.00% to 2.12%, with an average content of $0.47\% \pm 0.26\%$. OC content is significantly correlated with fine-grained sediments, with an average OC content in mud areas being 39% higher than that in non-mud areas. Modern sediments in the BYES are mainly buried in 7 major mud areas, with a total sedimentary OC burial flux of approximately $8.20 \text{ Mt C yr}^{-1}$. In its natural state, the annually sequestered OC in the sediments of the eastern China seas is equivalent to 25.37 Mt of atmospheric CO_2 , indicating a significant carbon sink effect. The distribution and burial of terrigenous organic carbon in the BYES are mainly influenced by the large river inputs and complex marine hydrodynamic environment, while human activities such as dam construction have significantly altered the burial of organic carbon in coastal mud areas.

Effect of Magmatic Intrusion on Carbonate Sedimentation in the Tarim Large Igneous Province

Mr Rongzhen Qiao¹, professor Meijun Li¹, Ms Donglin Zhang¹, doctor Hong Xiao¹, associate professor Haizhou Wang¹, Doctor Bing You¹, associate professor Xiaoqiang Liu²

¹National Key Laboratory of Petroleum Resources and Engineering, China University of Petroleum (Beijing), Beijing, China, ²China University of Petroleum-Beijing at Karamay, Karamay, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Large igneous provinces (LIPs), a key geological phenomenon, significantly influence the formation and alteration of carbonate sediments. The Permian Tarim LIP (295.9–273 Ma) offers an ideal natural laboratory for studying such interactions. Multiple episodes of magma intrusion occurred during the emplacement of the Tarim LIP. Microscopic analysis, seismic profiling, and gas chromatography-mass spectrometry of aromatic hydrocarbons in carbonate revealed the impact of magma intrusion on Ordovician carbonates. Magma from the basin base invaded laterally upon encountering the thick, fine-grained layers of the Santamu Formation. Intrusive bodies displayed marked seismic impedance contrasts with surrounding strata. They were subparallel to sedimentary strata with limited lateral continuity and terminated in inclined veins crosscutting the layers. Interaction between magma and Ordovician carbonates caused dissolution and released substantial CO₂. Magma intrusion induced localized thermal anomalies, leading to elevated concentrations of high-molecular-weight polycyclic aromatic hydrocarbons (5-ring PACs) and increased ratios of thermogenic PAHs in the carbonates. This research will deepen our understanding of the impact of magma intrusion on carbonate sediments. The interaction between magma and carbonates may also contribute to biological crises associated with LIPs.

Unconventional Petroleum Sedimentology: a Key to Understanding Unconventional Hydrocarbon Accumulation

Dr. Zhen Qiu¹, Prof. Caineng Zou¹, Dr. Jiaqiang Zhang¹, Dr. Zhiyang Li², Prof. Hengye Wei³, Dr. Bei Liu⁴, Prof. Jianhua Zhao⁵, Prof. Huifei Tao⁶, Dr. Qin Zhang¹, Dr. Wen Liu¹, Dr. Weiliang Kong¹, Prof. Yifan Li⁷

¹Research Institute of Petroleum Exploration and Development, China National Petroleum Corporation, Beijing, China, ²Texas A&M International University, Laredo, United States, ³Southwest Petroleum University, Chengdu, China, ⁴Indiana University, Bloomington, China, ⁵China University of Petroleum, Qingdao, China, ⁶Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences, Lanzhou, China, ⁷China University of Geosciences (Beijing), Beijing, China

6C: Sedimentology of Black Shales through Phanerozoic (1), Tāwhirimātea E (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

The commercial exploitation of unconventional petroleum resources (e.g., shale oil/gas and tight oil/gas) in black shales has drastically changed the global energy structure within the past two decades. Sweet-spot intervals (areas), the most prolific unconventional hydrocarbon resources, generally consist of extraordinarily high organic matter (EHOM) deposits or closely associated sandstones/carbonate rocks. The formation of sweet-spot intervals (areas) is fundamentally controlled by their depositional and subsequent diagenetic settings, which result from the coupled sedimentation of global or regional geological events, such as tectonic activity, sea level (lake level) fluctuations, climate change, bottom water anoxia, volcanic activity, biotic mass extinction or radiation, and gravity flows during a certain geological period. Black shales with EHOM content and their associated high-quality reservoir rocks deposited by the coupling of major geological events provide not only a prerequisite for massive hydrocarbon generation but also abundant hydrocarbon storage space. The Ordovician–Silurian Wufeng–Longmaxi shale of the Sichuan Basin, Devonian Marcellus shale of the Appalachian Basin, Devonian–Carboniferous Bakken Formation of the Williston Basin, and Triassic Yanchang Formation of the Ordos Basin are four typical unconventional hydrocarbon systems selected as case studies herein. In each case, the formation of sweet-spot intervals for unconventional hydrocarbon resources was controlled by the coupled sedimentation of different global or regional geological events, collectively resulting in a favorable environment for the production, preservation, and accumulation of organic matter, as well as for the generation, migration, accumulation, and exploitation of hydrocarbons. Unconventional petroleum sedimentology, which focuses on coupled sedimentation during dramatic environmental changes driven by major geological events, is key to improving the understanding of the formation and distribution of sweet-spot intervals (areas) in unconventional petroleum systems.

Dolomite Types and Reservoir Characteristics in Dengying Formation of Sinian in the Northern Margin of Yangtze Block

Mr Wang Qiyu¹, Mr Mou Chuanlong¹

¹Chengdu Center, China Geological Survey (Geoscience Innovation Center of Southwest China), Chengdu, China

9B: Carbonate depositional systems from platform, slope to basin (3), Tāwhirimātea C (Level 2),
January 29, 2026, 4:25 PM - 5:55 PM

In order to establish the geological-logging model of dolomite reservoir in Dengying Formation of Sinian in the northern margin of Yangtze Block, the W1 experiment well was implemented, and the whole interval core of 1115.7m was obtained. ofwhich the rock characteristics and reservoir characteristics were studied in detail. The results show that the dolomite types in Dengying Formation can be divided into four categories: crystalline dolomite, granular dolomite, algal dolomite and breccia dolomite. and further subtypes can be divided into nine subcategories: silty dolomite, algal sand dolomite, algal agglomerate dolomite, algal laminated dolomite, oolitic dolomite and so on. Reservoirs are concentrated in the second and fourth members in the Dengying Formation . A total of 9 reservoirs are explained in the fourth member in Dengying Formation, 1-4# is fractured reservoir, 5-8# is cavity reservoir and 9# is a pore reservoir. A total of 17 reservoirs are explained in the second member in Dengying Formation, of which 10-18# is a pore reservoir, 19-25# is a fractured reservoir and 26# is a cavity reservoir. Well W1 is the first well in the northern margin of Yangtze Block, which reveals the dolomite rock types and reservoir types of the whole Dengying Formation of Sinian. The Dengying Formation in Well W1 is rich in dolomite types and reservoir space types, and has established a good corresponding relationship with logging and imaging data. It can provide scientific basis for the optimization of favorable exploration zones and well location deployment of dolomite reservoirs in this area.

Late Pleistocene Greenland Ice Sheet Variability from Northwest Greenland Margin Site U1604

Miss Nina Quinn¹, Dr Georgia Grant^{2,1}, Prof. Rob McKay¹, Prof. Brian Romans³, IODP Expedition 400 Science Party⁴

¹Victoria University of Wellington - Antarctic Research Centre, Wellington, New Zealand, ²GNS Science, Wellington, New Zealand, ³Virginia Polytechnic Institute and State University, Blacksburg, USA, ⁴International Ocean Discovery Program

8E: Deciphering climate and environmental records in shallow marine environments across space and time (2), Rongomātāne B (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

The Greenland and Antarctic Ice Sheets are experiencing rapid and accelerating mass loss in response to anthropogenic climate change (IPCC, 2023). As future sea level rise patterns are determined by the source and relative timing of ice sheet melt, forecasting future sea level rise is reliant on understanding individual ice sheet response to climate forcings. However, while the history and cyclicity of the Antarctic Ice Sheets are relatively detailed, past variability of the Greenland Ice Sheet (GrIS) is poorly constrained due to a paucity of climate records.

Site U1604, one of the first GrIS proximal sediment records recovered on the NW Greenland margin as part of IODP Expedition 400, provides stratigraphic sequences to reconstruct GrIS variability through the last 1.4 million years (Knutz et al., 2025). Ice sheet proximity exerts a strong control on nearby sedimentary processes, and thereby sedimentary deposits. Consequently, the alternating packages of massive mud, laminated mud, interstratified mud and sand, and diamict, and abundance of outsized clasts reflect the advance and retreat of the GrIS through the Quaternary. Located on the lower continental slope, the salient sediment delivery and deposition processes at Site U1604 are ice-rafting, contourite currents, meltwater plumes, and turbidity currents (King et al., 2022).

Lithofacies were developed using a multi-proxy approach including physical characteristics and shipboard continuously scanned logs (including X-ray fluorescence) and assessed with principal component analysis. A comparison of the resulting record of GrIS variability to equivalent Antarctic records provides the relative timing of hemispheric ice sheet variability, thus determining the extent to which ice sheets respond synchronously to climate forcings. Ultimately, this study will aid in understanding variable timing and sources of meltwater to global sea-level changes, such as the 'double peak' of the Last Interglacial (Kopp et al., 2009) and assist future sea-level projections.

Ecosystem Response to a ~3000-year Deoxygenation Event: Paleoecological Insights from Trace Fossils, Algae, and Foraminifera Within the Sapropelic Nicola Bed, Monte San Nicola, Sicily

Dr Wiesława Radmacher¹, Prof. Martin J. Head, Prof. Alfred Uchman, Dr. Igor Niezgodzki, Grzegorz Kaczmarczyk, Dr Daniel Wałach

¹Institute of Geological Sciences, Polish Academy of Sciences, Krakow, New Zealand, ²Brock University, St. Catharines, Canada, ³Jagiellonian University, Kraków, Poland, ⁴Faculty of Civil Engineering and Resource Management, AGH University, Kraków, Poland

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Global boundary Stratotype Section and Point (GSSP) marking the base of the Quaternary System, the Pleistocene Series, and the Gelasian Stage is placed at Monte San Nicola, approximately 10 km NNW of Gela, Sicily, in the Mediterranean badlands (Italian calanche). Dated to 2.58 Ma, the GSSP lies at the base of a marly layer that immediately overlies the sapropelic Nicola bed—a distinct horizon recording a ~3000-year transition from anoxic to oxic bottom-water conditions in a deep marine setting. This interval is characterized by a well-defined ichnofabric. The ichnological features, analyzed both in polished profiles and through X-ray 3D computed tomography, document a progressive shift in bioturbation intensity and diversity, reflecting changing oxygen availability in seafloor and pore waters. Trace fossils indicate a temporary ecological rebound, providing insight into benthic community structure under fluctuating redox regimes. Concurrently, cyclic variations in dinoflagellate cysts and foraminiferal assemblages suggest paleoceanographic oscillations potentially linked to solar and/or orbital forcing mechanisms. This multi-proxy paleoecological analysis enhances our understanding of marine ecosystem responses to short-term deoxygenation during the critical Neogene–Quaternary transition. As part of the international GELSTRAT program, this study complements data from calcareous nannofossils, pollen, stable isotopes, organic geochemistry, magnetostratigraphy, numerical modelling and other tools selected to refine the characterization of the Gelasian GSSP. The project contributes to a more robust global correlation of the basal Quaternary and deepens our understanding of the complex interplay between climate, ocean circulation, and marine ecosystems during periods of environmental stress.

Acknowledgements:

Participation of WR and in was supported by the Polish National Science Centre, Grant number DEC-2022/47/D/ST10/01103.

The Role of Volcanic Activity and Mercury Biomethylation During the End-Devonian and OAE 2 Biotic Perturbation

Assoc. Prof. Michał Rakociński¹, Professor Leszek Marynowski¹, PhD student Marta Palarz¹, PhD student Daria Książak¹, Professor Zofia Dubicka², PhD student Dorota Staneczek¹, PhD student Jakub Kucharczyk¹, Dr Wojciech Krawczyński¹, Dr Andrew Cullen³

¹Faculty of Natural Sciences, University of Silesia in Katowice, Sosnowiec, Poland, ²Faculty of Geology, University of Warsaw, Warsaw, Poland, ³Independent Geoscientist, Norman Oklahoma, USA

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Late Devonian and mid-Cretaceous periods are abundant in climate-controlled marine and oceanic anoxic events, and biotic overturns characterised by the different scales of biotic changes. The Late Devonian (Kellwasser and Hangenberg events) and mid-Cretaceous (OAE 2) events are crucial and especially interesting regarding macroevolutionary changes in marine vertebrates' faunas at this time. Both of these intervals are distinguished by unexpected losses in top predators represented by very characterised placoderm fishes and fish-shaped marine reptiles, which were lost during these events, respectively. Enhanced volcanic activity led to significant changes in the global climate and biosphere during those intervals and provided a loading of huge amounts of mercury to aquatic environments. The end-Devonian and OAE 2 were characterised by the expansion of anoxic zones in marine environments. In aquatic settings, the main source of methylmercury is biomethylation of Hg by anaerobic microorganisms, such as sulfate-reducing bacteria (SRB).

Consequently, the conditions during these periods might have been conducive to the biomethylation of Hg. Methylmercury has received global attention since the poisoning of thousands of people in southern Japan (Minamata) in the mid-1950s. Our aim is to address the lack of knowledge surrounding the occurrence and impact of MeHg on past ecosystems, especially in the context of macroevolutionary drastic changes in aquatic vertebrates during total extinctions, such as the placoderm at the end-Devonian and the ichthyosaurs at the end-Cenomanian. In the end-Devonian deposits, we found MeHg in sediments representing the Kellwasser event (Germany, Thuringia) and the Hangenberg event (Poland, Uzbekistan, Austria and Oklahoma). While in the Cretaceous we found large mercury spikes (> 1500 ppb) in the Apennines (Italy), which are promising in terms of searches for methyl-mercury.

This project was financially supported by the grant of the National Science Centre in Poland (2023/49/B/ST10/00505).

Ocean Fertilization and Anoxia: Tracing the Role of Early Land Plants in Climate Feedback

Dr Mariano Remírez¹, Dr Alexander Dickson², Julie Fredborg Lange¹, Dr Mikael Calner³, Dr Tais Dahl¹

¹University of Copenhagen, Copenhagen, Denmark, ²Royal Holloway University of London, London, United Kingdom, ³Lund University, Lund, Sweden

Keynote: Dr. Mariano Remirez, Tāwhirimātea A (Level 2), January 29, 2026, 12:45 PM - 1:30 PM

Ocean fertilization is a natural carbon dioxide removal (CDR) mechanism that links enhanced continental weathering to increased nutrient delivery to the oceans. This process can stimulate marine primary productivity, leading to enhanced organic carbon burial, atmospheric CO₂ drawdown, and widespread marine anoxia. Several major Phanerozoic climate perturbations appear to reflect a coupling between carbon dioxide removal (CDR) and ocean deoxygenation. During the Ordovician, atmospheric CO₂ levels were among the highest of the Phanerozoic, while the Late Ordovician was marked by significant climatic shifts, including glaciations. This period also represents a pivotal stage in Earth's history with the colonization of land by early plants. It has been hypothesized that even the earliest land plants—such as bryophytes or shallow-rooting vascular plants—significantly accelerated silicate weathering, enhancing nutrient runoff to marine environments. In this contribution, we explore the relationship between the emergence of terrestrial vegetation, nutrient-driven ocean fertilization, and the expansion of anoxia during major CO₂ drawdown events of the Ordovician, particularly those associated with carbon isotopic excursions. We will investigate these events using oxidation-state-specific uranium isotopes ($\delta^{238}\text{U}$ measured in U4+) preserved in marine carbonates as proxies for global marine anoxia. Isotopic analyses targeting the U6+ redox state are particularly effective for capturing primary seawater $\delta^{238}\text{U}$ signatures, enhancing the reliability of anoxia reconstructions. Negative $\delta^{238}\text{U}_{6+}$ excursions, when paired with positive $\delta^{13}\text{C}$ shifts, may reflect expanded organic carbon burial driven by nutrient delivery from land. This work aims to provide new constraints on how early terrestrial ecosystems influenced ocean chemistry and climate during a key interval in Earth's biogeochemical evolution.

Sedimentary Controls on Soft-tissue Preservation in the Cambrian Emu Bay Shale Lagerstätte, Kangaroo Island, South Australia

Ms Stephanie Richter Stretton¹, Professor Robert Gaines², Dr Marissa Betts¹, Professor John Paterson¹

¹University of New England, Armidale, Australia, ²Pomona College, Claremont, USA

8A: Deep time biogeomorphology (1), Tāwhirimātea A (Level 2), January 29, 2026, 1:40 PM - 3:10 PM

The early Cambrian (~539–506.5 Ma) marks the most significant diversification of complex animal life in Earth's history —the Cambrian 'Radiation'. The fossil record is biased towards organisms with biomineralised body parts, but most of the marine biodiversity in both modern and ancient systems is dominated by entirely non-biomineralising taxa. As such, critical windows into Cambrian ecosystems is possible via Konservat-Lagerstätten – exceptional fossil deposits that preserve soft tissues. The Emu Bay Shale (EBS) (Cambrian Series 2, Stage 4) is Australia's only Cambrian-aged Lagerstätte that preserves macroscopic life, representing a clastic succession deposited on the edge of an ancient rift basin, featuring alluvial fans along the margins. Organisms were buried in a relatively deep, low energy depositional environment that underwent episodic high-energy events and fluctuating oxygen levels. While most organisms recorded from this Lagerstätte are well documented, the taphonomic processes leading to their exceptional preservation remain poorly resolved. We address this by employing thin section petrography, statistical analyses of the variability in three-dimensional relief seen in fossils, and micro-XRF elemental mapping of macrofossils to determine the controls on exceptional fossil preservation. Preliminary results reveal that the three-dimensional preservation of entire bodies proceeded via calcite replication mediated by rapid burial in anoxic sediments. This style of preservation appears to be strongly linked to the sedimentary environment and largely independent of original histology and composition of the organisms. This echoes recent work demonstrating that palaeoenvironmental conditions on the benthos had a strong influence on the organisms that are preserved in the EBS, particularly the autochthonous exaerobic specialists and rarer allochthonous benthic taxa deposited during episodic high energy events. Understanding the controls on exceptional three-dimensional preservation of EBS organisms will provide further insights into the variety of fossilisation modes of Cambrian Lagerstätten.

Eastern Carpathians Mesozoic Black Shales Sedimentation and Their Tectonic Setting

Dr Relu-Dumitru Roban^{1,2}, Mrs Mihaela Carmen Melinte-Dobrinescu²

¹University of Bucharest, Faculty of Geology and Geophysics, Bucharest, Romania, ²National Institute of Marine Geology and Geo-Ecology, Bucharest, Bucharest, Romania

7C: Sedimentology of Black Shales through Phanerozoic (2), Tāwhirimātea E (Level 2), January 29, 2026, 10:15 AM - 11:45 AM

The Outer Carpathians thin-skinned nappes comprise Late Jurassic (J3)- Late Miocene sedimentary sequences characterized by three major stratigraphic black shale levels: Upper Jurassic, Early Cretaceous, and Oligocene. The Oligocene foredeep black shales, the main regional hydrocarbon source rock, have been extensively studied, while the tectonic setting of the Mesozoic black shales remains poorly understood. These stratigraphic levels are linked to the genesis and evolution of the Ceahlău-Severin Basin (CSB), which opened during the Middle Jurassic as a distal branch of Alpine Tethys, separating the Dacia mega-unit from Europe.

The J3 basalts associated with CSB deposits exhibit a global MORB array, reflecting varying degrees of mantle source melting along oceanic ridge segments with different spreading rates. The J3 black shales containing graphite and alkaline basalts are restricted to a secondary aborted rift associated with the Dacia continental margin, being preserved just in the Northern part of the Carpathians. The Valanginian-Albian deep-sea black shales accumulated on the oceanic crust and the European passive margin of the CSB, ranging in TOC from 0.5 to 2% and containing marine kerogen. The hydrocarbon expulsion time was in Oligocene-Miocene. Oil generation predates trap formation in much of the Eastern Carpathians, explaining why Lower Cretaceous signatures are rare in the Carpathian oils. The deep and narrow basin morphology, intra-basinal continental ridges, and water circulation likely controlled the anoxic environment. The Barremian-Albian sedimentary facies and detrital zircon U-Pb ages suggest two distinct turbidite systems sourced from the opposite margins of the CSB, Dacia, and Europe. The western polarity of European plate subduction initiated in the Barremian-Aptian is supported by the pronounced subsidence near the Dacia mega-unit and the coarsening-upward trend of the lower Cretaceous general sequences capped by Albian sandstone sourced in this sector by the Dacia plate situated in a higher position to the subduction system.

Tectonic Insights from Mysterious Allochthonous Volcanic and Plutonic Beach Pebbles in the Falkland Islands

Professor Eric Roberts^{1,2}, Ms. Zoe Bowers¹, Professor Robert Henderson², Dr. Elliot Foley³, Dr. Robert Muir⁴, Professor Michael Gottfried⁵

¹Colorado School of Mines, Golden, United States, ²James Cook University, Townsville, Australia,

³Northern Territory Geological Survey, Darwin, Australia, ⁴University of the Western Cape, Bellville, Cape Town, South Africa, ⁵Michigan State University, East Lansing, United States

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Falkland Islands are an isolated micro-continent within the South Atlantic Ocean proximal to the South American continent and characterized by Paleozoic sedimentary successions for which connections with coeval depositional systems in southern Gondwana are debated. Two sets of mafic dikes cross-cut sedimentary units on the Falklands and represent the only volcanics in the islands. Aside from an isolated exposure of Proterozoic granite, no other plutonic rocks are known to exist. Here we report the presence of rare to abundant intermediate to felsic volcanic and plutonic pebbles/cobbles from beaches along the northern and southern margins of the Falkland Islands for which there is no obvious source in the islands today. U-Pb LA-ICPMS dating of zircon grains separated from nine representative volcanic cobbles from the northern beaches demonstrates a Middle-Late Jurassic provenance source between ~165-151 Ma. These ages are comparable to silicic volcanics in Patagonia, South Africa and the Antarctic Peninsula linked with initial Gondwanan break-up, suggesting that similar volcanics are likely present in the proximal (shallow) offshore portion of the north Falklands that will potentially help to better refine the pre-break up position of the Falklands within Gondwana. Additional U-Pb dating of 14 volcanic and plutonic cobbles from southern Falklands beaches indicates a different provenance source, as indicated by a broad range of Jurassic to Paleocene ages, which compare favorably with documented rocks from the islands, submerged banks and volcanic edifices of the North Scotia Arc (e.g., Burdwood, South Georgia). The timing and mechanisms for delivery of these large clasts to the Falkland Islands is confounding but may be related to large submarine slides off the Scotia Arc during periods of lowered sea level during the Quaternary. Determining the provenance of these allochthonous clasts may help with understanding the timing of opening of the Scotia Arc and associated ocean currents.

From Turbidites to Contourites: The South Atlantic Cretaceous Sedimentary Record from a Seismic Perspective

Dr Sara Rodrigues¹, Juan Pablo Lovecchio², Adam Kirby³, Felicia Winter⁴, Emily Kay⁴, F. Javier Hernández-Molina¹

¹IACT-CSIC, Armilla, Granada, Spain, ²YPF, Exploration, Buenos Aires, Argentina, ³Geowynd, Geology and Geophysics Team, London, UK, ⁴TGS, Weybridge, UK

5F: Contourites and Mixed Depositional Systems (1), Rongomātāne C (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

The South Atlantic Ocean contains an extensive Cretaceous sedimentary record, shaped by along-slope flowing bottom currents, gravity-driven currents and hemipelagic settling processes. This record offers a unique opportunity to better understand the onset and evolution of contourite and mixed (turbidite-contourite) systems, and how they relate to bottom-current transport and depositional processes. This study aims to summarize the main depositional systems that have developed in the South Atlantic Ocean during the Early to Late Cretaceous, with a particular focus on those established offshore Argentina, Uruguay and Namibia. These systems were studied using 2D and 3D seismic reflection data and correlated with well-established chronostratigraphic frameworks.

Seismic interpretations suggest that extensive turbidite and hemipelagic deposits began to accumulate along the southwestern Atlantic margins during the Early Cretaceous, while mixed systems emerged at slightly different times across the southeastern Atlantic. Most of these systems evolved into mixed systems in the Late Cretaceous, indicating that the previously established gravitational systems began to frequently interact with northward- and southward-derived bottom currents. During the Paleogene to mid-Miocene, the Cretaceous mixed systems shifted towards contourite depositional systems, suggesting a long-term transition from gravity-flow-dominated settings to bottom-current-driven environments. This transition is attributed to the opening and deepening of key oceanic gateways at different ages, such as the Falkland-Agulhas Seaway, the Equatorial Atlantic Gateway and the proto-Drake Passage. Other control factors include inherited morphological structures, regional tectonic events, varying sediment sources, and major paleoclimatic changes. These findings have important implications for the discovery and characterization of new depositional systems, particularly those associated with ancient paleo-circulation patterns and opening oceanic basins.

Unravelling the Morphological Complexity of Argentina's Cretaceous Mixed Systems

Dr Sara Rodrigues¹, Juan Pablo Lovecchio², Adam Kirby³, F. Javier Hernández-Molina¹

¹IACT-CSIC, Granada, Spain, ²YPF, Exploration, Buenos Aires, Argentina, ³Geowynd, Geology and Geophysics Team, Southampton, UK

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Argentina's Cretaceous sedimentary record is a compelling setting for frequent interactions between down- and along-slope processes, which have generated a wide array of morphological features. The complexity and variability of these features remain poorly understood and constrained, however. This study aims to investigate them in detail, to better understand their temporal and spatial variations. To achieve this, 2D seismic reflection data were analyzed and correlated with several exploration wells, to establish a robust chronostratigraphic framework.

Our results show that three distinct mixed systems developed in the southern, central and northern sectors of Argentina during the Early-Late Cretaceous. These systems are primarily characterized by mounded drifts, submarine channels, lobes, mass-transport deposits and smaller features. However, their geometries, seismic facies and dimensions vary greatly through space and time. Most mounded drifts display symmetric geometries along the upper continental slope, but transition to asymmetric forms on the continental rise. Submarine channels exhibit a similar trend, often presenting steep walls and deep axes along the upper slope (associated with tributary networks), which become broader and less confined on the continental rise. Their dimensions also vary between sectors, being smaller in the south (<5-10 km wide) and larger in the north (<10-30 km). In addition, these features have evolved over time, from gentle, convex bodies in the Albian-Cenomanian to gull-wing shapes in the Santonian-Campanian. These observations suggest that Argentina's Cretaceous mixed systems were influenced by local changes in sediment supply and transport, as they resulted from interactions between down-slope gravity flows and along-slope bottom currents. Other factors have also shaped their architecture, such as the establishment of the South Atlantic Ocean circulation and its connections to other ocean basins, inherited topographic features (e.g., structural highs and grabens), different sediment sources (e.g., paleo-deltas or basins) and the gradual shift from greenhouse to coolhouse climate conditions.

Evolution of Late Miocene Deep-marine Sedimentation in the Eastern Guadalquivir Basin (southern Spain)

Estefanía Llave¹, Francisco J. Sierrro², F. Javier Hernández-Molina³, Santiago Ledesma⁴, Jose F. Mediato¹, Francisco J. Rodríguez-Tovar⁵, Watcharaphong Phothadee³, Wouter de Weger³, **Sara Rodrigues**³, Debora Duarte³

¹Instituto Geológico y Minero de España, IGME-CSIC, 28003 Madrid, Spain, Madrid, Spain, ²Dpto. de Geología, Univ. de Salamanca, 37008 Salamanca, Spain, Salamanca, Spain, ³Instituto Andaluz de Ciencias de la Tierra, IACT-CSIC, 18100 Armilla, Granada, Spain, Granada, Spain, ⁴Trinity Energy Storage, 28050 Madrid, Spain, Madrid, Spain, ⁵Univ. Granada, Dept. Stratigraphy and Paleontology, Granada, Spain, Granada, Spain

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Outcrop-based studies in the Eastern Guadalquivir Basin (Southern Spain) have revealed Late Miocene hemipelagic, turbidites, contourites and bottom currents reworked turbidites. These deposits, which comprise sandstone bodies intercalated with marlstones, closely resemble the Late Miocene and Pliocene-Pleistocene Deepwater Sedimentary Systems of the Gulf of Cádiz. These deposits capture the interplay between gravitational and bottom current processes due to changes in the Mediterranean-Atlantic water exchange. Some sandstone deposits exhibit contouritic bi-gradational sequences or turbiditic deposits topped by a coarsening-upward grain size distribution. Additionally, sand dunes, characterized by large-scale cross-bedding are indicative of increased bottom current activity in- or close to- the Betic Corridors. These sediments were deposited synchronously to the tectonic processes derived from the convergence of the African and Eurasian plates and westward movement of the Alboran Plate. During this time, the connection between the Atlantic and Mediterranean evolved from a single wide seaway, when the Mediterranean acted as an embayment of the Atlantic, into two increasingly restricted corridors: the Rifian corridors in northern Morocco and the Betic corridors in southern Spain. As these gateways narrowed, bottom current velocities increased, initiating an overflow regime of Mediterranean Outflow Water and promoting the development of bottom current-influenced sedimentation during the late Tortonian to early Messinian in the eastern Guadalquivir Basin.

KAcknowledgements: The research is part of the project PID2021-123825OB-I00 (ALGEMAR) and was conducted in collaboration with the SEASTORAGE project (TED2021-129816B-I00) and “The Drifters” Research Group.

Recovery of Benthic Environment After the Messinian Salinity Crisis: Ichnological Analysis of Site 1611 (IODP Expedition 401)

Prof Francisco J. Rodríguez Tovar¹, Professor Emmanuelle Ducassou², Professor Rachel Flecker³, Professor Trevor Williams⁴, Science-Party Expedition-401⁴

¹Universidad De Granada, Granada, Spain, ²University of Bordeaux, Bordeaux, France, ³University of Bristol, Bristol, United Kingdom, ⁴Texas A&M University, College Station, USA

9A: Deep time biogeomorphology (2) & Ichnology and sedimentary basin research: assessing environmental conditions, Tāwhirimātea A (Level 2), January 29, 2026, 4:25 PM - 5:55 PM

International Ocean Discovery Program (IODP) Expedition 401 is the offshore drilling component of the Land-2-Sea drilling proposal, Investigating Miocene Mediterranean–Atlantic Gateway Exchange (IMMAGE). The target of IMMAGE is the record of Atlantic–Mediterranean exchange from inception (~8 Ma) through salt giant formation (the Messinian Salinity Crisis, MSC; 5.9 to 5.3 Ma) to the establishment of an exchange configuration like today in the early Pliocene. Expedition 401 drilled three Atlantic sites (U1385, U1609 and U1610) and one in the Mediterranean, at the Alborán Sea (U1611). The main objective for Site U1611 was to recover an 8–4 Ma succession that records the evolution of the Alborán Sea before, during, and after the major environmental change associated with the MSC. Sediments from the Messinian at Site U1611 are characterized by the presence of laminated beds alternating with nonlaminated and occasional coarse graded beds. Above, at the base of the Pliocene, Zanclean sediments consist of alternating calcareous mud and calcareous silty mud. Absence of trace fossils typifies sediments corresponding to the MSC with only a few ambiguous occurrences. However, at the Miocene/Pliocene transition some traces (i.e., Planolites) can be recognized. Then, at the Zanclean, mottled texture is recognized, and the trace fossil assemblage shows a significant increase in abundance and diversity with the record of Chondrites, Palaeophycus, Planolites, Thalassinoides and occasional Zoophycos. Cross-cutting relationships are evident in some intervals. Ichnological data allow interpreting the recovery of a well-developed, multi-tiered, marine tracemaker community at the base of the Zanclean, supporting the reestablishment of a habitable benthic environment in terms of paleoenvironmental (i.e., depositional and ecological) conditions after the MSC.

Multiproxy Approach to Reconstruct Environmental Conditions in a Vulnerable Coastal Lagoon (Mar Menor, Mediterranean Sea)

Prof Francisco J. Rodríguez Tovar¹, Professor Francisca Martinez Ruiz², Doctor Victor Villasante-Marcos³

¹Universidad De Granada, Granada, Spain, ²Instituto Andaluz de Ciencias de la Tierra (CSIC-UGR), Granada, Spain, ³Instituto Geográfico Nacional, Madrid, Spain

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Mar Menor, in the Mediterranean Sea, is a unique hypersaline coastal lagoon in south-east Spain. It is currently one of the Mediterranean's protected areas due to its high level of anthropogenic impact, particularly from mining and agriculture. The input of nutrients such as nitrates and phosphates has resulted in the growth of harmful algal blooms, fish mortality events and the general deterioration of the lagoon ecosystem, including the loss of benthic fauna. We have used a multiproxy approach, including ichnological, paleontological, sedimentological, geochemical and magnetic analyses, to assess this environmental deterioration and reconstruct changes over the last millennium. Sediment cores have been obtained across several transects inside and outside the lagoon, allowing interpretation of lateral and proximal/distal variations. Ichnological analysis shows the general scarcity of biogenic sedimentary structures, but locally the presence of a mottled background texture and bioturbated horizons is recognized. Paleontological study reveals a variable abundance and preservation of macro (i.e., bivalves, gastropods) and microfossils (i.e., foraminifera). Changes in lithology, grain size and colour have been characterized, evidenced by variations in depositional conditions (i.e., hydrodynamic energy). Sediment composition records a significant trace metal pollution, in particular of Pb, Cu and Zn. Magnetic properties also reflect metal pollution and significant environmental changes. The obtained information highlights the complexity of this coastal lagoon and its diverse impacts on depositional and ecological conditions, mainly the impact of human activities.

Bridging the Gap Between Modern and Ancient: High-resolution Analysis of Nearshore Deposits in the Book Cliffs of Eastern Utah

Leticia Rodriguez-Blanco¹, John Howell², Ivar Midtkandal¹, Ingrid Anell¹, Agustin Arguello-Scotti³

¹University of Oslo, Norway, ²University of Aberdeen, Scotland, ³Equinor, Norway

1C: Coastal to shelf environments across time and space (1), Tāwhirimātea E (Level 2), January 26, 2026, 10:15 AM - 11:45 AM

Conventional models for the formation of ancient progradational shorelines and their bounding surfaces typically record changes in facies tracts at the scale of the parasequence (10's m vertically, km's horizontally) or greater, omitting small-scale variations. Parasequences in the Book Cliffs have a typical duration of c. 60 ky and are associated with sea-level rises in the order of 10 m. The aim of this work is to examine smaller-scale, high-frequency fluctuations within the K4 parasequence of the Blackhawk Formation around Green River (Utah). Within the upper portion of the parasequence a variety of sub-environments including lagoon, coastal plain with small channels, deltaic lobes and thin shoreface packages interfinger, forming a complex nearshore setting. This previously undescribed facies heterogeneity is documented in a series of virtual outcrops generated from high-resolution drone-based photogrammetry that allow for a partial 3D rendering given the deeply eroded canyon landscape. The resulting models cover a ~7 x 5 km area of mostly inaccessible cliffs and allow to describe vertical detail and lateral continuity of facies. The virtual outcrop is complemented with traditional sedimentological techniques to decipher the forcing mechanisms and processes affecting shoreface evolution. The upper 6 m of the parasequence record at least 2 small-scale retrogradational pulses, which are evidenced by the presence of at least 2 coal levels (0.5-1.5 m thick) extending across the studied area and alternating with discontinuous thin (2-3 m thick) shoreface sandstones. These can be traced seaward into clear clinoforms in the shoreface sand bodies. Small-scale cyclic changes within the nearshore environment are documented and mapped, bridging the gap between relatively simplistic facies models and the complex set of sub-environments in modern wave dominated coastlines. Investigating the driving mechanisms for these small-scale cycles also has implications for understanding environmental change in modern coastal systems during a time of rising sea-level.

Microplastic Deposition and Transport in a Human-impacted Stream: Insights from Geomorphic Sinks and Sediment Analogues

Samuel Roudbar¹, Dr. Ronald Poepl², Prof. Dr. Daniel Le Heron¹, Prof. Dr. Michael Wagneich¹

¹University of Vienna, Department of Geology, Vienna, Austria, ²BOKU, Institute of Hydrobiology and Aquatic Ecosystem Management, Austria

10B: Plastic Pollution in Sedimentary Systems, Tāwhirimātea C (Level 2), January 30, 2026, 11:00 AM - 12:30 PM

Understanding microplastic dynamics in fluvial systems is key for identifying pollution source and potential long-term sink remediation. While many studies rely on controlled experiments (e.g., columns, flumes, tanks), to understand the behavior of this pervasive anthropogenic particle, in-situ investigations remain limited. This research investigates the deposition and transport behavior of microplastics in relation to natural sediments within a small (ca. 7 km) highly anthropogenically impacted stream near Vienna, Austria, serving as a natural field laboratory.

In April 2025, 18 sediment (>63 microns) and 7 water samples were collected from diverse geomorphic sinks—such as bars, backwaters, and areas affected by infrastructure. Water sampling was performed using a 150 µm plankton net to capture surface and suspended fractions. A follow-up sampling campaign is planned after a major rainfall event to evaluate sediment reactivation and the potential remobilization of microplastics from these sinks.

Hydrodynamic parameters were measured, and approximately 60 large wood (LW) deposits were mapped and characterized to assess their role in altering flow patterns and sediment connectivity. The overall research will be supported by a model of hydrological connectivity to support our understanding of sediment transport in the studied catchment. Microplastics particle shape (according to “Plastic as a Sediment” by Russell et al. (2023)), size and estimated density will be compared to natural sediments through grain size distribution and total organic content.

Extraction and identification methods include sieving, density separation (1.45 g/cm³), Fenton oxidation, and non-FPA FTIR mapping for polymer identification. Field blanks, lab blanks and recovery rate analysis will ensure reliability of the results.

This research explores to what extent microplastics behave analogously to natural sediments in riverine depositional environments. The findings aim to improve our understanding of microplastic behavior in real-world geomorphic contexts and contribute to broader discussions on sediment dynamics in human-impacted river systems.

Characteristics of Monazite from Cenozoic Ti-Zr Placer Deposits Along the Coast of South Africa: a Vast Resource of Rare Earth Elements and Thorium.

Prof Abraham Rozendaal¹, Ms Amber Hindly¹, Dr Rene Heyn¹, Dr Carlo Philander²

¹Dept of Earth Sciences Stellenbosch University, Stellenbosch, South Africa, ²Tronox Pty Ltd, Brand se Baai, South Africa

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Monazite is an orthophosphate and consists mainly of rare earth elements and thorium with minor Ca, As, Si and Bi. It may occur as small detrital grains in accessory quantities in a host of unconsolidated to semi-consolidated marine and Aeolian sands distributed along the African coastline. Globally these sands constitute significant resources of mainly ilmenite, zircon and rutile and are presently mined in several localities. In South Africa, Tronox Namakwa Sands Mine, Tronox Kwazulu-Natal Sands and Richards Bay Minerals are the main producers of more than 30 million tons of Ti-Zr ore from a several billion ton resource per annum.

The increased demand for critical metals/elements to establish a green and sustainable global society, has focused amongst others on rare earth elements. Placer deposits have the potential to satisfy some of this demand and as a result the mineralogical and geochemical characteristics of monazite, a potential by-product from Namakwa Sands and Fairbreeze (Kwazulu-Natal), has been investigated.

Heavy mineral concentrate mounts from various stratigraphic units as well as specific stages in the mineral separation process have been studied by optical microscope, SEM and LA-ICP-MS. Geochronology of individual monazite grains indicates a highly diverse and complex geological provenance, spanning more than 2 billion years. Almost all monazite grains studied however, are remarkably homogenous and of the cerium end member, light rare earth element and thorium enriched. Cheralite and brabantite are rare. Most grains are of similar grain size, well rounded, liberated and with limited gangue inclusions. Host sediment maturity however, influenced the quantity of monazite aggregates in certain stratigraphic units and will negatively affect recovery in. Pending local legislation regarding storage and transport of radioactive material, monazite(Ce) could become an economically important by-product of coastal placer deposits and contributor to the global REE inventory.

Sedimentation and Environmental History of the Wellington Region During the Late Pleistocene Using Tephrochronology.

Dr Matt Ryan¹, Dr Simon Barker², Ms Anna Miller², Dr Stephen Piva²

¹Toitu Te Whenua - Land Information New Zealand, Wellington, New Zealand, ²Te Herenga Waka - Victoria University of Wellington, Wellington, New Zealand

9D: Sedimentary evidence of geohazards (2), Rongomātāne A (Level 1), January 29, 2026, 4:25 PM - 5:55 PM

The 7.8 Mw Kaikōura earthquake in 2006 led to the demolition of 20 buildings in Wellington, with insurance claims totalling over 2 billion NZD. The engineering of seismically resilient buildings constructed thereafter requires extensive ground investigations to build a more complete picture of the subsurface conditions. The retrieval of deep sediment cores from Wellington used primarily for geotechnical assessments also offer incredibly valuable insights into prehistoric landscapes and major past environmental shifts.

Sediments up to 100 m + deep, retrieved from the Wellington Basin and the Hutt Valley, show distinct changes ranging from gravel, sand, silt, shell rich mud, peat, and contain tephra. Geochemical fingerprinting of these tephras has provided further insights into the sedimentation and vegetation histories on the landscape over the Late Pleistocene in this region. The vegetation response to the 345 ka Whakamaru Super Eruption, containing a 50 cm thick ash deposit 300 km from its source, is explored at millimeter scale resolution.

Role of Bioturbation at Cold Seeps

Ms Iga Ryczkowska¹, Dr Maciej Bojanowski¹, Professor Andreas Wetzel²

¹Polish Academy of Sciences, Warsaw, Poland, ²University of Basel, Basel, Switzerland

10A: Ichnology and sedimentary basin research (2), Tāwhirimātea A (Level 2), January 30, 2026,
11:00 AM - 12:30 PM

The highly variable shape of cold seep-related authigenic carbonate concretions, resulting from anaerobic methane oxidation coupled with sulfate reduction, has intrigued geologists for decades. The abundance and diverse morphology of these methane-derived authigenic carbonates (MDACs) remain poorly understood. So far, the influence of bioturbation on shape of MDACs is only subordinately recognized, even though traces are commonly spatially related to such concretions.

The Upper Oligocene succession at Skrzydlina (Silesian Basin, Polish Outer Carpathians) hosts cold-seep concretions arranged in clusters, each ranging from several to over a dozen individuals. Underlying strata are rich in holothurian and bivalve traces like *Protovirgularia*. Overlying deposits exhibit a patchy distribution of *Tisooa* traces. Their deep-reaching parts penetrate down to the concretion-bearing interval, where the traces either cross-cut or go around the concretions. A discontinuous bed with abundant chemosymbiotic lucinids traces occurs within this interval. The spatial relationships of trace fossils and MDACs appear to be non-random, suggesting a genetic link between bioturbation and early diagenetic controls of MDACs formation, in particular redox boundary dynamics.

These observations provide a better understanding of the link between benthic activity and geochemical processes. In particular, the role of burrows acting as conduits for fluids are of interest, as they affect the position and fluctuation of the redox boundary. Trace fossils related to MDACs have a high potential to document the position of paleo-redox boundary and fluid flow dynamics shallow in sediment. Trace fossils have been so far underestimated as paleo-environmental indicators in cold seep settings and thus, they represent a new frontier in interdisciplinary investigations.

This work was funded by the National Science Centre Grant 2024/53/B/ST10/03806.

Modern Soil–paleosol Proxy Comparisons in Loess: Exploring the Limits of Climate Transfer Functions

Kamila Ryzner¹, Dr Mathias Vinnepand^{1,2}, Dr Milicia Bosnić³, Dr Philipp Stojakowits⁴, Prof Milivoj Gavrilov³, Prof Slobodan Marković³, Zaniar Amiri¹, Hannah Müssener¹, Dr Christian Zeeden¹

¹Liag Institute for Applied Geophysics, Hannover, Germany, ²Université de Rennes, Géosciences Rennes, CNRS, Campus Beaulieu, Rennes, France, ³Chair of Physical Geography, Faculty of Science, University of Novi Sad, Novi Sad, Serbia, ⁴Institute of Geography, University of Augsburg, Augsburg, Germany

3E: Geoheritage and geodiversity of the sedimentary record & Open Science in Sedimentology, Rongomātāne B (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

Reconstructing past climate variability is vital for understanding the range and drivers of environmental change beyond the reach of instrumental records. Loess–Palaeosol Sequences (LPS), widespread across Europe, preserve paleosols formed under varying climatic conditions and represent promising geoarchives for reconstructing past environmental change. While rock magnetic and other geophysical proxies have gained attraction as efficient tools for paleoclimate reconstructions, their applicability across different climatic regimes remains uncertain. This study evaluates the sensitivity of a suite of soil property proxies—rock magnetic parameters, colorimetry, and grain size distributions—using modern topsoil samples from the Middle Danube Basin, which offers a controlled calibration setting. Our results reveal a critical limitation and opportunity: single proxies can be used in transfer functions decently well, but multi-proxy regression is even more powerful. To this end, our ongoing work targets a wider spatial transect along the Danube Basin catchment (Germany, Austria, Hungary, Serbia, and Romania), integrating both modern soil and interglacial fossil soils, especially those attributed to Marine Isotope Stage 5. Rather than equating fossil soils with modern meteorological data, we assess whether climate-sensitive trends in soil properties persist over time and offer meaningful insights into past climate regimes. Our research advances the calibration of geophysical proxies and informs more nuanced reconstructions of European paleoclimate dynamics. It further underscores the importance of spatially integrated, multi-proxy approaches when bridging the gap between modern processes and ancient geoarchives.

Monsoonal Variability Drives Atoll Island Dynamics: Tepuka Islet, Funafuti Atoll, Tuvalu

Mr Lamese Saamu¹, Dr Timothy Poate¹, Prof Gerd Masselink¹, Dr Nieves G Valiente¹

¹University of Plymouth, Plymouth, United Kingdom

4B: Carbonate systems and processes (3), Tāwhirimātea C (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

As low-lying atoll islands remain highly vulnerable to climate change, particularly through rising sea levels and oceanographic changes, understanding the role of monsoonal and seasonal wave forcing in shaping their stability is critical for adaptation and resilience planning. This study investigates the influence of wave energy variability on the morphological evolution of Tepuka Islet, located on the western rim of Funafuti Atoll, Tuvalu. Using a combination of multi-temporal Sentinel-2 satellite imagery, UAV-derived digital elevation models, and downscaled ERA5 wave reanalysis data, this research quantifies shoreline and topographic changes on Tepuka Islet from 2019 to 2025. The study specifically focuses on seasonal and interannual variations in wave energy and their relationship with sediment transport processes and geomorphic responses. Manual shoreline extraction techniques and topographic surveys are integrated with wave energy analysis to explore both horizontal (planimetric) and vertical (volumetric) island changes. Initial findings suggest that temporal variability of wave energy, driven by monsoonal shifts, plays a significant role in influencing sediment dynamics and shoreline mobility on Tepuka Island. Notably, sediment accretion and erosion patterns are shown to align with periods of energetic wave energy dominance, with heightened morphological activity during the austral summer and reduced movement during transitional monsoon phases when waves are less energetic and more variable. By linking wave forcing to observable morphodynamics shifts, this study provides empirical evidence of the sensitivity of atoll islands to wave-driven processes. The insights gained contribute to the broader understanding of sedimentological responses in coral reef–island systems and highlight the importance of incorporating seasonal oceanographic dynamics into coastal risk assessments for vulnerable Pacific atoll nations.

Facies and Bathymetric Preferences of Post-Paleozoic Stalked Crinoids from Panthalassa - Evaluating Ecological and Sedimentary Shifts During the Mesozoic Marine Revolution

Professor Mariusz Salamon¹, Dr Graciela Bressan², Dr Krzysztof Gaidzik¹, Dr Adiël Klompmaker³, Dr Marcin Krajewski⁴, Dr Dario Lazo², Dr Tatsuo Oji⁵, Professor Bartosz Płachno⁶, MSc Bruna Poatskievick Pierezan⁷, Dr Alfonso Rubilar Rodriguez⁸, Ms Alicja Wilk¹, **Dr Przemysław Gorzelak**⁹

¹University of Silesia In Katowice, Sosnowiec, Poland, ²Universidad de Buenos Aires, Buenos Aires, Argentina, ³University of Alabama, Tuscaloosa, USA, ⁴AGH University of Kraków, Kraków, Poland, ⁵Nagoya University Museum, Nagoya, Japan, ⁶Jagiellonian University in Kraków, Kraków, Poland, ⁷Unisinos University, São Leopoldo, Brazil, ⁸Unidad de Paleontología y Biocronología, Sernageomin, Chile, ⁹Institute of Paleobiology, Polish Academy of Sciences, Warszawa, Poland

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The demise of major invertebrate groups in specific environmental settings throughout geological history has played a crucial role in shaping sedimentary facies, as the loss of key ecosystem engineers often triggered fundamental shifts in depositional environments. For instance, stalked crinoids have historically represented a significant component of numerous shallow-marine ecosystems, frequently contributing to the formation of crinoidal facies. Today, however, their distribution is limited to deep-sea, and they are no longer contributors to shallow-water sedimentation. Data from Euramerica (Tethys Ocean) indicate that this transition toward deeper environments began during the Cretaceous and was largely completed by the Eocene. This environmental restriction was likely driven by increased predation pressure associated with the so-called Mesozoic Marine Revolution (MMR).

Nonetheless, the timing of this shift and global synchronicity remain topics of ongoing debate. Here, we examine the facies and bathymetric preferences of post-Paleozoic stalked crinoids from the Panthalassic realm (Antarctic Peninsula, Chile, Argentina, Peru, Mexico, USA, Canada, Japan, Australia, New Zealand). Our findings suggest that Mesozoic and Cenozoic stalked crinoids from this realm occupied a variety of environments, exhibiting no consistent preference for specific facies or bathymetric zones. While a trend toward deeper habitats is observable, shallow-marine occurrences of stalked crinoids persisted into the Miocene: the proportion of occurrences of stalked crinoids in deeper environments relative to all crinoids increases from 7.5% in the Mesozoic (Jurassic-Cretaceous interval) to 19% in the Cenozoic (Paleocene-Miocene interval). These observations imply that the restriction of stalked crinoids to deep-sea environments was not globally synchronous and was delayed relative to the onset of the MMR. In Panthalassa, this environmental transition may have been completed after the Miocene. Unlike the few exceptional cases observed in the late Mesozoic, Cenozoic stalked crinoids did not play a significant role in shallow-marine carbonate sedimentation

This project was financed by NCN grant 2023/51/B/ST10/00212.

Experimental Study of Chlorite Authigenesis: Insights From K-Feldspar Precursor

Mr Anas Salisu¹, Professor Khalid Al Ramadan¹, Dr Abdulwahab Bello¹, Dr Abduljamiu Amao¹

¹King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Chlorite, a critical diagenetic clay mineral, significantly influences porosity and permeability in deeply buried sandstone reservoirs. Authigenic chlorite developed from various clay and non-clay mineral precursors. Although chlorite formation from clay precursors is well-studied, its direct formation from non-clay precursors, such as K-feldspar, remains underexplored. Here, we present the first systematic hydrothermal-reactor experiments demonstrating chlorite authigenesis from K-feldspar in an arkosic sandstone (Subbat Member, Jauf Formation, NW Saudi Arabia). Closed-system autoclave experiments were conducted at 80–250 °C and ~10–16 MPa for 2–4 weeks, with a fluid-to-rock ratio of 10:1, using natural Red Sea water and synthetic Mg-rich brine. Integrated petrographic, mineralogical and geochemical analyses reveal a multistage reaction pathway for chlorite authigenesis: (1) dissolution of detrital K-feldspar, kaolinite, and hematite cements from 80 °C releases Al, Si, K, and Fe into the reacting fluid; (2) nucleation of smectite occurs at ~150 °C, forming honeycomb and grain-coating textures; (3) smectite transforms into well-crystallized chlorite between 200–250 °C via a dissolution–precipitation mechanism, with fluid chemistry dictating Fe vs. Mg enrichment; and (4) silica released from feldspar and kaolinite dissolution precipitates as quartz overgrowths on detrital quartz. Continuous chlorite grain coatings inhibit quartz cementation, preserving intergranular porosity, whereas pore-filling chlorite reduces porosity from 24% to 19%, underscoring the importance of chlorite texture and distribution for reservoir quality. These findings provide detailed insights into the K-feldspar-to-chlorite conversion through a smectite intermediary phase, with significant implications for predicting reservoir quality in K-feldspar-rich sandstone formations worldwide.

Syn depositional Botryoidal Cements as Stratigraphic Tool: Insights From U-Pb LA-ICP-MS Geochronology

Professor Elias Samankassou¹, Dr Nathan Looser, Professor Óscar Merino-Tomé, Professor Stefano M. Bernasconi, Dr. Stefan Schröder, Prof. N.J. Beukes, Dr. Marcel Guillong

¹Department of Earth Sciences, University of Geneva, Geneva, Switzerland

2B: Carbonate systems and processes (1), Tāwhirimātea C (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

The dating of carbonate sequences is generally based on index fossils, which only provide relative ages. These biostratigraphic ages must be correlated with tie points constrained by absolute, radiometric dates. U-Pb dating of zircons from volcanic ash layers provide such absolute ages. However, ash layers are rare, random, and difficult to locate in many carbonate sequences, which represents a major limitation for determining absolute deposition ages. In the present study, we dated syn depositional botryoidal cements by U-Pb LA-ICP-MS. Botryoidal cements, aragonitic marine cements with radial texture that commonly precipitate syn depositionally at the seafloor in shallow waters, are widespread, especially in Precambrian carbonates, and their direct dating by U-Pb offers great potential for the reconstruction of absolute deposition ages in sedimentary series lacking index fossils and suitable ash layers.

To test whether botryoidal cements, typically characterized by high U contents, which makes them potentially suitable for U-Pb geochronology, record and maintain accurate and precise depositional ages, we apply this approach to a Carboniferous carbonate sequence located in northern Spain. We show that the U-Pb ages of botryoidal cements from four biostratigraphically well-constrained horizons are statistically distinct in their respective depositional ages that closely match zircon ages from interbedded ash layers. Our botryoidal cement-derived depositional ages are also supported by $^{87}\text{Sr}/^{86}\text{Sr}$ data in agreement with the global curve of the Carboniferous. We compare the botryoidal cement-derived deposition ages with U-Pb ages of fossils, micrite, and early diagenetic void-filling calcites measured along and show that botryoidal cements yield better accuracy and precision.

Future studies should also explore syn depositional and early diagenetic cements other than botryoids, in particular radiaxal fibrous calcite cements, which often have lower U contents and are therefore more challenging to date by the U-Pb method, but are equally widespread in Precambrian carbonates.

Transport of Mud and Deposition of Mudstones - Understanding the Rock Record Via Experimentation

Professor Juergen Schieber¹, Dr. Zalmai Yawar¹

¹Indiana University, Bloomington, United States

1B: Transport of Mud and Deposition of Mudstones, Tāwhirimātea C (Level 2), January 26, 2026,
10:15 AM - 11:45 AM

Twenty years ago, a ridiculous idea became physical reality through verification with flume experiments and mudstone sedimentology changed in dramatic ways. Muds no longer needed quiet waters to come to rest, and could instead be deposited from currents strong enough to transport sand. That paradigm shift opened up a whole new way to understand muds, the roles of flocculation, bedload flocs and floc ripples, their transport regimes and facies distribution, with critical implications for petroleum geology and development of unconventional hydrocarbons. We now have clear criteria to evaluate mudstone textures for past action of bottom currents, soft substrate erosion and redeposition of rip-up-clasts, microbial surface colonization, and even the relationship between depositional processes and porosity development. Scaling issues limit what aspects can be examined via experimentation, but studying the rock record in concert with experimental work has for example shown the presence of second order (muddy megaripples) and even third order (mud waves) bedforms. Long term prospects for mudstone sedimentology point towards bedform phase diagrams that relate to flow velocity, sedimentation rate, and duration of sedimentation events. At the same time, experimentation is moving away from just examining the behavior of clays and including other silicate minerals, mineral mixtures, and the role of organic matter in flocculation and bed accretion. Fine grained carbonates (aragonite mud, coccolith debris), as well as fine grained non-clay silicates (e.g. quartz, diatoms), flocculate, give rise to bedload floc ripples, and behave comparable to clay minerals in earlier experiments. Equally important is the role of organic matter in flocculation and bed accretion, and experimentation already is opening up new dimensions for facies development and accretion patterns in mudstone successions. Experimental work underway now will result in a state of understanding mudstones that is process based, quantifiable, and enables realistic forward modeling of mudstone successions.

Refining Temporal Frameworks and Provenance in the Triassic Bowen Basin, Australia

Matthew Scipione¹, Dr. Espen Knutsen, Dr. Romain Vaucher, Dr. Eric Roberts, Dr. Joan Esterle

¹James Cook University, Douglas, Australia

3A: Next Generation Sediment Provenance (3), Tāwhirimātea A (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

The Triassic continental Rewan Group in the northern Bowen Basin, Queensland, Australia, yields a crucial faunal assemblage that presumably provides insight into the recovery period following the end-Permian mass extinction (EPME). The Rewan Group records deposition in a foreland basin formed during the Hunter-Bowen orogeny. For decades, the Rewan Group has been considered to be of Early Triassic age; however, previous age constraints for this stratigraphic interval relied on limited biostratigraphic data that were often inconsistent and geographically restricted, leaving the precise depositional timing unresolved. While some provenance interpretations have been proposed, no work has directly addressed sediment source using geochronological data.

To achieve this, we integrate detailed lithostratigraphic analysis with U–Pb detrital zircon (DZ) geochronology using LA-ICP-MS to establish a robust chronostratigraphic framework for the Sagittarius Sandstone and Arcadia Formation (Rewan Group). Samples collected from three vertebrate fossil localities and six drill cores (~300 grains per sample) were analyzed. Five different metrics for interpreting maximum depositional ages (MDAs) for each DZ sample were compared, and our results demonstrate that the Rewan Group spanned from the Early Triassic (~247 Ma, Olenekian-Anisian) to Late Triassic (~231 Ma, Carnian) and reveal paraconformities in certain basin depocenters. The new ages confirm that all fossil sites are Late Triassic (Carnian), meaning the faunas reflect a later diversification phase during the Carnian Pluvial event rather than the immediate post-EPME recovery. Additionally, DZ age spectra record a mixed provenance, with minor Precambrian-Paleozoic populations sourced from Gondwanan basement terranes and a significant late Permian-Triassic component derived from contemporaneous magmatism associated with the Hunter-Bowen orogen.

In turn, the refined chronostratigraphic framework of the Triassic northern Bowen Basin enables improved stratigraphic correlations across the basin, highlighting broader post-extinction recovery records.

Vertical Burrow Structures in a Sandy Beach: Examples from Australian Coasts

Dr Koji Seike^{1,2,3}, Dr Thomas Oliver³

¹Geological Survey of Japan, AIST, Tsukuba, Japan, ²The University of Tokyo, Kashiwa, Japan,

³University of New South Wales, Canberra, Australia

9A: Deep time biogeomorphology (2) & Ichnology and sedimentary basin research: assessing environmental conditions, Tāwhirimātea A (Level 2), January 29, 2026, 4:25 PM - 5:55 PM

Physical sedimentary structures such as parallel and trough-cross stratification dominate in a wave-dominated sandy beach. Biogenic sedimentary structures, on the other hand, are minor in the environment but have significant potential to be an indicator of detailed depositional settings. For example, the trace fossil *Macaronichnus segregatis*; its modern counterpart is a feeding trace of the opheliid polychaete, which is considered an indicator of paleo sea level. In this presentation, we will show the other biogenic sedimentary structures in backshore, foreshore, and shoreface settings on Bengello and Boydtown beaches, New South Wales, Australia. Almost all biogenic sedimentary structures in the settings are vertical burrows except for the *Macaronichnus* burrows. Details for each biogenic structure are as follows: The giant beach worm *Australonuphis* is known to grow up to 3-m long and lives in the foreshore/surface transition zone. The worm creates a meter-scale-deep vertical burrow with a narrow diameter. The donacid bivalve lives on the foreshore and creates a vertical burrowing structure with deformation of laminae surrounding it. The soldier crab *Mictyris* also makes a similar structure to the donacid bivalve burrow, but its transverse section is more rounded, and its distribution is limited to the lower part of the foreshore of a calm wave beach and sandy tidal flats. The ghost crab *Ocypode* produces a meter-scale-deep, inclined burrow with a few branches, shaping Y. Their burrow occurs from the uppermost foreshore to vegetated coastal dunes. Because the burrows shown here have a characteristic morphology and exhibit a specific distribution along a beach profile, their fossil counterparts can be used as indicators of the detailed depositional settings.

Dense Aggregations of Shrimp Burrows in the Lower Shoreface Off a Modern Beach, Central Japan

Dr Koji Seike^{1,2,3}, Dr Toru Tamura^{1,2}, Mr Kotaro Komori^{1,2}

¹Geological Survey of Japan, AIST, Tsukuba, Japan, ²The University of Tokyo, Kashiwa, Japan,

³University of New South Wales, Canberra, Australia

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The lower shoreface is characterized by heavy bioturbation and an abundance of trace fossils compared to other depositional settings, such as the backshore, foreshore, and upper shoreface. Nevertheless, there has been only limited information on the modern counterpart of the trace fossils in the lower shoreface. In this presentation, we report the abundant occurrence of upogebioid shrimp burrows in the lower shoreface of a wave-dominated sandy beach, the Kujukuri coast in central Japan. Upogebioid burrows occurred at water depths ranging from 20.1 to 30.2 m. The maximum burrow density was 2591.6 openings/m² at a water depth of 26.6 m. This roughly corresponds to a population density of 1296 /m² because upogebioid burrows typically have two openings. The burrow wall is composed of knobby mud materials, similar to the trace fossil Ophiomorpha. The results suggest that the upogebioid shrimp is a major bioturbator in the lower shoreface setting. The observed number of burrows indicates that a dense shrimp population comparable to the high value reported in tidal flats exists in the nearshore zone of a wave-dominated sandy beach.

SvalCLIME: Towards Deep-time Paleoclimate Scientific Drilling in Svalbard

Professor Kim Senger¹, Professor Sten-Andreas Grundvåg², Jiri Barta³, Silvia Danise⁴, William J. Foster⁵, Mads E. Jelby⁶, Morgan T. Jones⁷, Denise Kulhanek⁸, Amando Lasabuda⁹, Henning Lorenz¹⁰, Sverre Planke⁹, Grace Shephard⁹, Matthias Sinnesael¹¹, Kasia K. Sliwinska¹², Aleksandra Smyrak-Sikora¹³, Lidya Tarhan¹⁴, Weimu Xu¹⁵, Valentin Zuchuat¹⁶, SCT SvalCLIME Science Team¹

¹The University Centre In Svalbard, Longyearbyen, Norway, ²UiT - the Arctic University of Norway, Tromsø, Norway, ³University of South Bohemia, Ceske Budejovice, Czechia, ⁴University of Florence, Florence, Italy, ⁵University of Hamburg, Hamburg, Germany, ⁶University of Århus, Århus, Denmark, ⁷Umeå University, Umeå, Sweden, ⁸University of Kiel, Kiel, Germany, ⁹University of Oslo, Oslo, Norway, ¹⁰Uppsala University, Uppsala, Sweden, ¹¹Trinity College, Dublin, Ireland, ¹²GEUS, Copenhagen, Denmark, ¹³NTNU, Trondheim, Norway, ¹⁴Yale University, New Haven, USA, ¹⁵University College Dublin, Dublin, Ireland, ¹⁶CSIRO, Perth, Australia

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Sedimentary archives provide important constraints on deep-time paleoclimate dynamics, the evolution of life, and the response of the Earth System to environmental perturbations. In view of ongoing climate change and ever-increasing atmospheric CO₂ levels, reconstructing climate-ecosystem dynamics in Earth's past serves as a crucial constraint for future predictions.

Svalbard offers a nearly continuous Phanerozoic geological succession that records several environmental perturbations of global relevance. The SvalCLIME project aims to drill and fully core the Permian to Oligocene interval on Spitsbergen to decipher deep-time local, regional, and global paleoclimatic signals recorded in these strata, and to tie these data to neighbouring outcrops and existing cores. SvalCLIME comprises two proposals, submitted to the International Continental Scientific Drilling Programme (ICDP).

The first, SvalCLIME-P2P (Permian to Paleogene), is a full drilling proposal that aims to core Svalbard's Permian to Paleogene succession. This record will provide essential insights into global climate dynamics from mid- to high-paleolatitudes, including the impact of past hyperthermal events. Drilling a high-resolution paleoclimate archive will allow for the investigation of environmental and biotic responses to large-scale igneous activity and other climate perturbations at local, regional, and global scales. This will help improve our understanding of paleolatitudinal gradients in climatic responses to global warming and how these have varied in magnitude.

The second, SvalCLIME-Hot2Cold, proposes a land-to-sea workshop aimed at developing a full proposal to collect drill core records from Svalbard across the Eocene–Oligocene Transition. This will test the hypothesis that the opening of Fram Strait played a major role in the establishment of global thermohaline circulation and cooling of Earth's climate.

In this presentation we present the SvalCLIME proposals, outlining the motivation, scientific hypotheses, and future plans.

Basin-scale 3D Seismic Stratigraphy and Seismic Geomorphology; Contextualizing Bottom Current Deposits and Paleogeographic Reconstructions.

Prof Christophe Serie¹

¹University of Oslo, Oslo, Norway

5F: Contourites and Mixed Depositional Systems (1), Rongomātāne C (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

While modern bottom currents deposits are relatively well understood thanks to high-resolution bathymetric mapping, surface sediment sampling, and direct current measurements; ancient contourite and mixed depositional systems remain comparatively underexplored, particularly in terms of paleo-setting controlling their spatio-temporal evolution.

These ancient systems have been identified through outcrops, exploration boreholes, cores, and seismic studies, in addition to paleogeographic reconstructions to contextualize their regional settings. As a response to spatio-temporal change in depositional systems, bathymetry, and ocean circulation; mixed depositional systems can result from the interaction of gravity flow with surface currents in relatively shallow settings, deep tidal currents on paleo-terraces, or thermohaline circulation along paleo-slopes.

Access to regional seismic data including basin wide acquisition of modern 3D seismic data, as well as state-of-the-art interpretation methods represent a key turning point to study the development and evolution of contourites and mixed depositional systems. Basin-scale seismic stratigraphy and geomorphology offer key insights into the dynamic interplay between sedimentary processes, especially where core interpretation can often be ambiguous and sometimes fail to recognize the interaction between gravity flows and bottom currents. In addition to seismic analysis, integration of sedimentology, geochemistry, ichnology, petrography, and biostratigraphy studies are essential to fully understand the evolution of ancient depositional systems.

Recognition of ancient contourite and mixed depositional systems at multiples scales is key, while basin-scale 3D seismic stratigraphy and seismic geomorphology offers an invaluable toolset for unravelling Earth's dynamic history, including plate tectonics, ocean circulation, source-to-sink systems, and climate evolution.

Dominant Role of a Thermohaline-driven Ocean Current in Forming the Choshui Detached Mud Belt in the Taiwan Strait

Dr Xin Shan¹, Dr Robert Dalrymple², Dr Xuefa Shi¹, Dr Shuqing Qiao¹, Dr Chenguang Liu¹, Dr Zhengquan Yao¹, Dr Lina Jin¹, Dr Qingfeng Hua¹, Dr Han Feng¹, Dr Shan Liu³, Dr Shihao Liu⁴, Dr. Paul Liu⁵

¹First Institute of Oceanography, Qingdao, China, ²Queen's University, Kingston, Canada, ³Sun Yat-sen University, Zhuhai, China, ⁴East China Normal University, , China, ⁵North Carolina State University, , USA

10C: Mapping marine sediments in the world (2), Tāwhirimātea E (Level 2), January 30, 2026, 11:00 AM - 12:30 PM

Contourites are commonly associated with deep-water environments, but this study documents a shallow-water, muddy contourite drift in the centre of Taiwan Strait. The drift body (220 km long, 50–70 km wide, 0–30 m thick), with its long axis approximately colinear with the Taiwan Strait Current, is flanked on both sides by moats. Compositional data show that the drift is composed of sediment carried northward by the Taiwan Strait Current from the Choshui River draining Taiwan. The coast-normal Changyun Ridge directly offshore of the Choshui River splits the Taiwan Strait Current into two branches that occupy the moats. Oblique cross-drift flow from west to east contributes to drift growth. The dispersal system shows a down-current fining from sands on the Changyun Ridge (ca 100 km long, 25–45 km wide) to the fine-grained elongate drift; these together represent the asymmetrical subaqueous portion of the Choshui delta. Cores show that the drift is <8 kyr old, with sedimentation rates up to 7.8 m/ka. It coarsens upward during the initial phase of drift growth, perhaps due to an increase in current strength, with smaller-scale textural bedding attributed to fluctuating current strengths or variations in wave energy depending on the location. Seismic data show that the southern end of the drift is migrating westward, due to elongation of the Changyun Ridge, whereas the middle and distal end are migrating eastward because of cross-drift flow. Erosion by the eastern branch of the Taiwan Strait Current detached the drift from the coeval coastal mud belt. The influence of tidal currents is small because of the destructive interference of tidal waves entering from the two ends, creating weak rotary tidal currents over the drift. Wave energy is small within the Strait but larger waves arriving from the East China Sea are thought to be responsible for upward coarsening of the more exposed northern end. Taiwan Strait serves as a starting point for developing a facies model for ocean-current-dominated straits and seaways.

Process and Deposit Asymmetry of Bohai Strait Driven by Bathymetry and Sediment Supply

Dr Xin Shan¹, Dr Robert Dalrymple², Dr Xuefa Shi¹, Dr Zhengquan Yao¹, Dr Shuqing Qiao¹, Dr Yuting Huang¹, Dr Xia Zhang³, Dr Shihao Liu⁴

¹First Institute of Oceanography, Qingdao, China, ²Queen's University, Kingston, Canada, ³Nanjing University, Nanjing, China, ⁴East China Normal University, Shanghai, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Bohai Strait, a critical conduit between the Bohai Sea and the Yellow Sea, exhibits pronounced asymmetry in its bathymetry, hydrodynamic processes, sediment sources, and Holocene depositional patterns. This study utilizes extensive high-resolution seismic reflection data and sediment cores to characterize the Holocene sedimentary architecture and elucidate the governing processes driving this asymmetry. The strait morphology, featuring a deep northern channel (Laotieshan Channel) and a shallower southern platform with islands, alongside significant sediment input, primarily from the Huanghe River, dictates contrasting depositional environments.

Our findings reveal that the northern Bohai Strait is dominated by flood-tidal processes. The Laotieshan Channel acts as an erosional conduit for coarser sediments, feeding a large flood-tidal delta system within the Bohai Sea, characterized by evolving sand ridges and channels. Seismic facies and core data from this region indicate net sediment transport into the Bohai Sea, with evidence, such as incision into older Holocene strata and upward-coarsening trends in cores, suggesting an increase in tidal-current strength over time.

In contrast, the southern Bohai Strait is characterized by a net ebb-dominant regime (primarily by the wind-driven Lubei Coastal Current), significantly influenced by the massive sediment discharge from the Huanghe River. This results in an extensive coastal mud belt (Shandong mud wedge) that extends eastward from the river delta, through the southern strait, and along the Shandong Peninsula. While generally showing eastward fining, this pattern is interrupted by localized scour and coarser lag deposits around islands and within inter-island channels, reflecting flow acceleration.

The synthesis of seismic stratigraphy, facies analysis, and core data demonstrates a northern sector characterized by flood-driven erosion and coarse-grained deltaic deposition, and a southern sector dominated by the transport and deposition of fine-grained, river-derived sediments under a net ebb-influenced current system .

Airborne Microplastics: A Review of Current Perspectives and Environmental Implications

Professor Longyi Shao¹, Ms Yaxin Cao¹, Dr. Yaowei Li², Dr. Pengju Liu³, Ms Susu Fan¹

¹China University of Mining and Technology (beijing), Beijing 100083, China, ²Hebei North University, Zhangjiakou 075000, China, ³School of Environment, Tsinghua University, Beijing 100084, China

10B: Plastic Pollution in Sedimentary Systems, Tāwhirimātea C (Level 2), January 30, 2026, 11:00 AM - 12:30 PM

Microplastics (MPs), as an entirely anthropogenic type of pollution, are considered to be stratigraphic markers of the Anthropocene Epoch, and have become of increasing public concern over the past decade. Recent studies have revealed that the atmosphere is an efficient medium to disseminate MPs from their sources to remote mountains and marine areas. However, current research on atmospheric MPs (i.e. airborne MPs) is generally less highlighted than MP water and soil pollution studies due to the lack of standard methods for the identification and quantification of atmospheric MPs. This paper reviews the published literature on airborne MPs, gives an overview of the advantages and disadvantages of current airborne MPs collection techniques, extraction methods and identification (i.e., ‘passive’ and ‘active’ sampling, density separation and visual identification), and lays a foundation for future studies. The physical and chemical characteristics, classification, spatial and temporal scale distributions, sources, transport, and environmental impacts of airborne MPs are summarized. There are substantial research gaps in the quantification of airborne MPs and the exploration of toxicity mechanisms of inhalable MPs. The establishment of accredited methods is an urgent challenge for a better understanding of airborne MPs and their environmental and health effects. As one of the constituents in many aerosols, airborne MPs should be treated as a recognized pollutant for long-term monitoring, and the factors that specifically affect airborne MPs could be better addressed by means of the characterization of individual MPs. In the future, the effects and interaction of MPs in the atmosphere, lithosphere and hydrosphere are also of critical importance. As a case, the MPs in Beijing air have been studied for their physico-chemistry, possible sources, and toxicological mechanisms.

Proposal for an International Collaborative Project on Mapping Ecological Substrates in the Global Ocean (MES-GO)

Professor Xuefa Shi¹, Prof Shuqing Qiao¹, Dr. Lina Jin¹, Prof Zhengquan Yao¹, Dr. Jie Sheng¹, Dr Xin Shan¹, Dr Bin Wu¹

¹First Institute of Oceanography, Ministry of Natural Resources, China, Qingdao, China

9C: Mapping marine sediments in the world (1), Tāwhirimātea E (Level 2), January 29, 2026, 4:25 PM - 5:55 PM

The marine ecological substrate map as a scientific foundation for ocean exploration and utilization, provides critical support for ecosystem protection, sustainable resource management, and global ocean governance. However, a comprehensive global marine ecological substrate map does not currently exist, representing a critical gap in our understanding. We propose the launch of an international collaborative initiative—Mapping ecological substrates in the global ocean (MES-GO) project—under the framework of the United Nations Decade of Ocean Science for Sustainable Development (UN Ocean Decade). This project aims to systematically collect and integrate global marine ecological substrate data through extensive international cooperation, utilizing advanced technologies such as survey sampling, seafloor observation, and artificial intelligence. The project will establish a comprehensive marine ecological substrate database and develop unified global standards for seabed classification and technical specifications. Key deliverables will include multi-scale, dynamically updated ecological substrate maps, incorporating both natural and anthropogenic substrates. Additionally, the project will create an international portal for data sharing, atlas display, knowledge services, and interactive communication, fostering collaboration among scientists in ocean science and management. By mapping the distribution patterns, the MES-GO project will deepen our understanding of the ocean, accelerate the application of marine knowledge, and provide critical support for achieving the UN Sustainable Development Goals. We eagerly look forward to collaborating with international colleagues to jointly advance this landmark scientific project.

Life-environment Interactions in a Jurassic Lagoonal Delta: Insights from True Substrates of the Lastres Formation, Northern Spain

Dr Anthony Shillito¹, Dr Maximiliano Paz², Dr Romain Gougeon³, Dr Luis Buatois¹, Dr Gabriela Mángano¹, Dr Laura Piñuela⁴, Dr José García-Ramos⁴

¹University of Saskatchewan, Saskatoon, Canada, ²Oberlin College and Conservatory, USA, ³Universite de Bretagne Occidentale, France, ⁴Museum of the Jurassic of Asturias, Spain

8A: Deep time biogeomorphology (1), Tāwhirimātea A (Level 2), January 29, 2026, 1:40 PM - 3:10 PM

The Late Jurassic Lastres Formation (Asturias, N Spain) has long been recognised for the exceptional record of dinosaur footprints it contains, leading to the area being known as Spain's "dinosaur coast". However, the formation also bears a high diversity invertebrate ichnofauna, recording the significant ecological impacts of bioturbating arthropods and molluscs. Despite its abundance and diversity, this invertebrate ichnofauna has never previously been studied in detail, or accurately placed in the context of the palaeoenvironments.

The formation is extremely well exposed along the coast of Asturias, cropping out as shallowly dipping strata in cliffs and along the foreshore. Sedimentologically there are multiple continuous cycles from fully marine deltaic sediments, to emergent floodplain and palaeosol deposits. This style of outcrop has led to a high frequency of bedding surfaces along with exposures of vertical sections in the cliffs, meaning that it is possible to get a good account of both vertical and horizontal trace fossils and sedimentary structures, as well as high resolution snapshots of communities from throughout the different facies.

With novel sedimentological and ichnological field data we discuss how these snapshots record different durations of sedimentary stasis throughout the stratigraphy, ranging from years to centuries on floodplains, to hours to days in interdistributary bays, to instants within distributary channels. Intermediate durations of stasis lead to the best conditions for preservation of true substrates, as a relatively high recurrence frequency lines up with a sufficiently long colonization window and preservation potential. However, short stasis durations can provide informative snapshots of short-timescale events, and long stasis durations can provide broader palaeoenvironmental context that cannot otherwise be inferred. Together, these enable a reconstruction of the complex life-environment interactions that were occurring within a Jurassic lagoonal delta system.

Geochronology and Sedimentary Environments of the Udu-dong Archaeological Site, Chuncheon, Korea

Phd Seungwon Shin¹, Doctor Jeong-Heon Choi², Miss Yubin Jeong¹, Miss Yesom Yu¹

¹Daegu University, Gyeongsan si, South Korea, ²Korea Advanced Institute of Science and Technology, Cheongju-si, South Korea

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Udu-dong archaeological site in Chuncheon, South Korea, dates to the Proto–Three Kingdoms Period (ca. 100 B.C. to A.D. 350). Numerous artifacts, including pottery, have been unearthed from ancient dwelling remains at the site. To better understand the chronology of occupation and the preceding environmental conditions, we employed three geochronological methods—radiocarbon dating, optically stimulated luminescence (OSL), and archaeomagnetic dating. Radiocarbon analysis of charcoal fragments from furnaces provided estimates for the initial settlement period, while archaeomagnetic dating helped constrain the timing of abandonment by dating the last use of fire. The underlying fluvial deposits were dated by OSL and analyzed for sedimentary facies to reconstruct the pre-settlement sedimentation history. Results indicate that coarse sediments began accumulating around 10,000 years ago, followed by the development of a stable floodplain environment approximately 3,000 years ago. Human settlement began about 50 years after floodplain stabilization, and the site was continuously occupied for roughly 150 years before being abandoned around A.D. 200–250. The absence of major changes in sedimentary facies during this period suggests that environmental catastrophes were not the primary cause of abandonment. This study demonstrates the value of integrating geochronological and archaeological approaches to reconstruct the occupation history of prehistoric sites and underscores the importance of such interdisciplinary methods for future excavation and preservation efforts.

Development of Fluvial Terraces Along the Fault Valley and Causes of Their Spatial Variations: The Strike-slip Yangsan Fault, Se Korean Peninsula

Mr Hyeon Su Shin^{1,2}, Dr Tae-Ho Lee³, Dr Youngbeom Cheon³, Assoc. Prof. Yong Sik Gihm^{1,2}

¹Department of Geology, Kyungpook National University, Daegu, South Korea, ²KNU G-LAMP Research Center, Kyungpook National University, Daegu, South Korea, ³Active Tectonics Research Center, Korea Institute of Geoscience and Mineral Resources, Daejeon, South Korea

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Fault-controlled topographic evolutions alter fluvial dynamics, creating complex spatiotemporal variations in river terrace formation. The present study investigates the fault valley along the NNE-SSW directed strike-slip Yangsan Fault in the southern part of the Korean Peninsula. The fault valley exhibits asymmetric topography: western granite-andesite high mountains versus eastern transition from high granite peaks to low sedimentary hills northward. Seven tributary streams (S1-S7, from north to south) fed sediments to alluvial fans along the western mountain front under East Asian Summer Monsoon influence. Four river terraces (T1-T4) are identified on the basis of field examination, characterized by spatial variations of their extent. T3 terraces are extensively developed near S2-S7, while T2 shows maximum development near S1. Bedrock elevation and terrace treads display a gradual northward decline from S5 to S2, with minimal change between S2-S1. The result of Optically Stimulated Luminescence (OSL) dating indicates terrace formation during interglacial periods: T4 (244–213 ka, MIS7), T3 (129–127 ka, MIS5e) and T2 (42 ka, MIS3b). This temporal pattern indicates that enhanced monsoon-driven sediment supply primarily controlled aggradation. In addition, spatial terrace distribution reveals decreasing bedrock uplift rates northward following T3 formation. High uplift rates from S7 to S2 constrained T2 development, whereas reduced uplift near S1 permitted extensive T2 formation. This demonstrates that fault controlled uplift variations controlled the spatial variation of the dimension of the terraces.

The Relationship Between Rainfall and Water Level in Mountain Rivers Surrounded by Rice Fields in Japan

ミスター **Akihiro Shoda**¹, Mrs Miwa Yokokawa¹

¹Osaka Institute of Technology, Osaka, Japan

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

In Japan's Asian monsoon climate, rice cultivation is practiced even in steep mountainous valleys. Small and medium-sized rivers in these areas have limited catchment areas and steep slopes, making them highly responsive to rainfall and prone to sudden water level rises and flooding. The Fugenji River, located in Kyotanabe City, Kyoto Prefecture in Japan, is one such river and serves as an important agricultural water source. However, the runoff delay effects of paddy fields and terraced fields remain insufficiently quantified. Recent increases in off-season and localized heavy rainfall events highlight the need to revise runoff models to include these effects.

This study aims to analyze rainfall–water level responses in the Fugenji River to support flood prediction and agricultural water management. Long-term data from 2010 to 2024 (daily upstream rainfall and downstream water levels) and high-frequency (10-minute interval) observations from a new upstream water level logger in 2025 were used. Rainfall data from five stations in Kyoto and Nara were spatially interpolated using the Inverse Distance Weighting (IDW) method.

A positive correlation between upstream rainfall and downstream water levels was found, with correlation coefficients rising from 0.45 in the 2010s to 0.57 in the 2020s. Extreme events in 2014 and 2023 reflected different water level responses depending on rainfall patterns from typhoons and the rainy season. Recent years have seen extreme rainfall even in May and October, suggesting changes in rainfall seasonality.

In May 2025, water levels rose by 0.42 m within 30–60 minutes upstream, while downstream levels rose only 0.22 m with a one-hour delay. This difference is attributed to the buffering effects of paddy and terraced fields and topographic variation. The high correlation (0.6–0.8) between IDW-estimated rainfall and observed water levels confirms the method's effectiveness in sparsely monitored mountainous basins.

Influence of Seamount Subduction on Deep-marine Sedimentary Processes in the Hikurangi Subduction Margin of New Zealand During the Quaternary

Mr Anthony Shorrock¹, Dr Lorna Strachan¹, Dr Helen Bostock², Dr Philip Barnes³, Ms Natasha Ngadi¹, Ms Laura McDonald¹, Dr Sam Davidson³, Dr Kathleen Marsaglia⁷, Dr Daniel Tentori⁸, Dr Davide Gamboa⁴, Dr Gregory Moore⁵, Dr Adam Woodhouse⁶

¹University of Auckland, Auckland, New Zealand, ²University of Queensland, Brisbane, Australia,

³NIWA, Wellington, New Zealand, ⁴Universidade de Aveiro, Aveiro, Portugal, ⁵University of Hawaii,

Honolulu, USA, ⁶Cardiff University, Cardiff, United Kingdom, ⁷California State University, Northridge,

USA, ⁸Italian National Research Council, Rome, Italy

4F: Sedimentary processes in the northern Hikurangi Margin of New Zealand: Insights from IODP Expeditions 372/375, Rongomātāne C (Level 1), January 27, 2026, 10:15 AM - 11:45 AM

Subduction margins are some of the most dynamic geologic interfaces on the planet, and the ongoing interactions of volcanic and tectonic features in these localities lead to significant changes in sedimentary regimes over relatively short periods. We present evidence on how these processes influenced the deep-marine Hikurangi Subduction Margin (HSM) of New Zealand in the Quaternary. Using data acquired from the northern HSM during IODP Expedition 375 from within the Hikurangi Trough and atop a seamount, we identify shifts in regional sedimentation processes at four key time junctures. Coupled with paleogeographic reconstructions of the HSM, we show the influences of seamount subduction and changing environmental conditions on the HSM during the Quaternary.

The submarine Hikurangi Channel underwent a significant avulsion event in response to the encroachment of a seamount with the subduction front at 1.75 Ma while northward continuation was dammed by additional seamounts, leading to the establishment of an unusual trench-escaping axial channel that persists to the present. This re-routing is recorded by a sudden shift from a carbonate-dominated hemipelagite/contourite regime to a siliciclastic turbidite-dominated sequence with minor contourites. At 1.3 Ma, the subduction of this seamount led to increased slope instability/erosion and began the formation of the Māhia Canyon. By 0.5 Ma the Māhia Canyon was fully established in the wake of the subducted seamount, leading to increased sedimentation rates (>20 m/ka) within the trough as the canyon connected to terrestrial sediment transport systems. At 0.035 Ma, the region was changed following the catastrophic failure of the continental slope following seamount impacts further north and emplacement of one of the largest submarine landslides ever recorded, the Ruatōria Mass Transport Deposit. This study presents one of the first integrations of sedimentological data with paleogeographic reconstructions to demonstrate the significant influence seamount subduction can have on regional sedimentation regimes.

Evolution and Interaction of Deep-Marine Sediment Transport Processes in the Northern Hikurangi Margin of New Zealand

Mr Anthony Shorrock¹, Dr Lorna Strachan¹, Dr Helen Bostock², Dr Philip Barnes³, Ms Laura McDonald¹, Dr Adam McArthur⁴, Dr Kathleen Marsaglia⁵, Dr Daniel Tentori⁶, Dr Davide Gamboa⁷

¹University of Auckland, Auckland, New Zealand, ²University of Queensland, Brisbane, Australia,

³NIWA, Wellington, New Zealand, ⁴University of Leeds, Leeds, UK, ⁵California State University, Northridge, USA, ⁶Italian National Research Council, Rome, Italy, ⁷Universidade de Avero, Avero, Portugal

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

IODP Expedition 375 acquired a ~850 m-long trough floor sediment sequence from Site U1520 in the northern Hikurangi Trough of New Zealand. This is the longest deep-water record ever obtained from the Hikurangi Subduction Margin (HSM) and provides an unprecedented opportunity to assess how deep-marine sediment transport processes operate and change over time in active margin settings. Here we present a lithofacies scheme for the siliciclastic upper 500 m of this core (Unit I, II, and III) based on a combination of visual assessment with physical properties datasets, including granulometry, CT densities, petrology, and XRF compositions, to characterise the sediment transport regime of the northern HSM over the past 1.75 Ma.

This 500 m-long succession is dominated by the deposits of downslope gravity flow processes, with turbidite beds of up to 10 m in thickness making up most of the identified strata. Minor contributions from bottom currents are also noted, with potential contourite deposits identified near the base of this interval. Sedimentation rates have increased through time, particularly following the establishment of the shelf-incising Māhia Canyon at ~0.5 Ma, after which sedimentation rates peaked at up to ~20 m/ka during the last glacial maximum. The establishment of the Māhia Canyon also led to a shift from more southerly derived-sediments fed into the axial Hikurangi Channel system, to sediments derived from the Raukūmara Peninsula to the west. Unit II of the core (105 – 220 mbsf) is associated with the Ruatōria Mass Transport Deposit and the differing sedimentological characteristics (e.g., thinner, finer-grained) within this interval suggest that this unit was emplaced further to the north prior to being shifted southwards during the mass transport event. This study improves our understanding of sediment transport processes along active margins, with implications for ongoing paleoseismic and paleoclimate studies that utilise records from such settings.

Spatiotemporal Distribution of Chlorite Coats and Their Impact on Reservoir Properties in Jurassic Deltaic Sandstones- a Case Study from Norwegian Sea

Ms Monika Shukla¹, Mr Henrik Hansen¹, Ms Lina Line², Mr Jens Jahren¹

¹University of Oslo, Oslo, Norway, ²AkerBP, Stavanger, Norway

1C: Coastal to shelf environments across time and space (1), Tāwhirimātea E (Level 2), January 26, 2026, 10:15 AM - 11:45 AM

The lower Jurassic Tilje Formation, a heterolithic tide-dominated deltaic reservoir on the mid-Norwegian shelf, hosts chlorite-coated sandstones critical for porosity preservation by inhibiting quartz cementation. While the influence of chlorite on reservoir quality within the Halten Terrace is recognized, the regional-scale chlorite distribution remains poorly constrained. Previous studies were focused on field scale sedimentology; this study integrates petrography, well-log analysis and available petrophysical data in five fields to unravel the distribution of chlorite coats across a range of burial depths.

Well-log correlation of Tilje Formation shows that the formation is thick towards the western part of the study area. The Formation exhibits an overall shallowing-upward succession and is divided into lower, middle, and upper units based on well-log signature. The lower and middle units are characterized by coarsening-upward trends separated by a flooding surface, while the upper unit displays aggradational log response capped by coarsening-upward motif. These units are further correlated across the study area with chlorite coats ubiquitous in all the units. Petrography data shows that the chlorite coats are prevalent in wells with burial depths exceeding 4 km. Intervals with chlorite coatings show strong relationships with core plug porosity ranging from 15-22%, suggesting their role in reservoir quality preservation. The study further highlights spatial variations in sediment input across the area that controls both the distribution and characteristic of chlorite within the reservoir.

The findings of this research refine predictive models for reservoir quality anomalies in chlorite-coated sandstones, with implications for hydrocarbon exploration and CO₂ storage in the Norwegian Continental Shelf.

Genesis and Distribution of Mg-clay Minerals in Pre-salt Carbonate Reservoirs of the Santos Basin, Brazil

Dr Carlos Manuel de Assis Silva¹, MSc Alessandra Suzely Moda Cacela¹, MSc Caroline de Oliveira Nardi Leite¹, MSc Natasha Pereira Rocha¹, Dr Vinicius Carbone Bernardes de Oliveira¹, Dr Camila Wense Ramnani¹

¹Petrobras, Rio De Janeiro, Brazil

9B: Carbonate depositional systems from platform, slope to basin (3), Tāwhirimātea C (Level 2),
January 29, 2026, 4:25 PM - 5:55 PM

The origin and distribution of the magnesium-rich claystones of the Barra Velha Formation during the Lower Aptian in the Santos Basin remain subjects of ongoing research aimed at better predicting their occurrence. Currently, the magnesium-rich claystone deposits of the Miocene Madrid Basin are considered the most suitable analogue for the Pre-Salt deposits. They encompass a wide range of magnesium-rich clay minerals, including palygorskite, sepiolite, stevensite, kerolite, and saponite. In contrast, the magnesium-rich claystones of the Pre-Salt typically occur in protected structural lows across the Santos Basin. Not only does the paleobathymetry differ, but the mineralogical composition varies slightly between the sediments of the two basins. In the Pre-Salt, the most common clay minerals are kerolite, interlayered kerolite/stevensite, and stevensite. Less frequently, saponite is present, and sepiolite is rarely observed. Outcrops of Mg claystones in the Madrid Basin display sedimentary structures indicative of subaerial exposure, such as root marks and mudcracks. Conversely, such features have not been identified in the claystone cores of the Pre-Salt reservoir. Generally, these claystones are finely laminated and contain diagenetic calcite spherulite nodules, suggesting deposition in a relatively deeper and calmer environment. The Pre-Salt magnesium-rich claystones are more frequently found with higher clay content above the Intra-Alagoas Unconformity, directly overlying the basaltic volcanism dated at 115 million years ago. Comprehensive sedimentological, petrological, microbiofacies, and palynofacies analyses were conducted across the entire Barra Velha interval. X-ray diffraction, microprobe, QEMSCAN, hydrogen and oxygen isotope analyses, and Rare Earth Element (REE) analyses were performed on the clay minerals. These investigations indicate that the claystones formed in a sublittoral paleo-bathymetric setting within protected lows during a period of high lake levels, influenced by meteoric water and likely volcanic or hydrothermal activity. These observations explain their stratigraphic occurrence and contrasting origin when compared to the Mg-rich claystones of the Madrid Basin.

Modeling Sedimentary Evolution in the Green River Basin: a Comparative Analysis of Forward Stratigraphic Tools

Mr. Endriw Silva¹, Mr Daniel Fabian Bettú¹, Mrs Ana Paula Soares², Mrs Lindaura Maria Steffens¹

¹State University of Santa Catarina, Balneário Camboriú, Brazil, ²Pontifícia Universidade Católica do Rio de Janeiro, Rio de Janeiro, Brazil

5A: Can Forward Stratigraphic Modeling enhance geological understanding of the subsurface and predict sedimentation through time and space? (2), Tāwhirimātea A (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

A forward modeling approach is applied to three stratigraphic intervals of the Green River Basin, a well-documented lacustrine system studied since the early 19th century. Spanning approximately 20,000 square miles in the Central Rocky Mountains of the United States, this basin provides an exceptional example for stratigraphic analysis, as it preserves a complex sedimentary lacustrine environment.

The modeled interval covers approximately 3 million years, ranging from 53 to 50 Ma. The geological record reveals significant variations in paleohydrological configurations, transitioning from overfilled to balanced-filled, and ultimately underfilled—primarily controlled by climate and subsidence. Constructing a forward model requires parameters that are not directly measurable, necessitating the reconstruction of the environment and associated processes with an inherent level of uncertainty.

Key factors such as paleorelief, sedimentary supply, carbonate productivity, and evaporite precipitation, along with subsidence and lake level variations, were estimated using data from literature. Model parameterization incorporated information from isopach and synoptic maps, stratigraphic sections, and sedimentary field descriptions.

This study presents a comparative case applying Forward Stratigraphic Modeling (FSM) to the Green River Formation using three distinct simulation platforms: DionisosFlow, SedSimple, and GPM. The objective is to evaluate how each software processes stratigraphic modeling based on parameterization that reflects a conceptual model. Starting from a conceptual framework for the basin's stratigraphic and sedimentological characteristics, simulations were conducted within each software environment.

The resulting simulation outputs were analyzed in terms of stacking patterns, stratigraphic architecture, and facies distribution. The parameterization highlights notable differences between the software packages, particularly in interface complexity and how each model simulates physical processes such as diffusion and dispersion. This comparative approach illustrates how parameter selection and specific software functionalities influence modeling outcomes and their interpretation. Understanding these differences is crucial for selecting the appropriate tool for various geological inquiries and improving the reliability of stratigraphic predictions.

Petrography and Geochemistry of Eocene to Oligocene Sandstones and Shales from the Barail Group, Laimaton Area, Indo-Myanmar Range, Manipur (India)

Mr Wahengbam Ajoykumar Singh¹, Mr Yengkhom Raghumani Singh¹, Mr Birendra Pratap Singh²

¹Manipur University, Imphal West, India, ²Banaras Hindu University, Varanasi, India

3A: Next Generation Sediment Provenance (3), Tāwhirimātea A (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

The Barail Group, extensively exposed around the Laimaton area in the Noney district, Manipur, Northeast India, is part of the syn-collisional flysch and post-collisional molasse deposits of the Indo-Myanmar Ranges (IMR). Here, the Barail Group (Late Eocene to Late Oligocene) consists of thick sandstone, siltstone, and shale. Despite its geological significance, integrated petrography and geochemical studies of these sediments are limited in this area. This study aims to investigate the provenance and tectonic setting of the Barail sandstones and shales using integrated studies of petrography and geochemical proxies. Representative outcrop samples were analysed for major, trace and rare earth elements (REE). Petrographic analysis reveals that the sandstones are predominantly composed of quartz, with feldspar, rock fragments, mica, heavy minerals, clay minerals and opaque materials as minor components. Quartz is the dominant framework component, classifying most samples as quartz-rich greywackes and quartz arenites and also indicating derivation from thrust-related upliftment. QFL (Quartz-Feldspar-Lithic fragments) and QmFLt (Monocrystalline quartz-Feldspar-Lithic fragment) diagrams classify the sandstones as quartzarenites to sublitharenites, suggesting the source from the craton interior and recycled orogeny belt. It also suggests that the sediments are derived from subduction complexes. Inclusions of muscovite, hematite, chlorite, rutile and zircon within the quartz grains further reflect a diverse source rock composition. Geochemical proxies such as La/Sc, Th/Sc, Th/Cr, Th/Co, Cr/Th and Co/Th ratios support a mixed provenance. $\text{Al}_2\text{O}_3/\text{TiO}_2$ ratios and discrimination diagrams indicate input from felsic to mafic sources. These findings suggest a complex tectonic evolution, with sediment supply from different tectonic settings, which is associated with the uplift of the Indo-Myanmar Range (IMR) orogenic system. Thus, the integrated petrographic and geochemical data suggest that the Barail sediments were diverse source rocks deposited in a tectonically complex setting.

Settling Velocity of Carbonate Grains: Implications for Carbonate Slope Deposition

Dr Arnoud Sloomman¹, Max De Kruijf², Guenther Glatz³, Joris Eggenhuisen⁴, Zane Jobe¹, John Reijmer⁵

¹Colorado School of Mines, Golden, United States of America, ²TNO – Geological Survey of the Netherlands, Utrecht, The Netherlands, ³The University of Kansas, Lawrence, United States of America, ⁴Utrecht University, Utrecht, The Netherlands, ⁵Vrije Universiteit Amsterdam, Amsterdam, The Netherlands

9B: Carbonate depositional systems from platform, slope to basin (3), Tāwhirimātea C (Level 2),
January 29, 2026, 4:25 PM - 5:55 PM

Particle transport and deposition in turbidity currents is governed by the balance between turbulent suspension and gravitational settling, with settling velocity becoming dominant during the final run-out phases of decelerated turbidity currents on lobes. For turbidites of carbonate composition, existing models do not fully incorporate the complexity of the hydrodynamics of irregular skeletal grains. Differential particle settling velocities play a role in the sorting of grains in turbidity currents; there is a preference of grains with higher settling velocities to be deposited first, yielding a settling-velocity gradient in vertical and longitudinal cross sections through turbidite beds. If sediments contain little variation in particle shape and density, such as typical for siliciclastics, then settling velocity is dominantly controlled by grain size. Carbonate sediments, in contrast, are composed of non-skeletal and skeletal grains – complete specimens and/or fragments – with various growth structures, producing a wide distribution of particle shapes. Similar-sized skeletal carbonate grains may therefore settle at very different rates, while particles of different size may settle together.

This study aims to constrain the extent to which shape-dependent differential settling velocities influence sorting mechanisms in carbonate turbidity currents through experiments using natural skeletal carbonate sand. Size, density and shape parameters were analysed using high-resolution micro-CT. It was found that the effect of particle shape on the sorting mechanism operating in carbonate sediment suspensions becomes increasingly significant as grain size increases, in particular above medium sand. Carbonate turbidites may therefore be more poorly sorted than siliciclastic turbidites, which is expected to result in lower primary porosity in calciturbidites compared to siliciclastic turbidites.

Sediment Particles Are Not Ellipsoids: Volume/area Ratio as Descriptor of Particle Size and Shape in Sediment Hydrodynamic Modelling

Dr Arnoud Sloodman¹, Max De Kruijf², Guenther Glatz³, Joris Eggenhuisen⁴, Zane Jobe¹, John Reijmer⁵

¹Colorado School of Mines, Golden, United States of America, ²TNO – Geological Survey of the Netherlands, Utrecht, The Netherlands, ³The University of Kansas, Lawrence, United States of America, ⁴Utrecht University, Utrecht, The Netherlands, ⁵Vrije Universiteit Amsterdam, Amsterdam, The Netherlands

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Particle settling velocity has wide application in sedimentology and engineering. The ability to predict settling velocity based on fluid and particle properties is essential to generate realistic sediment transport models. It is common practice to describe the size and shape of natural sediment grains with an ellipsoidal model. This paper tests the validity of the ellipsoidal model for the prediction of particle settling velocity for two common sediment compositions: siliciclastic and carbonate. The parameters associated with this model are the ellipsoidal nominal diameter and Corey shape factor, calculated from the short, intermediate, and long axial diameters. We calculate the drag coefficient (i.e., nondimensional friction) expressed as a function of particle Reynolds number (i.e., nondimensional particle size) and Corey shape factor (i.e., ellipsoidity). Significant differences are explained by carbonate sediment containing particle forms (i.e., shapes) that are more irregular than particle forms of siliciclastic sediment, due to enhanced angularity and surface roughness for carbonates composed of skeletal remains. Thus, the size and shape of sediment grains as defined in the ellipsoidal model, despite its popularity, is actually not suitable for the description of natural sediments and the prediction of settling velocity. We have tested other models to describe particle size and shape using a dataset of 200 irregular carbonate grains that were scanned at 10 micrometre resolution using micro-CT. The most accurate particle size and shape descriptor is the volume/area ratio. Implications and ways forward are discussed in this presentation.

Carbon Connections: Mapping the Carbon Interactions Between Adjacent Marine Sedimentary Environments

Dr Craig Smeaton¹, Dr William Hiles¹, Dr Pauline Gulliver², Professor William Austin^{1,3}

¹University of St Andrews, St Andrews, United Kingdom, ²National Environmental Isotope Facility, Glasgow, United Kingdom, ³Scottish Association of Marine Science, Oban, United Kingdom

9C: Mapping marine sediments in the world (1), Tāwhirimātea E (Level 2), January 29, 2026, 4:25 PM - 5:55 PM

Annually, continental shelf sediments bury an estimated 137 Mt of organic carbon (OC) making these sedimentary systems an integral component of the global carbon (C) cycle. Within continental shelves individual sedimentary environments can range between inshore fjord to offshore non-deltaic settings each vastly differing in their ability to trap and lock away OC. of these different environments fjord sediments have been shown to be hotspot for the burial and storage of OC burying and estimate 18 Mt OC yr⁻¹, which equates to ~11% of all marine C burial (Smith et al., 2015). In Scotland, the postglacial sediments of the mid-latitude fjords are estimated to store 252 ± 62 Mt OC (Smeaton et al., 2017) with a further 84,000 tonnes of OC being trapped and stored each year (Smeaton et al., 2021). It is clear that fjord sediments are an integral element of the global C cycle and could potentially be crucial long-term climate mitigation. Yet these systems do not exist in isolation and how these systems interact with other marine sedimentary systems remains an open question. Current research is largely focused on the close interactions between fjord sediments and the terrestrial environment (Cui et al., 2016; Smeaton and Austin, 2017) but recent research in Scotland and Norway has indicated the marine environment can play as large if not greater role in the OC dynamics of fjords than terrestrial ecosystems (Faust and Knies, 2019; Smeaton et al., 2021). Here we explore the interactions between the sediments of the Loch Linnhe fjord complex on the West coast of Scotland and the adjacent continental shelf. Using an array of geochemical techniques the source, age and depositional history of the OC held within the sediments will be investigated to understand the geochemical processes driving OC burial and storage in both the fjord and continental shelf sediments. By integrating state-of-the-art spatial analytics with the geochemical measurements we further seek to quantify how these different sedimentary settings interact and how these processes drive OC dynamics across a continental shelf.

Controls of Rainfall and Wave in Channel Morphodynamics in Semi-enclosed Macrotidal Flats: a Comparative Study of Naturally Preserved and Human-modified Tidal Flats

Seungyeon Sohn¹, Dr Joohee Jo², Ms Seolhui Bang¹, Dr Dohyeong Kim³, Dr Kyungsik Choi¹

¹Seoul National University, Seoul, South Korea, ²Research Institute of Oceanography, Seoul National University, Seoul, South Korea, ³Korea Environment Institute, Sejong, South Korea

5C: Coastal to shelf environments across time and space (5), Tāwhirimātea E (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

The morphodynamics of tidal channels result from a complex interplay among tidal currents, wave activity, and rainfall. While the role of tides in the channel morphodynamics is well established, the influences of rainfall and wave processes remain less thoroughly understood. To better identify the governing factors, this study investigates morphologic evolution, sedimentology, and hydrodynamic processes across two contrasting semi-enclosed tidal flats: the naturally preserved Dokgotri tidal flat and the anthropogenically modified Shinsi tidal flat.

In both areas, intensified summer rainfall strengthens ebb-dominant flows, triggering substantial erosion of the tidal flats, headward erosion, and pronounced channel migration. Although wave energy is relatively limited in semi-enclosed environments, wave-built bedforms exert a significant local influence on channel behavior. At Dokgotri, westerly and southwesterly winds generate waves that transport sand landward, forming sandy swash bars that restrict lateral migration and instead promote downstream channel translation. In contrast, at Shinsi, shelly sand ridges created by waves reflected off a dike exert similar controls on morphodynamics. In locations where such wave-built features are absent, the combined action of tides and rainfall facilitates vigorous lateral channel migration, with frequent chute cutoffs contributing to high spatial variability in sedimentary facies.

These observations demonstrate that even in semi-enclosed tidal flats, wave-induced bedforms can locally govern the evolution of channel planforms. Furthermore, the findings underscore the dominant role of intensified summer rainfall, in conjunction with tidal currents, in driving channel morphodynamics. This study emphasizes the need for an integrated understanding of tidal, wave, and rainfall interactions to fully comprehend the morphodynamic processes and the resultant sedimentary architecture of tidal channels.

Sedimentology and Luminescence Constraints on Asian Monsoon Dynamics and Soil Erosion Since MIS 6 (~210 Ka) in the Weihe Basin, Central China

Mr Yougui Song¹, Mr Xuke He¹, Miss Xiaofen Fu¹, Dr. Shengli Yang²

¹Institute of Earth Environment, Chinese Academy of Sciences, Xian, China, ²Lanzhou University, Lanzhou, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Wei River Basin on the southern Loess Plateau in China provides a key archive for linking sedimentological processes with East Asian climate dynamics. We established a robust luminescence chronology (Quartz OSL and feldspar pIR200IR290) with 16 samples from the upper 40 m of the 272 m-long 23GL core, yielding ages consistent with stratigraphic sequences and spanning ~210 ka to the present. The stratigraphy documents a clear transition from fluvial and floodplain deposits to eolian loess, reflecting alternating dominance of East Asian summer and winter monsoon systems. High-resolution OSL ages constrain sedimentation rates from ~18 cm/ka in the MIS 6–MIS 5 interval to >20 cm/ka during the last glacial, highlighting accelerated dust input under strengthened winter monsoon. Geochemical proxies (Rb/Sr, Si/Al) and natural gamma logging indicate variable weathering intensity, sediment grain size, and soil erosion patterns, with maxima during climatic transition phases when hydrodynamic regimes shifted abruptly. These results demonstrate that soil erosion and sediment supply in the Weihe Basin were primarily driven by orbital-scale variations in Northern Hemisphere ice volume and low-latitude insolation. Comparison with marine and ice-core records reveals close coupling between basin-scale depositional changes, glacial–interglacial cycles, and eustatic fluctuations. This study illustrates how luminescence dating integrated with sedimentological and geochemical proxies refines our understanding of late Quaternary climatic, tectonic, and hydrological interactions in the Asian monsoon domain.

Magmatic Activity in the Extreme Crustal Thinning Area of the Northern Margin of the SCS: A Case Study of the Qiongdongnan Basin

Mr Zhibin Song¹, professor Jianye Ren¹

¹China University of Geosciences, Wuhan, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The ultra-thin crustal lithosphere underlying the central depression of Qiongdongnan Basin often has the characteristics of high heat flow and active magmatic activity. Many depressions are developed along the central depression, such as Lingshui Sag and Baodao-Changchang Sag, which are all hydrocarbon rich depressions. In recent years, abundant oil and gas fields have been discovered, and they are important fields for deepwater and ultra-deepwater exploration in the South China Sea.

This thesis studies Cenozoic magmatic activities in the central depression of Qiongdongnan Basin, trying to determine the types, characteristics and spatio-temporal distribution of magmatic activities. The regional controlling factors and magmatic models of magmatic activity are elucidated, and the oil-gas geological significance of magmatic activity is revealed. Guided by the theoretical methods of sedimentary basin dynamics, sequence stratigraphy, magmatic geology and other disciplines, this study systematically identifies the occurrence type, scale and spatio-temporal distribution of Cenozoic magmatic activity in Qiongdongnan Basin based on the fine interpretation of three-dimensional seismic data, the use of special seismic data processing technology, the analysis of deep geophysical data and the relevant knowledge of predecessors.

It is found that both intrusive and extrusive rocks are developed in the central depression of Qiongdongnan Basin. The intrusive rocks mainly include sill, laccolith and dike. The sill is further divided into saucer sill, flat sill and climbing sill, and the sill complex is formed when many sill aggregate. The laccolith is mainly developed in the basement under the sedimentary basin, while the sill and dike are mainly developed in the basin filling sequence, and they are often associated. The dike is often developed along faults, often above the channel beneath the surface volcano at the time. The main identification marks of extrusive rock are volcanic structure construction and strong reflection in-phase axis. The volcanic construction in Qiongdongnan Basin is fully developed, and the original morphology is basically maintained. Conical volcanoes and crater volcanoes can be identified. Strong amplitude reflection of stratified accumulation is also observed on both sides of the volcanic cone. In addition, this study identified for the first time the hydrothermal vents triggered by hydrothermal activities, which are 3D shaped like eyeballs and domes, and are often connected to the deep bedrock tip by vertical cracks in the section.

Geochemical Footprints of Concealed Cu Ore-forming Fluid Systems in Sedimentary Settings

Dr. Marta Sosnicka^{1,3}, Jennifer Porter^{2,3,4}, Richard Chopping^{2,3}, Dr. Helen McFarlane^{1,3}

¹CSIRO Mineral Resources, 26 Dick Perry Avenue, Kensington, WA 6151, Australia, ²Geological Survey and Resource Strategy Division, DEMIRS, 100 Plain St, East Perth WA 6004, Australia, ³Mineral Exploration Cooperative Research Centre, CSIRO, 26 Dick Perry Avenue, Kensington, WA 6151, Australia, ⁴Future Industries Institute, University of South Australia, Mawson Lakes SA 5090, Australia

7A: Applications of Sedimentology for the Green Energy Transition & The role of subaqueous sediment gravity flows in carbon sequestration, Tāwhirimātea A (Level 2), January 29, 2026, 10:15 AM - 11:45 AM

As the global shift toward a green economy and electrification intensifies, the strategic significance of Cu is expected to further increase. Sediment-hosted deposits represent the second most important Cu deposit type, accounting for ca. 20-25% of global Cu reserves. The genesis of sediment-hosted Cu deposits involves the evolution of large-scale fluid systems within sedimentary basins and their underlying basement rocks, often facilitated by deep-penetrating basin structures. Basin architecture plays a critical role in establishing migration pathways for ore-forming fluids, effectively connecting source regions to sites of ore deposition.

The nature, source and metal content of the ore fluids responsible for Cu mineralization at the shale-hosted Nifty deposit in Western Australia remain poorly constrained. Accordingly, the objectives of this study are to differentiate fluid migration stages, their timing, and to trace the geochemical signatures of ore fluids in both proximal and distal parts of the mineralizing system. These objectives are pursued through an integrated approach involving comprehensive fluid inclusion analysis, apatite geochronology, and sulphide geochemistry.

Preliminary petrographic analysis reveals the presence of multiple generations of fluid inclusions within shale-hosted bands and nodules parallel to bedding, as well as in paragenetically younger veins. Gangue bands in relatively unaltered carbonaceous shale host low-temperature, 2-phase (L+V) aqueous fluid inclusions spatially associated with framboidal pyrite, which is partially replaced by chalcopyrite. In contrast, mineralized shale exhibiting pervasive hydrothermal alteration is characterized by abundant intergrowths of chalcopyrite and granular carbonate with clusters of 3-phase (L+V+S) aqueous inclusions. In chalcopyrite-bearing veins, fluid inclusions often decorate crack-seal zones in quartz, while euhedral dolomite crystals contain sulphide inclusions coeval with 2-phase aqueous inclusions along growth zones.

The findings of this study will contribute to refining genetic models and better constraining the temporal evolution and spatial extent of concealed sediment-hosted stratiform/stratabound Cu ore-forming systems, therefore supporting more effective exploration strategies.

Establishing a Luminescence-based Chronology for Debris-flow Alluvial Fans in the Anza-Borrego Desert State Park, California, USA

Dr Myriam Stelletti¹, Dr Mario De Luca¹, Prof Cornel Olariu², Prof Leonardo Casini¹, Dr Giulia Cossu¹, Prof Vincenzo Pascucci¹

¹University of Sassari, Sassari, Italy, ²University of Texas at Austin, Austin, USA

6A: Sedimentology and Luminescence keys to tune late Quaternary tectonic, climate and eustatic events, Tāwhirimātea A (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

The alluvial fans of the Fish Creek–Vallecito Basin (part of the Anza-Borrego Desert State Park in California) represent a valuable sedimentary archive of late Quaternary landscape evolution in a tectonically active and climatically arid setting. Through detailed sedimentological analysis of stratigraphic sections across proximal to distal fan sectors, we characterized facies transitions from high-viscosity debris flows to hyperconcentrated and sheetflood deposits. These vertical and lateral facies arrangements are interpreted in the framework of repeated depositional pulses interspersed with episodes of stabilization, incision, and potential tectonic reorganization. To investigate the evolution of this system, several stratigraphic units were sampled for luminescence dating, ranging from active lobes to abandoned surfaces and toe-cut terraces. Given the known challenges of luminescence dating in coarse, poorly sorted deposits, we applied a dual approach using both quartz OSL and K-feldspar post-IR IRSL protocols on the same grain-size fraction, to cross-check signal reliability and refine the timing of aggradation and incision phases. Luminescence-dated surfaces were then associated with multiscale topographic roughness indices (RI , r_g) extracted from high-resolution DEMs. The correlation between roughness values and surface age allowed us to extrapolate age estimates across the alluvial fan system, distinguishing older smoothed lobes from younger rugged ones and reconstructing fan-wide chronostratigraphy and phases of reorganization potentially driven by tectonic or climatic forcing. Our results demonstrate that the integration of sedimentological analysis, luminescence dating (quartz and K-feldspar), and multiscale roughness metrics enables both the detection of key depositional and erosional events and the reconstruction of the spatial and temporal evolution of debris-flow-dominated alluvial fans. This approach provides a high-resolution chronostratigraphic framework that reveals how fan surfaces responded to tectonic uplift, surface reworking, and climate variability.

Submerged Beachrocks as Paleo-shoreline Indicators: High-resolution Mapping and Habitat Implications from Northern Sardinia (Italy).

Dr Myriam Stelletti¹, Dr Giulia Cossu¹, Paolo Marras², Prof Mario De Luca¹, Dr Antonio Santonastaso¹, Prof Stefano Andreucci², Prof Sandro Demuro², Prof Vincenzo Pascucci¹

¹University of Sassari, Sassari, Italy, ²University of Cagliari, Cagliari, Italy

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Submerged beachrocks, as early-cemented coastal deposits, represent key sedimentary archives for reconstructing sea-level changes and paleo-shoreline dynamics across the late Quaternary. Despite their relevance, they remain underrepresented in marine sediment mapping. This study applies a high-resolution, multi-method approach to identify and characterize beachrocks along the northern coast of Sardinia (Italy, Western Mediterranean), a region marked by tectonic stability and a microtidal regime. Shallow beachrocks were initially identified through satellite imagery (Google Earth), while deeper features were mapped using Side Scan Sonar (SSS) and Multibeam Echosounder (MBES). These methods were integrated with ROV surveys, diving-based ground-truthing, sedimentological analyses, sample collection, and both optical and SEM analyses. Spatial data were processed and visualized using ArcGIS to depict their geomorphological variability. Beachrocks occur across a wide bathymetric gradient (−2 m to > −100 m) and display different morphologies, thicknesses, and internal facies. Their stratigraphic position aligns with paleo-shorelines formed during late Quaternary stillstands and transgressive phases, providing clear markers of coastal configurations and relative sea-level positions. As such, they offer direct sedimentary evidence of shoreline migration and serve as key archives for reconstructing sea-level evolution in the Mediterranean. Beyond their geological significance, beachrocks also act as ecological indicators. Erosional features such as potholes and block displacements enhance structural heterogeneity, promoting microhabitat complexity. In shallow waters, beachrocks host *Posidonia oceanica* meadows and associated benthic fauna, while deeper outcrops support coralligenous communities. Both habitats are under EU protection for their ecological value in the Mediterranean. This integrated methodology demonstrates how beachrocks can be reliable indicators of both past coastal dynamics and present-day habitat distribution. By combining remote sensing, geophysics, and field-based sedimentology, our results highlight the importance of including submerged beachrocks in sediment mapping frameworks, as they provide a valuable contribution to improving reconstructions of sea-level curves and to supporting ecosystem-based coastal management.

Eocene Deposits of the Eastern Carpathians: An Example of Coalescing Turbidite Systems

Mr. Andrei Stoian^{1,2}, Ms Denisa Bunea², Mr Vladimir Cosmescu², Mr Relu-Dumitru Roban², Mr Mihai Nicolae Ducea^{2,3}

¹National Institute for Marine Geology and Geo-ecology – Geoecomar, Bucharest, Romania, ²Faculty of Geology and Geophysics, University of Bucharest, Bucharest, Romania, ³University of Arizona, Tucson, USA

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Descriptions of coalescent turbidite systems sourced from opposing basin margins are scarce in the literature, primarily due to challenges in distinguishing between source areas. However, the Moldavian Basin of the Eastern Carpathians presents a particular case, with distinct petrographic basement and U-Pb detrital zircon isotopic signatures on both continental margins. The Moldavian Basin is a remnant oceanic basin that opened during the Middle Jurassic, separating the Western Dacia Mega-Unit from Europe - a collage of continental units including the Eastern European Craton, Moesian Platform, and North Dobrogea Orogen. A shift in tectonic regime during the mid-Cretaceous times initiated subduction, shortening, and progressive thrusting eastward, followed by Cretaceous-Quaternary uplift. During the Eocene, two distinct turbidite systems developed, in the western and eastern parts of the basin. The Western depositional system, characterized by thicker sandstone units, suggests a subsidence-driven tectonic environment. U-Pb detrital zircon ages (~460 Ma) indicate sourcing from the Dacia Mega-Unit. In contrast, the Eastern depositional system consists of thinner sandy and carbonate beds, sourced from the European realm, with distinct U-Pb age peaks (~290-310 Ma, ~510-550- Ma, and >1 Ga). Interaction between these systems is evident in the central sector of the basin, where common age peaks for the two distinct depositional systems are recorded.

Late Oligocene–Early Miocene Sedimentation in Southern Hawke’s Bay: Implications for Early Hikurangi Subduction Margin Evolution and Paleogeography in Central Zealandia

Dominic Stroger¹, Kyle J. Bland¹, Hugh E. G. Morgans¹, Hannah Harvey²

¹Earth Sciences New Zealand, Lower Hutt, New Zealand, ²School of Agriculture and Environment, Massey University, Palmerston North, New Zealand

1D: Controls on sedimentation at submarine active margins (1), Rongomātāne A (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

An Early Oligocene–Early Miocene deep-marine sedimentary succession cropping out in southern Hawke’s Bay, New Zealand, records abrupt changes in depositional paleoenvironments and sedimentary lithofacies. Highly calcareous early Waitakian (latest Oligocene) Weber Formation strata are unconformably overlain by the terrigenous-dominated late Waitakian–Otaian (Early Miocene) Coast Road or Whakataki formations. In some localities, lowermost parts of the Coast Road Formation (Mangapuku Mudstone Member) contain prominent matrix-supported extra-formational olistoliths of centimetre to decametre scale derived from the underlying Weber Formation. Deposition of these blocks is attributed to deep-water collapse of parts of rapidly growing, over-steepened, reverse-fault-controlled thrust ridge(s). The onset of Coast Road and Whakataki formation deposition with associated abrupt changes in sedimentary lithofacies correlate to prominent Early Miocene lithological, mineralogical, and paleoenvironmental changes elsewhere along the Hikurangi Margin. We attribute these bio- and lithostratigraphic changes as evidence for significant shortening and upper-plate reverse faulting marking the onset of subduction beneath eastern North Island during the mid-Waitakian (c. 23 Ma). These results are placed within the wider paleogeographic evolution of central Zealandia and the progressive development of the Hikurangi subduction margin.

Subaqueous Till Deposits in Past and Present Proglacial Lakes in Alpine Settings: Insights from Geophysical and Sedimentological Analyses

Dr. Michael Strupler¹, Siro Hosmann¹, Margrit Rindlisbacher¹, Prof. Flavio S. Anselmetti¹

¹University of Bern, Bern, Switzerland

2F: Earth's sedimentary record of glaciation (2) & Sedimentation in polar ice sheet margins, Rongomātāne C (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

Subaqueous till deposits, formed beneath proglacial lakes, provide important insights into past and modern glacial dynamics and depositional processes. Understanding these processes is crucial in the context of ongoing deglaciation to better estimate future landscape evolution.

Little is known about the formation of subaqueous moraines in peri-alpine lakes. We aim to characterize the composition, internal structure, morphology, and spatial variability of subaqueous till deposits within the proglacial lake basins. To achieve this, we analyze deposits from both former (Lake Lucerne) and present (Rhône Lake) proglacial environments in Switzerland, using sedimentological, geophysical, and glaciological approaches. Specifically, we integrate high-resolution bathymetry, seismic reflection profiles, sediment core analyses, and suspended sediment sampling.

By analyzing existing and newly acquired seismic and high-resolution bathymetric data, alongside sedimentological and geochemical properties of sediment cores, we assess the influence of glacier retreat, meltwater dynamics, and sediment transport on lakebed deposits. The comparison between modern and past proglacial lake environments provides new insights into glacier-front dynamics, sedimentation rates, and depositional processes. Furthermore, the geophysical and sedimentological results can be used for landform modelling. These findings improve our understanding of proglacial lake sedimentary environments and their role in reconstructing past glacial behavior.

Effect of Pore Pressure on Reservoir Quality in Deep and Ultra Deep Sandstones

Miss Yang Su¹

¹China University of Petroleum Beijing, Beijing, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Deep and ultra-deep tight sandstones, buried at great depths, undergo extended geological processes under extreme temperatures (150-180 °C or higher), stress, and high pore pressures, which significantly affect their petrophysical properties. Pore pressure, a critical factor controlling pore preservation, plays a pivotal role in reservoir evaluation and reservoir-controlling mechanisms. This study comprehensively investigates the control of pore pressure on reservoir quality through thin sections, computed tomography (CT) scanners, core observations and well logs. By thin sections and cores, we conducted a systematic analysis of pore structure and fracture. The methods for formation pressure prediction in deep and ultra-deep tight sandstones were evaluated, with the Eaton method identified as optimal for pore pressure calculations. These results were calibrated by Modular Formation Dynamics Tester (MDT) measurements, enabling precise pore pressure calculation.

By integrating conventional and imaging logs, along with calibration using core data, we can conduct both qualitative and quantitative evaluations of fractures. Pore pressure also affects the preservation of primary pores, showing a strong positive correlation between formation pressure and porosity. Moreover, pore pressure influences fracture evolution and effectiveness. Higher pressure coefficients enhance fracture aperture and porosity. Matrix porosity can keep as high as 6.0% beyond 6000 m where the pore pressure coefficient exceeds 1.75. A higher pore pressure coefficient links to wider early - formed natural fracture apertures (up to 4.7 mm) and a larger pore throat radius (over 1.0 μm for coarse-grained, well-sorted rocks). In faulted-fold structures, sustained overpressure in the thrust front and back limbs helps keep fractures open and preserves matrix porosity and pore structure. This research comprehensively analyzed the correlations among diagenesis, fractures, porosity, and formation pressure, offering vital theoretical support for deep and ultra-deep hydrocarbon exploration.

Sedimentary Architecture of the De Grey Fluvio-deltaic System: Integrating GPR and Shallow Core Data

Mr Alexander Sullivan¹, Professor Simon Lang¹, Dr Victorien Paumard¹, Mr Andrew Winch¹, Mr Kresna Laksono¹, Mr Khalil Bow¹, Mr Vaisakh Prathapan¹, Professor John Holbrook², Professor Stephen Hasiotis³

¹Centre for Energy & Climate Geoscience, School of Earth and Oceans, UWA, Perth, Australia, ²Texas Christian University, Department of Geological Sciences, Fort Worth, United States, ³Department of Geology, University of Kansas, Lawrence, United States

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The De Grey River delta, situated along the arid Pilbara coast of northwestern Australia, is a modern example of a dryland fluvio-deltaic system formed under macro-tidal conditions. Its development within a semi-arid climatic setting and its minimal anthropogenic modification makes it a globally significant analogue for ancient deltaic successions and associated reservoir systems. This study aims to characterise the sedimentary architecture of the De Grey delta by integrating shallow coring and Ground Penetrating Radar (GPR) data, supported by drone mapping, remote sensing, and geospatial modelling.

Fieldwork has focused on a series of transects across the fluvial distributary and deltaic plain. Shallow sediment cores and auger samples were collected at closely spaced intervals to identify vertical facies trends, stratigraphic bounding surfaces, and textural variation. Complementary GPR surveys were used to image subsurface reflectors down to ~8 m, enabling 3D visualisation of depositional features, backed up with targeted shallow drilling and trenching.

Preliminary results highlight both spatial and vertical heterogeneity across the system. Facies successions show evidence for fluctuating depositional energy, with coarsening- and fining-upward cycles linked to fluvial channel migration and tidal influence. GPR data reveal architectural element geometries, which can be correlated with sedimentological interpretations from the cores.

By combining high-resolution field and geophysical data, this research contributes to a growing body of work on dryland deltas and enhances understanding of their internal structures. The results will be integrated into a multi-scale framework to support analogue-based interpretation and improve predictions of heterogeneity in subsurface fluvio-deltaic reservoirs.

This case study demonstrates how modern dryland systems can inform both paleoenvironmental reconstructions and forward-looking geoscientific models of Earth surface dynamics.

Volcanism Controlled Dolomite Characteristics and Its Origin: A Case Study of the Lower Cretaceous in Erlian Basin, Inner Mongolia, China

Dr Xiaojie Huang, **Professor Haitao Sun**¹, Professor Jing Sun, Professor Dakang Zhong, Professor Shi Chen

¹China University of Petroleum-Beijing, Beijing, China

6E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (3), Rongomātāne B (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

Investigating the role of volcanic activity in carbonate production, deposition, and evolution is of significant scientific value. A novel dolomite reservoir was discovered in the Lower Cretaceous lacustrine mudstones of the Erlian Basin, Inner Mongolia, China. This reservoir, dominated by dolomite with well-developed intercrystalline pores, exhibits excellent potential as an oil and gas reservoir. Core samples, well-logging data, and analytical techniques including XRD, SEM, and electron probe microanalysis (EPMA) were employed to characterize the elemental and isotopic compositions of the dolomite. The study reveals that the dolomite consists of ferroan dolomite, natrolite, analcime, ferroan brucite, barite, and pyrite. Dolomite crystals are small (10–200 μm) and exhibit wavy extinction and saddle-shaped textures. The dolomite displays synsedimentary deformation structures, vein-like fabrics, and brecciated textures. It is characterized by high natural gamma radiation (700–1,100 API), elevated uranium and thorium concentrations, and trace element compositions (Cu, Ni, Co, Fe, Mn) consistent with modern hydrothermal sediments from the Red Sea floor. We propose that this dolomite formed through hydrothermal sedimentation triggered by submarine volcanic activity. Magmatic intrusions into the lake basin interacted with lake water, leading to the precipitation of hydrothermal deposits termed "white chimney deposits." The distribution of these dolomites aligns with the trends of deep-seated faults in the basin.

Diagenesis and Pore Evolution of the Cretaceous Ultra-deep Reservoirs in the Bozi Area, Kuqa Depression

Mr Xinyu Sun¹, Mr Jian Wang¹

¹China University of Petroleum (East China), Qingdao, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Diagenesis and pore evolution are critical factors controlling tight-gas exploration in the Cretaceous ultra-deep reservoirs of the Bozi area, Kuqa Depression. This study integrates core description, thin-section petrography, SEM, XRD, and cathodoluminescence to investigate reservoir characteristics and reconstruct porosity evolution during different tectonic stages. Results indicate that these reservoirs, initially high in porosity and permeability, have undergone significant porosity loss due to moderate to strong compaction and intensive carbonate cementation. Based on diagenetic intensity, four reservoir types are recognized: (1) compaction-dominated, (2) cementation-dominated, (3) co-controlled by strong compaction and medium cementation, and (4) moderately compacted and weakly cemented. In the compaction-dominated type, porosity reduction reaches 23–34% (avg. 29.3%), with cementation contributing <7%, resulting in porosity of 2–10%. In the cementation-dominated type, cementation reduces porosity by 10–20%, yielding 2–5% porosity. In the co-controlled type, compaction accounts for 28–32% (avg. 29%) and cementation for 7–11% (avg. 8.5%), with porosity generally reduced to 0–4%. These results highlight compaction and cementation as the primary drivers of porosity evolution, providing new insights into the reservoir quality of Cretaceous ultra-deep strata in the Kuqa Depression. During pore evolution, diagenetic processes strongly influence reservoir pore–throat structure parameters. Under different diagenetic conditions, the variations in pore–throat structures among different reservoir types can be summarized. Based on the diagenetic evolution pathways of distinct pore–throat types, corresponding physical property restoration can be conducted. By integrating quantitative diagenetic data associated with pore–throat differences, the evolution of reservoir physical properties can be simulated, and numerical modeling can be performed for different diagenetic evolution pathways.

Mechanisms of Structural Differentiation and Fault-fold-salt Development Model Under the Control of Dual Detachment Layers in the Jianyang–Zitong Area, Central Sichuan

Mr Hao Sun¹

¹China University of Petroleum (east China), Qingdao, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The northern slope of the Central Sichuan Paleo-uplift exhibits complex deformation mechanisms and pronounced spatial heterogeneity under the combined influence of multiphase detachment layers and multi-directional tectonic stresses. Understanding its genetic mechanism is of great significance for deep shale gas exploration. This study focuses on the Jianyang–Zitong area within the structural zone. Using high-resolution 3D seismic and drilling data, we conduct detailed interpretation of the fault-fold system architecture, clarify the spatial distribution of two Middle-Lower Triassic evaporite detachment layers and their coupling relationship with overlying structures, and establish a "fault–fold–salt" developmental model within the regional tectonic stress context. The results indicate: (1) The study area exhibits clear structural zonation, comprising a fold-dominated zone (Zitong area), a fault-dominated zone (western Jianyang), and a deformation attenuation zone (eastern Jianyang); (2) The thickness and continuity of the detachment layers exert a significant control on the overlying structural styles, with spatial consistency between structural trends and detachment layer distribution. Specifically, the fold-dominated zone, characterized by thicker detachments, develops salt-controlled anticlines and fault-propagation folds; the fault-dominated zone, with thinner detachments, features large thrust faults and segmented fault systems; the deformation attenuation zone, marked by further thinning of detachments and proximity to the rigid basement in central Sichuan, shows markedly weakened deformation; (3) Integrating the attenuation pattern of the stress field, we propose a genetic model in which structural differentiation is co-controlled by the properties of the dual detachment layers and the intensity of far-field stresses. This model not only elucidates the genetic mechanism of the structural framework but also has significant implications for predicting favorable zones for natural gas accumulation and reducing exploration risks in deep structural plays within the Sichuan Basin.

Genetic Mechanism and Reservoir Prediction of Deep-water Fans Under the Construction of Tectonics and Deposits: A Case Study from Bohai Bay Basin

Mr Xinyu Sun, Ms Jun Xie¹, Mr Liande Zhou, Mr Juncai Diao, Mr Hongfei Yang, Mr Shicong Lv

¹CNOOC (China National Offshore Oil Corporation), Tianjin, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Bohai Bay Basin, a representative rifted lacustrine basin in eastern China, hosts significant hydrocarbon potential in Late Paleogene deep-water gravity flow deposits. However, the genetic diversity of fans and control factors of high-quality reservoirs remain unclear due to structural complexity and reservoir heterogeneity, with no systematic understanding yet formed. This study combines core observations, well-seismic analysis, and sedimentary simulations to establish a tripartite classification for deep-water fans and develop a novel reservoir prediction technique, which is frequency-divided coherence with facies constrained modeling.

The main achievements are as follows. Three genetic classification framework are established, strong-supply slumping system (fault-controlled), sag turbidite system (slope-controlled), and flood type (hyperpycnal flow-controlled). The strong supply slumping system is governed by syndepositional faults, forming imbricated sand bodies. Primary pore is well developed within 15-25% porosity when depth is less than 3500m. Deposits can cross faults and form tongue-shaped collapse bodies, with seismic responses transforming from parallel strong reflection (inner fan), imbricated reflection(middle fan) to discontinuous weak amplitude (outer fan). The sag turbidite system develops thin sand-mud interbeddings, with depth deeper than 3500m and fracture-dominated permeability, showing independent thrust patterns. The subfacies can be effectively distinguished through dip attribute analysis. The flood type is characterized by large but poorly sorted lens-shaped sand bodies, with internal erosional channels and external supply channels. Besides, main factors of high-quality reservoirs were revealed. Synsedimentary faults geometry controls sediment transport routes, slope-break gradient changes dominate facies differentiation, and flow rheological properties determine sand body structures. The facies-constrained prediction technique constructed based on the above understanding achieves 85% accuracy in the application in Liaozhong Sag.

This study advances theoretical understanding of gravity flow processes in rifted basins while providing an integrated "process-modeling-prediction" workflow for lithologic reservoir exploration.

Traces in the Sand: the Application of Sedimentary Ancient DNA (sedaDNA) to Investigate Storm and Tsunami Deposits

Professor Adam Switzer^{1,2}, Dr Wenshu Yap^{1,2}, Dr Federico Lauro³

¹Earth Observatory of Singapore, Nanyang Technological University, Singapore, ²Asian School of the Environment, Nanyang Technological University, Singapore, ³Luminis Water Technologies, Singapore

7D: Shaking across the land-to-sea boundary, Rongomātāne A (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

Sedimentary ancient DNA (sedaDNA) is emerging as a powerful tool for studying storm and tsunami deposits, offering novel insights into past events and their ecological impacts. The original work on the deposits of the 2004 Indian Ocean Tsunami and subsequent storm events, demonstrated significant differences in microbial communities and allowed our team to distinguish between these deposits and non-overwash sediments (Yap et al., 2021). Here, we present a study where we successfully applied this method to sites impacted by the Palu tsunami in 2018, where we distinguish between tsunami and non-tsunami deposits in different geological settings. Despite challenges related to sample preservation and data interpretation, the integration of sedaDNA with traditional methods holds promise for enhancing our understanding of sedimentary processes and ecological shifts associated with catastrophic natural events. We proposed that combining sedaDNA with traditional sediment analysis can provide a more comprehensive understanding of past environmental events. Furthermore, sedaDNA has shown potential longevity in tsunami deposits (Yap et al., 2023), preserving microbial community signatures for more than a millennia.

References:

Yap, W., Switzer, A. D., Gouramanis, C., Marzinelli, E., Wijaya, W., Yan, Y. T., ... & Lauro, F. M. (2021). Environmental DNA signatures distinguish between tsunami and storm deposition in overwash sand. *Communications Earth & Environment*, 2(1), 129.

Yap, W., Switzer, A. D., Gouramanis, C., Horton, B. P., Marzinelli, E. M., Wijaya, W., ... & Lauro, F. M. (2023). Investigating geological records of tsunamis in Western Thailand with environmental DNA. *Marine Geology*, 457, 106989.

Mystery of the Holocene Inter-reef Halimeda Bioherms: Surface Morphology and Subsurface Facies Variations in the Northern Great Barrier Reef

Miss Zsanett Szilagyi^{1,3}, Dr Luke Nothdurft¹, Dr Stephanie Duce², Professor Jody Webster³, Dr Mardi McNeil⁴, Professor Juan Carlos Braga⁵, Dr Trevor Graham⁶, Dr Bethany C. Behrens^{7,8}, Professor Yusuke Yokoyama⁸, Dr Robin Beamen⁹, Dr Victorien Paumard¹⁰, Professor Jeffrey Shragge¹¹, Amy Nau¹², Christopher Berry¹², Dr Quan Hua¹³, Dr Melina Celik¹, Dr Catherine Kim¹, Sarah Goh¹, Jacquelin Reeves⁶, Lara Picton¹, Professor Helen Bostock⁶

¹Queensland University of Technology, Brisbane, Australia, ²James Cook University, Townsville, Australia, ³The University of Sydney, Sydney, Australia, ⁴Geoscience Australia, Canberra, Australia, ⁵University of Granada, Granada, Spain, ⁶University of Queensland, Brisbane, Australia, ⁷Akita University, Akita, Japan, ⁸University of Tokyo, Tokyo, Japan, ⁹James Cook University, Cairns, Australia, ¹⁰University of Western Australia, Perth, , ¹¹Colorado School of Mines, Denver, USA, ¹²Commonwealth Scientific and Industrial Research Organisation (CSIRO), Hobart, Australia, ¹³Australian Nuclear Science and Technology Organisation, Sydney, Australia

5B: Carbonate systems and processes (4), Tāwhirimātea C (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

Halimeda, calcareous green algae, bioherms are among the largest accumulations of biogenic sediment within the Great Barrier Reef Marine Park, spanning over >6000 km² of the continental shelf exceeding the area of adjacent coral reefs at equivalent latitudes. Previous studies have shown the peculiar circular to reticulate shapes, the internal structure and thickness, underscoring their uncertain genesis and significant contribution to the global Holocene neritic carbonate factory.

However, a comprehensive understanding of the formation and development of these uniquely shaped bioherms has been hindered by the absence of high-resolution bathymetric maps and densely spaced core samples that target geomorphological variations.

This study presents new data from the RV Investigator voyage IN2022_V07 “Halimeda bioherms: Origins, function and fate in the northern Great Barrier Reef (HALO)”. The first sub-metre resolution (50 cm) multibeam bathymetry data and sub-bottom profiles reveal spectacular bioherm shapes and patterns not previously visible on 30 m models. Geomorphic analysis using ESRI ArcGIS Pro 3.3 of the 50 cm DEMs was done to quantify the surface characteristics and produce the first benthic terrain classification using pattern recognition rather than differential geometry to define benthic features (Geomorphon Landforms).

Forty-two densely spaced vibrocores were collected (max 6 m length) from 3 sites between 15°-13° S and scanned with high-resolution CT. Split cores were logged and scanned with multi-sensor core logger (magnetic susceptibility, spectrophotometer, X-ray fluorescence). Subsamples at regular intervals (10 cm) have been processed for grain size, CaCO₃ % and microfossils. Radiocarbon dates indicate the cores range from 12 ka to present. Initial observations revealed a range of morphotypes, including Halimeda floatstone-rudstone and Foraminiferal wackestone-packstone facies and layers of coral, mollusc, rhodolith and lithified clumps. This new dataset significantly advances our understanding of Halimeda bioherm morphology, development, and regional influences, providing new insights into their formation processes and ecological significance.

Tracing the Origin of Sedimentary Organic Matter in Fjords Located Along a Transect from the Skagerrak to Northern Norway Using Lipid Molecular Markers

Assoc. Prof. Małgorzata Szymczak-Żyła¹, Dr Ludwik Lubecki¹, Dr Magdalena Krajewska¹, Professor Wojciech Tylmann², Professor Tomasz Ciesielski³

¹Institute of Oceanology, Polish Academy of Sciences, Sopot, Poland, ²University of Gdańsk, Gdańsk, Poland, ³The University Centre in Svalbard, Longyearbyen, Norway

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Fjords are important natural carbon sinks, playing a key role in organic carbon burial. The organic matter (OM) preserved in fjord sediments originates from both marine and terrestrial sources. These inputs are strongly influenced by regional climatic and environmental conditions, including productivity levels and terrestrial runoff, which are expected to shift with ongoing climate change. Fjords influenced by warm Atlantic Water—such as those along the Norwegian coast—are particularly important for understanding these dynamics, yet the effects of recent climate warming on organic carbon cycling in these systems remain poorly understood.

This study presents a comprehensive latitudinal analysis of sedimentary molecular markers in fjords from Skagerrak to northern Norway. Using a multi-proxy approach—including photosynthetic pigments, alkenones, polar steroids, n-alkanes, hopanes, steranes, and polycyclic aromatic hydrocarbons (PAHs)—we assessed spatial variability in OM sources and anthropogenic influence across this broad climate and ecological gradient.

Results of this study indicate that marine-derived OM showed no consistent trend in overall productivity with latitude, although significant shifts in phytoplankton community composition were observed. Sterol biomarkers revealed a gradual shift from dinoflagellate to diatom dominance from south to north. Terrestrial inputs, as reflected in long-chain n-alkanes from vascular plants, declined markedly toward higher latitudes, corresponding with changes in regional vegetation cover. Anthropogenic molecular markers (e.g., sewage steroids, hopanes, PAHs) were most pronounced in southern fjords, with a clear decline in human impact signatures toward the north, where fjords remained relatively pristine. Multivariate statistical analyses confirmed significant latitudinal trends in OM sources and contamination profiles. These findings support the hypothesis that climate-driven and anthropogenic factors shape OM inputs in fjord environments. They underscore the value of sedimentary molecular markers in tracing spatial and temporal changes in carbon cycling and environmental pressure.

This work was supported by the National Science Centre, Poland [Grant No. 2023/49/B/ST10/03768].

Depositional Characteristics and Delivery Mechanism of the Late Triassic Narrow-shelf-type Submarine Fan in the Northeastern Margin of the Paleo-Tethys Ocean

Dr. Mingxuan Tan¹, Hongxia Ma², Dr. Chengcheng Zhang³

¹College of Oceanography, Hohai University, Nanjing, China, ²PetroChina Hangzhou Research Institute of Petroleum Geology, Hangzhou, China, ³Nanjing Center of China Geological Survey, Nanjing, China

3D: Controls on sedimentation at submarine active margins (3), Rongomātāne A (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

The Upper Triassic narrow-shelf-type submarine fan successions are outcropped in the Taohe Basin of West Qinling Orogen, recording the final deep-marine sedimentation along the northeastern margin of the paleo-Tethys Ocean. The study conducts an integrated descriptive and statistical work on bed types, architectural elements, and genetic mechanisms of the submarine fan successions from the Upper Triassic Nalu and Kache Formation through a thorough field and laboratory work on the representative outcrop localities in the Lintan-Zhuoni area. The results indicate that the submarine fan succession in the study area mainly contain several bed types of gravity flow deposits, including low- or high-density turbidites, hybrid event beds, hyperpycnites, and reflected turbidites. Most studied outcrop localities are interpreted as representative deposits of the mid-to-distal submarine fan, with the dominance of various architectural elements in fan lobes, including lobe channel, lobe axis, off-axis lobe, and lobe fringe. The primary feeder channel and levee, however, are less developed. Detailed field sedimentological study together with regional tectonic and paleoclimatic analysis reveal that the formation of the Upper Triassic submarine fans in the Taohe Basin was not driven by a single cause, but dual or multiple causes. Paleoearthquake, slope failure, and sediment reworking via littoral currents on the shelf are subject to the indirect delivery, whereas the flood-related hyperpycnal flow belongs to the direct delivery. The dominance of different formation mechanisms is significantly related to the shelf topography and high-frequency sea-level fluctuation. The narrow shelf setting of the active continental margin is closely related to the semi-closed tectonic pattern, where frequent submarine landslides have increased the ruggedness of submarine topography. Moreover, with a continuous uplift of the Bailongjiang High, the distal deposits of the narrow-shelf-type submarine fans have been modified by reflected turbidity currents, resulting in the formation of dual genetic and partially confined submarine fans.

Sedimentary Response to Glacial-interglacial Cycles in an Alluvial Fan at the Marginal East Asian Monsoon Zone, Northern China

Dr. Chengpeng Tan¹, Shuangqi Feng², Beibei Liu³, Xinghe Yu¹

¹China University of Geosciences, Beijing, China, ²China University of Petroleum, Beijing, China, ³Higher Education Press, Beijing, China

6A: Sedimentology and Luminescence keys to tune late Quaternary tectonic, climate and eustatic events, Tāwhirimātea A (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

The rapidly accumulating alluvial fans are important archives of tectonic and climatic processes. However, deciphering how alluvial fans respond to orbital-scale climate fluctuations remains unclear. This detailed outcrop study of the late Quaternary Bantanzi alluvial fan in the Daihai Lake Basin, northern China, reveals two stratigraphic intervals with distinct facies, where a lower stratigraphic succession is dominated by debris flow deposits and palaeosols and a higher stratigraphic unit by flashflood deposits and loess. Physical correlations to well-dated successions on the Chinese Loess Plateau provide a chronological framework. The palaeosols and the elevated values in magnetic susceptibility of the debris flow-dominated interval, dated 88.1 to 73.4 ka (the last interglacial period MIS5, 130 to 70 ka), indicate a climate with intense seasonal monsoon rainfall, which facilitated chemical weathering and saturation of clay-rich sediments on hillslopes triggering debris flows. The wind-blown loess deposits together with regional data in the flash flood-dominated interval, dated 58.5 to 22.1 ka (the last glacial period MIS 2 to 4, 70 to 14 ka), indicate an arid climate with highly intermittent and short-duration rainfall. Such rainfall conditions tend to promote rapid run-off and generate flash floods, as well as hinder hillslope saturation and chemical weathering resulting in a regolith with higher permeability and erodibility, hindering high pore pressures from building up and promoting erosion by run-off. These distinct climatic conditions between interglacial and glacial periods were controlled by the latitudinal shift of the margin of the East Asian Monsoon. The Bantanzi fan's position at this climatic boundary, coupled with its small size, made it highly sensitive to glacial-interglacial cycles. Comparison with other fan systems suggests that the position of alluvial fans at distinct climate boundaries, rather than within the climate zones, is an important control on their sensitivity to climate changes and their potential as climate-change archives.

The Effect of Tectonic Evolution on Shale Gas Accumulation in the Southeastern Sichuan Basin, China

Professor Xianglu Tang¹, Professor Zhenxue Jiang¹, Professor Zhuo Li¹, Professor Zhiye Gao, Professor Qun Luo¹, Professor Shujing Bao¹

¹China University of Petroleum-Beijing, Beijing, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Sichuan Basin is one of the four major sedimentary basins in China, with abundant shale gas resources and a geological resource volume of 21.74 trillion cubic meters. However, the Sichuan Basin has undergone a long period of tectonic uplift and destruction, and the tectonic evolution process has played a significant role in the formation and destruction of gas reservoirs. Therefore, we analyzed the tectonic evolution of the shale strata in the southeastern Sichuan Basin. The research shows that since the Silurian sedimentation, six major tectonic movements have mainly developed, all of which have influenced the formation and evolution of the tectonics in the southeastern Sichuan Basin. Among them, the three compressive deformations since the Yanshanian period have controlled the differential tectonic evolution process and deformation characteristics of the study area. The large-scale tectonic movements that occurred after the main hydrocarbon generation period caused rapid uplift of the strata and large-scale fractures, resulting in the escape of shale gas and the destruction of the formed shale gas reservoirs, which is not conducive to the preservation of shale gas. The tectonic fractures in the study area are controlled by the compressive stress during the early Yanshanian to Himalayan periods, and the tectonic deformation has a significant impact on the preservation conditions of shale gas. Based on the control mechanism of shale gas accumulation through the construction style and its evolution, as well as the controlling role of tectonic processes, we have established three types of shale gas accumulation patterns and evolution patterns: syncline type, anticline type, and slope type.

Seismic and Sedimentological Characterization of the Messinian Mixed Depositional System in the Algarve Basin, Gulf of Cádiz

Professor F Javier Hernandez-Molina¹, **Dr Manuel Teixeira**¹, Dr Zhi Lin Ng², Dr Debora Duarte¹, Dr Estefania Llave³, Dr Francisco J. Sierro⁴, Dr Andreas Laake⁵, Dr Fadl Raad⁶, Dr Trevor Williams⁷, Dr Emmanuelle Ducassou⁸, Dr Rachel Flecker⁹, Expedition 401 Science Party

¹IACT-CSIC, 18100. Armilla, Granada, Spain, ²School of Marine Sciences, Sun Yat-sen University, Zhuhai 519082, China, ³Instituto Geológico y Minero de España, IGME-CSIC, 28003 Madrid, Spain, ⁴Dpto. de Geología, Univ. de Salamanca, 37008 Salamanca, Spain, ⁵slb, , Germany, ⁶Université de Montpellier, 34095 Montpellier Cedex 05, France, ⁷Texas A&M Univ., International Ocean Discovery Program, College Station, USA, ⁸Univ. Bordeaux, EPOC, UMR CNRS, 5805, Bordeaux, France, ⁹Univ. Bristol, School of Geographical Sciences, Bristol, UK

6F: Contourites and Mixed Depositional Systems (2), Rongomātāne C (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

Along-slope bottom currents and a series of secondary oceanographic processes form sedimentary deposits referred to as contourite or mixed (turbidite-contourite) depositional systems. In this work, the seismic and sedimentological characterization of the Messinian deposits in the Deep Algarve Foreland Basin within the Gulf of Cádiz is presented based on extensive regional 2D and 3D seismic data, as wells as data and samples from the International Ocean Discovery Program (IODP) Expedition 401 Site U1610 and other industry wells.

Four main Messinian seismic units (SU1-SU4) have been recognized: the basal SU1, deposited over the Allochthonous Unit of the Gulf of Cádiz (AUGC), consists of a tabular facies with low-amplitude reflections; SU2 deposited above a regional erosion surface, consists of a mounded facies with low amplitude reflections that progressively increases towards the top; SU3 is characterized by tabular facies with high-amplitude reflections that laterally culminates as wide and low incised channel facies; and finally, SU4 is characterized by several deeply incised channel facies with marked lateral migration that transitions sideways into tabular facies transparent reflections. Channel facies change from a progradational to an aggradational configuration towards the uppermost part of the unit.

During the deposition of SU1 to SU4, turbidites and debrites are interbedded with contourites and pelagic/hemipelagic deposits, characterising a Messinian Mixed Depositional System (MDS). On this MDS the turbidites and pelagic/hemipelagic deposits are reworked by bottom currents via synchronous and/or asynchronous interactions. The Messinian MDS is buried by the upper aggradational part of SU4, dated as latest Messinian, and by younger early Pliocene deposits. These results demonstrate the common interaction of sedimentary processes and the great variety of deepwater sedimentary facies during the early stages of a foreland basin, which are not limited just to turbidites. Tectonic and orbital forcing can exert control over these facies dictating their interactions and development.

Deep-water Contourites and Mixed Deposits: Criteria, Global Stratigraphic Distribution and Implications

Professor F Javier Hernandez-Molina¹, Dr Wouter de Weger¹, Dr Sara Rodrigues¹, Dr Debora Duarte¹, Watcharaphong Phothadee¹, Dr Yin Shaoru², Dr Estefania Llave³, Dr Zhin L Ng⁴, **Dr Manuel Teixeira**¹

¹IACT-CSIC, 18100 Armilla, Granada, Spain, ²Second Institute of Oceanography, Ministry of Natural Resources, China, 310012 Hangzhou, China, ³Instituto Geológico y Minero de España, IGME-CSIC, 28003 Madrid, Spain, ⁴School of Marine Sciences, Sun Yat-sen University, 519082 Zhuhai, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Drifters Research Group has started a second phase of the Joint Industry Project (JIP #2, 2024-2027) “Deep-water contourites and mixed deposits: criteria, global stratigraphic distribution and implications”. Contourite and mixed depositional systems are critical deep-ocean features whose influence extends across many different fields of research, policy and industry. These systems remain under-recognised, yet the reality is that they are ubiquitous in deepwater sedimentary environments. These systems are formed by the long-term circulation of water masses and associated boundaries or interfaces (pycnoclines), with bottom currents shaping the seafloor, modifying continental margin morphology, and conditioning sedimentary stacking patterns over time. A commonality between the two systems is their long-term evolution that underlines the mechanistic evolution in response to the long-term behaviour of the water masses responsible for their formation. Examples of contourite and mixed depositional systems appear in Palaeozoic, Mesozoic, and Cenozoic sections, suggesting that they adhere to basic uniformitarian principles. Tectonic activity further influenced these systems, by controlling the downslope sediment transport, as well as the initiation, development, and termination of water masses. Remnant margin and basin architectures, development of bathymetric obstacles, and the opening and closing of oceanic gateways, all represent tectonically-dependent influences on contourite deposition. Whereas on shorter time scales, (glacio-)eustatic changes driven by orbital cycles and oceanographic processes can result in the deepening or shoaling of water masses and influence bottom current velocities. These factors, in turn, determine the vertical and lateral distribution of sandier and muddier deposits, sedimentary stacking patterns, and thicknesses of contourite and mixed depositional systems. This research aims to establish new paradigms and to recapitulate a detailed understanding of global deep-sea processes and sedimentation through time. Many of the activities and ideas discussed are at the frontier of knowledge and this would not be possible without the collaboration between academic and industry partners.

Evolution of NW Sabah Intra Slope Basins and Sediment Routing Systems from Late Miocene to Present Day

Mr Tengku Mohd Syazwan Tengku Hassan^{1,2}, Dr Julien Bailleul², Dr Victorien Paumard³, Dr Azli Abu Bakar¹

¹PETRONAS Carigali Sdn Bhd, Kuala Lumpur, Malaysia, ²U2R UNIL-UPJV 7511, Basins-Reservoirs-Resources (B2R), Geosciences department, UniLaSalle, Beauvais, France, ³Centre for Energy and Climate Geoscience, School of Earth and Oceans, The University of Western Australia, Perth, Australia

1D: Controls on sedimentation at submarine active margins (1), Rongomātāne A (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

Deepwater fold and thrust belts occur in different geological settings around the world. Thus, they are found associated to both passive or active margins either dominantly controlled by tectonic or gravity-driven processes. In convergent settings, near-field and far-field stresses may coexist or be superimposed across the same margin due to extended and complex geological events. A strong relationship exists between deformation mechanisms and the distribution in time and space of intra-slope basins over the orogenic wedge, their stratigraphy having also potentially recorded the more local tectonic history. This study focuses on the southwest of the NW Sabah fold and thrust belt (Malaysia) to understand the Late Miocene to present day tectonostratigraphic evolution of intra-slope basins, with a particular focus on the interactions between the development of structural highs and the evolution of sediment routing systems. The dataset used comprises the offshore Sabah TGS multiclient 3D broadband seismic megasurvey of 12.5 x 12.5 m bin dimensions (processing) with 3ms of vertical resolution and 86 wells drilled in the study area. The thrusts, associated anticlines and decollement levels were extracted from a 1.502 km² subset, allowing to: (1) refine the understanding of the structure of the deformed wedge; and (2) investigate in 3D the potential controls of the down-going crust rugosity on it. Key seismic unconformities, calibrated with the wells, where possible, highlight how successive intra-slope basins developed through time between the more or less continuous structural ridges. For selected horizons, the ultra-high-resolution recognition in seismic geomorphology of sediment routing systems is promising for the detailed and extensive 3D analysis of the feedback mechanisms between sedimentation and the structural development of the margin.

Metamorphoclastic Sand Routing Across the Hikurangi Slope: Insights from IODP Expeditions 372/375

Daniel Tentori¹, Anthony Shorrock², Professor Kathleen Marsaglia³, Lorna Strachan²

¹Institute of Environmental Geology and Geoengineering, Italian National Research Council, Rome, Italy, ²School of Environment, University of Auckland, Auckland, New Zealand, ³California State University Northridge, Northridge, United States

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

New petrographic data from International Ocean Discovery Program (IODP) Expeditions 372/375 (Sites U1520, U1519, U1518, U1517) provide new insights into sediment sourcing and delivery mechanisms across the Hikurangi Subduction Margin, spanning 725–3,520 m water depths. The 21 sandy beds and laminae (1–30 cm thick) analysed range from Early Pleistocene (~2 Ma) to late Holocene (<0.01 Ma), and from 4.7–633.5 m below seafloor (mbsf), capturing a complete slope-to-trench transect. Grain populations are dominantly sub-rounded very-fine to fine sand, exhibiting remarkably uniform compositions dominated by quartz, feldspar, and a distinctive suite of metamorphic lithic fragments, notably chlorite- and pumpellyite-bearing tectonites (grand mean for all sites: QFL% 34:21:45; QmKP% 60:10:30; LmLvLs% 55:19:26). This metamorphoclastic signature, consistent across sites, contrasts sharply with the more compositionally diverse slope and shelf sand from the Waipaoa Sedimentary System (WSS) to the south which feeds into the Hikurangi Channel. Comparison with new detrital data from non-WSS rivers and outcrops suggests a local northern source, likely involving recycling of fine-grained coastal Miocene sedimentary units. Downhole trends within sites reveal subtle compositional shifts but overall compositional homogeneity, implying persistent local sediment sourcing rather than episodic cross-slope and along-slope transport. The fine grain size of the sands and their compositional consistency throughout the cored sections suggest that tectonic- or eustatic-driven sea-level changes may have eroded and remobilized the Miocene metamorphoclastic slope units (Hikawai or equivalents) multiple times during the Quaternary. Reworked sediments may have been transported into deeper water by shelf-to-slope currents (sealevel highstand), or by a paleostream system that developed on the shelf exposed during sealevel lowstand. These results highlight the importance of intraslope reworking and tectonic uplift in shaping sediment supply to the Hikurangi Trough and complicate the traditional WSS source-to-sink model for the region.

Multi-proxy Provenance Study of Pre-ophiolite Litho-units Adjoining the Northeast India Ophiolite Belt and Their Implications

Miss Akham Thajamanbi Devi¹, Professor Bidyananda Maibam^{1,2}, Professor Stephen Foley^{2,3}, Dr. Yoann Gréau^{2,3}, Professor Suresh Chandra Patel⁴

¹Department of Earth Sciences, Manipur University, Imphal, India, ²School of Natural Sciences, Macquarie University, Sydney, Australia, ³Research School of Earth Sciences, Australian National University, Mills Road, Acton, Australia, ⁴Department of Earth Sciences, IIT-Bombay, Powai - Mumbai, India

3A: Next Generation Sediment Provenance (3), Tāwhirimātea A (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

A combined in situ phase chemistry and isotopic study of detrital tourmaline, chromite, and zircon from the pre-ophiolite sedimentary rocks from northeast India has been carried out to decipher the provenance. Phase chemistry of the tourmaline suggested a metapelite source, detrital chromite belongs to the Al-chromite and found to be both peridotite and magmatic source. Trace element concentration shows that the detrital zircons were derived from granite magmatism belonging to the continental arc settings. Crystallisation temperature was estimated to be ranging between 600-900°C. The age spectrum of the studied sample ranges from ~500 to 3640 Ma with distinct peaks at 500, 1100 -1200, 1550 -1650 Ma, and with a minor Archaean component indicating multiple episodes of the provenance. These ages correspond with known supercontinent assemblies. Episodic juvenile crust formation of the detritus was documented at 1600 and 2600 to 2700 Ma and the reworked and juvenile source nature of the detritus could be inferred from the subchondritic to superchondritic ϵ_{Hf} value (-32.81 to +32.14) at 500 and 1100 to 1200 Ma (-32.81 to +17.59). Combine geochronological and Hf isotopic datasets of the studied samples could be compared with the adjoining Gondwanaland provinces of Indian craton, Precambrian terrain of Meghalaya, and Australia. These support the Gondwanaland adjoining areas as the probable provenance for the studied detritus.

Landform–sediment Assemblages of a Retreating Alpine Glacier Since the Little Ice Age (Évettes Glacier Valley, Western Alps, France)

Myriam Thériault¹, Patrick Lajeunesse¹, Jean-François Ghienne², Jean-François Bernier¹, Pierre-Olivier Couette^{1,2}, Sydney W. Meury¹

¹Département de Géographie, Université Laval, Québec, Canada, ²ITES, CNRS-Université de Strasbourg, Strasbourg, France

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The end of the Little Ice Age (LIA) in the 19th century caused a widespread trend of glacial retreat in the Northern Hemisphere, leaving behind diverse sediment-landform assemblages. Along with historical documents, these features help us reconstruct past glacier dynamics and their links to climate change. Advances in high-resolution topographic data and aerial imagery now enable detailed analysis of these morphosedimentary records and study their connection to glacial front behavior and environmental evolution.

Here, we present a conceptual model of sediment-landform assemblages that were deposited since the LIA during the rapid retreat of a glacier front at the head of one of the major alpine valleys of the Western Alps (Haute-Maurienne, France). A high-resolution map of glacial and glaciofluvial sediment-landforms was produced from digital elevation models derived from UAV (10 cm-resolution) and LiDAR (40 cm-resolution) data, combined with targeted field validation. Historical datasets, including maps, aerial photograph timeseries, and iconography, provide a timeline for observing changes at the glacier terminus since its LIA maximum extent.

The glacial morphosedimentary record indicates that the retreat of the Évettes Glacier in its distinctive, large, flat-bottomed valley was punctuated by stages of readvance and stillstand. These stages were associated with five morainic systems consisting of: 1) a prominent terminal ridge and outwash fans deposited at the LIA maximum ~1860 CE; 2) an overridden and subdued moraine formed during a previous ice-front position with flutes on its surface; 3) a ridge deposited during the early 1900s; 4) a well-defined ridge deposited ~1930, associated with a time-transgressive assemblage reminiscent of surge-type glacier landsystems; and 5) a ridge deposited by a readvance in the 1980s with series of flutes and boulders. The Évettes glacial landsystem, suggestive of surge-type dynamics, provides valuable insights into the morphosedimentary signatures of alpine glaciers subjected to rapid climate change.

Turbidite Paleoseismology Reveals Multi-fault Rupture Dynamics Along the Southern Hikurangi Subduction Margin, Aotearoa New Zealand

Miss Stephanie Tickle¹, Dr. Jamie Howarth¹, Dr. Alan Orpin², Dr. Katherine Maier³, Dr. Lorna Strachan⁴, Dr. Scott Nodder², Dr. Michael Ketterer⁵, Dr. Xun Li⁶

¹Victoria University of Wellington, Wellington, New Zealand, ²NIWA, Wellington, New Zealand, ³Pacific Northwest National Laboratory, Richland, United States of America, ⁴University of Auckland, Auckland, New Zealand, ⁵Northern Arizona University, Flagstaff, United States of America, ⁶GNS Science, Lower Hutt, New Zealand

7D: Shaking across the land-to-sea boundary, Rongomātāne A (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

Complex rupture of multiple upper plate faults or synchronous rupture of these faults with the subduction interface can produce unexpected, locally enhanced ground motions and tsunamis. However, identifying these in the paleoseismic record can be challenging. Turbidite paleoseismology provides a proxy for past ground shaking that has the potential to distinguish between different rupture types. Synchronous rupture of multiple faults can produce a single turbidite event bed. Conversely, earthquakes that occur in sequence, within years to decades of each other, produce stacked turbidite deposits. Here, we present new evidence of past multi-fault ruptures derived from turbidite records in the southern Hikurangi subduction margin of Aotearoa New Zealand. Millennial-scale chronologies of event-bed sequences within the Cook Strait Canyon and Hikurangi Channel were constrained by radiochemical (²¹⁰Pb profiles, bomb-spike Pu) and ¹⁴C AMS radiocarbon dating, along with additional age constraints from the presence of exotic pollen indicative of the European Phase. Sedimentological and ichnofacies analyses were used to distinguish between multiple grain-size pulses within single event beds and stacked turbidite sequences. The turbidite record was compared to existing terrestrial, on-fault paleoearthquake records to identify overlapping earthquake ages for faults across the southern Hikurangi subduction margin. Of the 11 co-seismic turbidites identified, six likely involved synchronous rupture of multiple faults. Our new analysis suggests that, although the most recent rupture on the southern Hikurangi subduction interface (1473-1434 CE) did not involve synchronous rupture of upper plate faults, the penultimate subduction earthquake (1153-1072 CE) involved synchronous rupture of the interface and the Wairarapa and/or Wellington faults. This analysis highlights how turbidite records can distinguish single-fault ruptures, multi-fault earthquakes and earthquake sequences, which can better inform our understanding of regional earthquake hazards.

Periglacial Characterization of the Late Paleozoic Glaciation Across Saudi Arabia

Mr Saeed Tofaif¹, Mr Mohammed Sadah¹, Mr Hassan Albayyat¹, Mr Habib Mamman¹

¹Saudi Aramco, Dhahran, Saudi Arabia

1F: Earth's sedimentary record of glaciation (1), Rongomātāne C (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

The Late Paleozoic Ice Age (LPIA) lasted over 30 million years, yet we still have a limited understanding of this major event. Paleogeographic reconstructions of the Carboniferous-Permian timeframe show a major ice-body approaching Arabia from the South and extending Northward. This is supported by outcrop observations in countries such as Nigeria, Eritrea, Yemen, Saudi Arabia and Oman. A dynamic and reiterative multidisciplinary approach was utilized for this study to show that the LPIA deposits in the study areas are mostly found within NNW-SSE oriented paleovalleys. Petrophysical analysis from subsurface wells show that these paleovalleys could reach a thickness of over 1000 ft, hosted by various lithological and stratigraphical intervals. Sedimentological analysis from over 2000 ft of cores and integration with petrophysical logs show that these paleovalleys are filled mainly by clean sandstone with limited argillaceous sandstone and rare mudstone intervals. Outcrop data from Southwest Arabia shows a similar stacking pattern of the paleovalley infill. Within the Wadi Al-Dawasir area, a confluence of paleovalleys from the Early Paleozoic Ice Age are cut by another paleovalley from the LPIA, creating a mesmerizing relationship. More impressively, however, is the presence of a paleovalley standing in positive relief with the infill of the paleovalley having been weathered out. This presents us with a rare 3-D exposure of the boundaries of these paleovalleys. Detailed sedimentological and stratigraphic investigations of these paleovalleys show sub-glacial conditions for the outcrops and pro-glacial conditions for ones in the subsurface. A comparative study between the two paleo-geographic settings provides a rare comprehensive characterization of this glaciation across time and space.

Characteristics, Genesis, and Reservoir Implications of Laumontite in Volcaniclastic Rocks

Huan Tong¹, Professor Shifa Zhu¹

¹China University of Petroleum (Beijing), China

3F: Diagenesis of volcaniclastic sediments, Rongomātāne C (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

Volcaniclastic rocks commonly contain abundant unstable volcanic glass, which readily undergoes alteration due to its disordered internal structure composed of loosely bonded SiO₄ tetrahedra. Alteration typically leads to the formation of zeolites and clay minerals. As temperature and pH increase, early-formed zeolites gradually transform into analcime and heulandite. Under persistent alkaline conditions, heulandite further alters into laumontite (Ca₄[Al₈Si₁₆O₄₈]·16H₂O) and prehnite. Due to its special formation conditions and its high instability in acidic environments, laumontite provides a key geological clue for analyzing the sedimentary-diagenetic system and searching for high-quality reservoirs.

In volcaniclastic rocks, laumontite commonly occurs as cement, replacement product, and fracture filling. Its associated minerals include clay minerals, quartz, heulandite, calcite, and albite. Laumontite is a typical low Si/Al zeolite (2.00–2.20), and its chemical composition remains stable regardless of temperature or occurrence. Formation pathways of laumontite include albitization of plagioclase, alteration of volcanic material, transformation of heulandite, and hydrothermal alteration. The conversion from plagioclase and volcanic material to laumontite mainly occurs at temperatures between 60°C and 140°C, while the transformation from heulandite to laumontite generally requires temperatures above 90°C. Hydrothermal alteration may involve even higher temperatures. High pH, low pCO₂, and Ca²⁺-rich fluid conditions are key factors for laumontite formation.

Early-formed laumontite fills primary pores, but the dissolution of laumontite minerals creates abundant secondary pores. Under comparable conditions, the reaction in which laumontite is dissolved by organic acids in K⁺-rich environments is the most thermodynamically favorable, resulting in the greatest reduction in solid volume (33%) during mineral transformation. Due to the combined influence of factors such as cleavage, crystal structure, and the equilibrium constants of dissolution reactions, laumontite is more readily dissolved by organic acids than K-feldspar and albite. The sedimentary environment, acidic fluids, and fluid migration pathways synergistically control the reservoir quality of laumontite-bearing volcaniclastic rocks.

Signals of the Paleo-Kuroshio Current: The Pleistocene Chinen Formation, Okinawa Island, South-west Japan

Ms. Yui Tsukada¹, Assoc. Prof. Naohisa Nishida²

¹University of Tsukuba, Tsukuba, Japan, ²Tokyo Gakugei University, Koganei, Japan

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Kuroshio Current of the north-western Pacific is recognized as one of the strongest oceanic currents globally. Spatiotemporal fluctuations of the current are closely linked to the oceanic environment, climate and the physiographic features of both land and sea. Although this is well known for the Late Pleistocene and Holocene, the nature of the Kuroshio Current is less well understood for the Early Pleistocene. This study documents the sediment facies and architecture of the Lower Pleistocene Chinen Formation on Okinawa Island, southwest Japan, and interprets a strong influence by the paleo-Kuroshio Current. The principal facies is a bioturbated calcareous lithic sandstone with parallel lamination and cross-lamination (inferred back-set structures). Shell fragments of shallow-water species occur oriented parallel to the bedding plane. The Chinen Formation is interpreted as derived from shallow-water sediments under the influence of persistent and weak currents on a slope environment. Based on the facies characteristics and inferred palaeogeography we propose the downslope transfer of sediment within a strong and active spillover branch of the paleo-Kuroshio Current. Sheet-like sandy sediments occur widely from shallow to deep water around present-day Nansei Islands, deposited under the influence of bottom currents associated with the Kuroshio Current. This modern example is a likely analogue of the Chinen Formation. Thus, the Chinen Formation is an important record for understanding the early history of the Kuroshio Current and the contemporaneous palaeoceanography, palaeoclimate, and palaeogeography of the north-western Pacific region.

An Intensified Hydrological Cycle and Environmental Responses During the Paleocene-Eocene Thermal Maximum at Modgunn Hydrothermal Vent Complex, Norwegian Margin (IODP Expedition 396)

Ms Nikita Turton¹, Dr Weimu Xu¹, Dr Natalia Varela², Professor Pierre Pellenard³

¹University College Dublin, Dublin, Ireland, ²University of Virginia, Charlottesville, United States of America, ³Université Bourgogne Europe, Dijon, France

7E: Deciphering climate and environmental records in shallow marine environments across space and time (1), Rongomātāne B (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

The Paleocene-Eocene Thermal Maximum (PETM) was an extreme climate warming event driven by the rapid release of carbon to the ocean-atmosphere system. Geological records from the PETM show considerable environmental change associated with atmospheric warming driving an intensified hydrological cycle. In shallow marine environments these records show increased erosion and transport of coarse terrigenous material, enhanced primary productivity, and widespread marine anoxia. However, there is notable regional variability in the timing of these responses. IODP Expedition 396 recovered an expanded shallow marine PETM succession from the Modgunn Hydrothermal Vent Complex (HTVC) on the Norwegian continental margin. The Modgunn HTVC formed just prior to the PETM and preserved ~80 m of PETM sediment close to the centre of the HTVC, identified by the distinct carbon isotope excursion (CIE) and biostratigraphy. We produced multi-proxy sedimentary and geochemical records to investigate the hydrological, sedimentological, and environmental response to the PETM and their temporal relationships with the carbon cycle perturbation.

Our preliminary results show variable timing between climatic feedbacks and the CIE onset. An increase in the kaolinite/illite ratio prior to the CIE aligns with other records from the North Atlantic that suggest a potential intensification of the hydrological cycle preceding the major carbon perturbation. We also observe a two-step increase in mean grain size—a minor increase at the PETM onset, followed by an increase of coarse material in the PETM body that may be complicated by the influx of volcanic ash. Enrichments in redox-sensitive indicators point to multiple episodes of anoxic to euxinic conditions throughout the early PETM, likely driven by strong water column stratification and oxidation of organic matter from enhanced freshwater input and nutrient supply. These records demonstrate major but variable environmental responses along the Norwegian margin leading up to and during the PETM driven by a strengthened hydrological cycle.

A 13,000-year Multi-proxy Record of Environmental Variability and Anthropogenic Impacts from Varved Lake Gorzyńskie, Central Europe

Wojciech Tylmann¹, Maria Kril¹, Alicja Bonk¹, Maarit Kalliokoski², Piotr Kołaczek³, Jakub Niebieszczański⁴, Monika Rządkiwicz³, Małgorzata Szymczak-Żyła⁵, Izabela Zawiska⁶, Maurycy Żarczyński¹, Bernd Zolitschka⁷

¹Faculty of Oceanography and Geography, University of Gdansk, Gdansk, Poland, ²Department of Geography and Geology, University of Turku, Turku, Finland, ³Institute Geoecology and Geoinformation, Adam Mickiewicz University, Poznan, Poland, ⁴Faculty of Archaeology, Adam Mickiewicz University, Poznan, Poland, ⁵Institute of Oceanology, Polish Academy of Sciences, Sopot, Poland, ⁶Institute of Geography and Spatial Organization, Polish Academy of Sciences, Warsaw, Poland, ⁷GEOPOLAR, Institute of Geography, University of Bremen, Bremen, Germany

10E: Varved and high-resolution lacustrine sequences as records of climate change, anthropogenic impact and extreme events, Rongomātāne B (Level 1), January 30, 2026, 11:00 AM - 12:30 PM

A 10.45 m-long varved sediment sequence from Lake Gorzyńskie, located in western Poland, represents a unique archive of environmental variability spanning the Late Glacial and the Holocene. Combining varve counting, radiometric dating (¹⁴C, ²¹⁰Pb, ¹³⁷Cs), and cryptotephra analysis, we developed a robust age–depth model covering approximately 13,250 years. Distinct depositional phases were identified based on characteristic shifts in sediment lithology and geochemical composition. Interpretation of the underlying environmental processes are supported by biotic proxies, including pollen, non-pollen palynomorphs, diatoms, cladocerans, and sedimentary pigments. The Younger Dryas is particularly well represented and marked by a pronounced increase in allochthonous sediment input, likely linked to vegetation changes in the catchment as indicated by pollen data. Changes in diatom and cladoceran assemblages further suggest shifts in the trophic status of the lake, corroborated by variations in sedimentary pigment concentrations. In the Early Holocene, short-term environmental fluctuations are evident and coincide with recognized palaeoclimatic events, such as the Preboreal Oscillation and the 10.3 ka event. During the Late Holocene, notable shifts in catchment erosion are observed, corresponding to increasing human impact, as inferred from pollen analyses and archaeological evidence in the region. This high-resolution, multiproxy investigation of the sedimentary archive from Lake Gorzyńskie provides valuable insights into long-term environmental trends in Central Europe, as well as into short-term variability associated with palaeoclimatic events and rapid anthropogenic changes.

3D Imaging of Till from the Baltic Sea Floor

Dr Karol Tylmann¹, Prof. Jan A. Piotrowski^{2,3}, Dr Sarah L. Greenwood⁴, Dr Richard Gyllencreutz⁴, Dr Piotr Duda⁵

¹University of Gdansk, Gdańsk, Poland, ²Aarhus University, Aarhus, Denmark, ³Nicolaus Copernicus University, Toruń, Poland, ⁴Stockholm University, Stockholm, Sweden, ⁵University of Silesia, Katowice, Poland

1F: Earth's sedimentary record of glaciation (1), Rongomātāne C (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

The Baltic Sea in northern Europe is a relatively shallow, epicontinental sea, whose formation after the last deglaciation was modulated by eustatic sea-level fluctuations and isostatic adjustments. During the Pleistocene glaciations, the Baltic Basin served as one of the main corridors of the Fennoscandian Ice Sheet flow toward the Central European Plain. The advances and retreats of the ice sheet sculpted the Baltic Basin, leaving behind a variety of glacial landforms and deposits. In many areas of the southern and central Baltic Basin, the seafloor is composed of glacial till.

Here we present the results of 3D imaging of sediment cores collected from the Swedish sector in the southern part of the Baltic Sea. The aim is to reveal the properties and internal structure of the analyzed till using 3D X-ray microtomography. Ultimately, our goal is to reconstruct the processes of till formation and better understand the dynamics of the ice sheet that deposited it.

Three sediment cores containing till layers were analyzed and sampled for 3D X-ray microtomography. Till monoliths (5 × 5 × 5 cm) were extracted from the cores and scanned at a resolution of ~30–50 μm (voxel size). The resulting images were processed using Blob3D software and grain size, clast orientation, and clast shapes were analyzed. These parameters allow us to constrain the subglacial processes and the dynamics of the last Fennoscandian Ice Sheet as it advanced into the central and southern Baltic Basin.

Sediment Properties Derived from Geophysical Downhole Logging Data in the SWAIS2C Project – West Antarctica

Dr. Arne Ulfers¹, Dr Huw Horgan^{2,3}, Prof Molly Patterson⁴, Dr Gavin Dunbar², Prof Denise Kulhanek⁵, Prof Richard Levy⁶, Prof Tina van de Flierdt⁷, Dr Simona Pierdominici⁸, Dr Christian Zeeden¹, and the SWAIS2C Science Team

¹LIAG - Institute for Applied Geophysics, Hannover, Germany, ²Antarctic Research Centre - Te Herenga Waka - Victoria University, Wellington 6012, New Zealand, ³Laboratory of Hydraulics, Hydrology and Glaciology (VAW) - ETH Zürich, 8093 Zürich, Switzerland, ⁴Department of Geological Sciences and Environmental Studies, Binghamton University, Vestal, USA, ⁵Institute of Geosciences, Christian-Albrechts University of Kiel, Kiel, Germany, ⁶GNS Science, Lower Hutt, New Zealand, ⁷Imperial College London, London, GB, ⁸German Helmholtz Centre for Geosciences, GFZ, Potsdam, Germany

2F: Earth's sedimentary record of glaciation (2) & Sedimentation in polar ice sheet margins, Rongomātāne C (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

The West Antarctic Ice Sheet (WAIS) is currently experiencing accelerated mass loss and contains enough ice to raise global sea levels by up to five meters if it were to melt completely. The objective of the international and interdisciplinary SWAIS2C project (Sensitivity of the West Antarctic Ice Sheet to 2 Degrees Celsius of Warming) is to understand past and present factors influencing WAIS dynamics and to reconstruct WAIS response to warmer temperatures, including those exceeding the +2°C target outlined in the Paris Climate Agreement.

In its third season, the SWAIS2C project will target the second drilling location Crary Ice Rise Site 1 (CIR) in the grounding zone of the Ross Ice Shelf. After hot water drilling through ~516 m of ice, a combination of hydraulic piston coring and rotary coring will be used to retrieve a sediment core of up to 200 m length.

The LIAG Institute for Applied Geophysics and the German Helmholtz Centre for Geosciences (GFZ) are in charge of downhole logging operations. Downhole logging is a powerful method to retrieve complete, continuous records of drilled sediment successions. The inclusion of different methods will allow downhole logging of several parameters over the entire sediment sequence and at the same time minimizes the influence of unstable borehole walls on the measurements. The physical parameters measured in the borehole allow to infer sediment properties and to statistically analyze sedimentation cycles.

Shaped By Ice and Tectonics: Mapping Carbon Preservation in New Zealand's Fjords

Ellen Unland¹, Andrew Gorman¹, Philip Barnes², Chris Moy¹, Jess Hillman²

¹University of Otago, Dunedin, New Zealand, ²National Institute of Water and Atmospheric Research, Wellington, New Zealand

9E: Fjord sediments: Archives of climate and tectonics through time, Rongomātāne B (Level 1),
January 29, 2026, 4:25 PM - 5:55 PM

Fjords are globally recognised as efficient sites of organic carbon preservation due to their capacity to trap and accumulate sediment under low-energy, low-oxygen conditions. The temperate fjords of Te Rua-o-te-Moko Fiordland, located along the tectonically active southwestern margin of Aotearoa New Zealand, comprise a glacially sculpted and geomorphologically complex coastal landscape. High annual precipitation (6–8 m/yr), steep forested catchments, low-salinity freshwater input, and episodic landslides collectively drive the delivery of large volumes of terrestrial sediment and organic matter into overdeepened and hydrologically restricted fjord basins.

To investigate the controls on sediment deposition and carbon preservation, high-resolution seismic reflection data have been integrated with multibeam bathymetry and geomorphometric analysis. These datasets enable detailed spatial characterisation of submerged delta surfaces and entrance sills, as well as the delineation of basin morphology, particularly basin-floor depocenters. Together, these features modulate fjord circulation, sediment retention, and the spatial distribution of organic-rich infill. The spatial arrangement of these features provides key constraints for reconstructing marine inundation timing. Main basins, typically the deepest, longest, and widest within individual fjords, not only contain the greatest volumes of sedimentary infill but also indicate the positions of glacial stillstands or retreat phases. As such, they serve as primary archives for reconstructing the post-glacial depositional evolution of the region.

Seismic stratigraphy reveals laterally continuous, acoustically distinct units, which can now be traced across and within multiple fjords using new seismostratigraphic frameworks. For the first time, regionally consistent interpretations enable a spatially continuous reconstruction of the youngest sedimentary unit, interpreted as organic-rich deposits and highlight shifts in deposition dynamics across the Fiordland fjord network.

This study underscores the utility of geophysical methods in resolving the spatial patterns of sediment accumulation and organic carbon preservation, advancing the understanding of postglacial fjord evolution under changing climatic and environmental conditions.

Reevaluation of Grain Shape Index: A Case Study of Pebble Provenance in the Marine Terraces

Ms Takako Utsugawa¹, Mr Masaaki Shirai²

¹Nara Women's University, Nara, Japan, ²Tokyo Metropolitan University, Tokyo, Japan

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Grain shape is a general and a basic index to understand the transport–depositional processes of clastic grains in riverine and marine environments. This study indicated the importance of grain shape index being simple but useful. With the index, the provenance of pebbles composing the marine terraces (MIS 5c and 5a) located in Joban Coast, northeastern Japan was estimated.

In these terrace deposits, chert grain reported as “exotic gravel” in the previous studies is relatively abundant. Because chert may not be abraded easily in transportation due to its durability, the shape is used to reflect the depositional environment. Therefore, chert pebbles (-4 to -5 phi in long axis) in gravelly sand layers of the terraces were sampled, and the three axes of pebbles were measured to calculate the indices; average grain size, elongation and flatness. Additionally, the roundness of pebbles was measured following the Krumbein chart.

Based on facies analysis, the gravelly sand layers in researched marine terraces may have been deposited in lower shoreface to foreshore. Grain shape tendency of the sampled chert is summarized as follows:

- (i) the pebbles were more angular and thicker than beach chert pebbles transported ca. 30 km from river mouth,
 - (ii) the pebbles were rounder than beach chert pebbles sampled around river mouth,
 - (iii) the pebbles were slightly rounder than the marine terrace (MIS 5e) chert pebbles on nearby MIS 5c and 5a terraces and than the conglomerate clasts distributed on the northern side of the terraces.
- Based on the information of shape and lithological composition of pebbles, the source of the chert may be the conglomerate.

Acknowledgment:

Our research was financially supported by the Center for Research Promotion and Social Contribution at Rissho University, the Fujiwara Natural History Foundation, and the Organization for the Promotion of Gender Equality at Nara Women's University.

Anoxic Concretions Triggered by Residual Lake Ice Feedbacks Track 7000 Years of Extreme Arctic Winter Climate Change

Dr Willem Van Der Bilt¹, MSc Andreea Auer¹, MSc Sher-rine Kong¹, MSc Barnabás Csiszár¹

¹University of Bergen, Bergen, Norway

10E: Varved and high-resolution lacustrine sequences as records of climate change, anthropogenic impact and extreme events, Rongomātāne B (Level 1), January 30, 2026, 11:00 AM - 12:30 PM

Paleo data play a critical role in constraining the future evolution of climate in the Arctic, Earth's most rapidly warming region. However, most proxies capture past change during the brief summers, when biological indicators are synthesized, and the availability of liquid water as well as the absence of snow allows sediment transport. As a result, little is known about climate variability in other seasons. This bias is of consequence, because simulations hint at more extensive winter variability. Also, these changes affect regional and global climate by impacting surface albedo, glacier melt, and biodiversity. This work helps close this knowledge gap, by providing a 7000-year long record of abrupt and extreme Arctic winter climate change. For this purpose, we analyzed lake sediments – sensitive recorders of surface change, taken from a high-altitude basin – amplifying the imprint of winter season change, on Svalbard – a High Arctic climate change hotspot. By characterizing variations in geochemistry with X-Ray Fluorescence (XRF), density with Computed Tomography (CT), anoxia with Hyperspectral Imaging (HI), and mineralogy with spectroscopy (SEM-EDS and Raman), we provide multiple lines of independent evidence for the presence of concretions that formed after extreme winters triggered widespread anoxia owing to residual lake ice feedbacks. Comparison with ice core records and climate model simulations suggest that these abrupt shifts were triggered by the complex interaction of abrupt forcing mechanisms like volcanic eruptions, and more gradual changes. Our findings highlight the potential of imaging techniques to fingerprint the geochemical imprint of little-known winter climate change.

Very High Resolution Analysis of a Tidally-controlled Contourite Drift, Offshore Ireland: Implications for Diagnostic Criteria

Professor David Van Rooij¹, Alice Matossian¹, Prof. Dr. Martin White³, Dr. Thomas Vandorpe³, Dr. ir. Wieter Boone³, Dr. Leandro Ponsoni³, Kobus Langedock³, Fred Fourie³, Eoghan Daly², Sheena Fennell², Nadzeya Shymbaliova¹

¹Ghent University, Gent, Belgium, ²University of Galway, Galway, Ireland, ³Flanders Marine Institute, Ostend, Belgium

9C: Mapping marine sediments in the world (1), Tāwhirimātea E (Level 2), January 29, 2026, 4:25 PM - 5:55 PM

Contourite deposits are challenging to identify in the rock record, even though their diagnostic criteria are unequivocal in the present-day marine record. This is due to the multitude of processes that may drive contourite-shaping bottom currents. Whereas large-scale identification looks straightforward using seismic profiling and multibeam bathymetry, this is a technique that hardly can be applied on outcrops. Alternatively, one is looking at lithology and bedforms. Unfortunately, also here the present-day record does not seem to give a clear-cut answer.

Here, we present a case study from the Belgica Mound Drift, which is a small confined drift, located on the eastern slope of the Porcupine Seabight, offshore Ireland. The drift is constrained by an escarpment in the east and by cold-water coral mounds in the west and north. A detailed network of high-resolution seismic profiles elucidates the onset and evolution of this drift since the early Pleistocene, intensely linked to presence of the Mediterranean Outflow Water in the North Atlantic Ocean. A clear change in depositional architecture may be associated with the Middle Pleistocene transition. Based upon the geophysical record, as well as the general water mass stratification, the sediment dynamics are controlled by two moats along the edges of the drift, linked to the action of the interglacial flow of the Mediterranean Outflow Water.

However, new high-resolution near-seabed visual and acoustic imagery shows large sediment waves inside the moats, whereas the main drift body displays no bedforms. The analyses of the bedforms indicate a complex hydrodynamic environment, driven by near-seafloor currents nearly perpendicular to the moat axis. The asymmetry of the bedforms also hints at a variable orientation of the responsible current. This is corroborated by adjacent moorings, indicating a dominant presence of tidal currents remobilizing sediments (and trapping them) within the moats in the present day situation.

Recent Sediment Dynamics and Cold-water Coral Mounds in the Land-detached Submarine Gollum Channel System, Offshore Ireland

Dr Lotte Verweirder¹, **Professor David Van Rooij**¹, Fred Fourie², Kobus Langedock², Professor Martin White³, Dr. Aggeliki Georgiopoulou⁴

¹Ghent University, Ghent, Belgium, ²Flanders Marine Institute, Ostend, Belgium, ³University of Galway, Galway, Ireland, ⁴Ternan Energy, Brighton, United Kingdom

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Gollum Channel System is a land-detached large-scale canyon-channel system situated offshore southwest Ireland on the Northeast Atlantic margin. The system is considered to have been inactive since the Last Glacial Maximum, but newly acquired geophysical seafloor and shallow subsurface data do suggest recent activity.

To test the hypothesis of present-day (in)activity, high-resolution side-scan sonar, photography and bathymetry data were collected using an AUV in the upper slope (350-1000 m water depth) section of two of the tributary channels. These data are presented alongside current meter data from a mooring station in one of the channels, which were used for quantification and validation of the AUV results. The presence of current ripples on the channel floor indicates that bottom currents acting here are capable of the (re)distribution of sediments. The ripple orientation matches the predominant tidal axis. Additionally, some features in the AUV data, located on the channel floor, are interpreted as patches of cold-water corals, shaped as (mini-)mounds. Their occurrence depends on nutrient influx as well as a hard enough substrate to grow on, both of which may be promoted by bottom current activity. This would be the first observation of cold-water coral (mini-)mounds in such an environment.

The current meter data show bottom currents had an average speed of 15.1 cm/s and reached a maximum of 53.7 cm/s during the measurement period. Therefore, collectively, these datasets allow interpretation of the channel floor features visible within the AUV data with respect to the current regimes they represent, and vice versa. At present, bottom tidal currents seem to be the prevalent current source in the channels, while activity from gravity flows has not been observed.

The Cabrières Biota Inhabited a Polar Wave-influenced Delta

Dr Romain Vaucher¹, Soline Michel², Dr Damien Pas³, Dr Romain Gougeon⁴, Daniel Vizcaïno⁵, Dr Bertrand Lefebvre², Dr Farid Saleh³

¹College of Science and Engineering, James Cook University, Townsville, Australia, ²Université Claude Bernard Lyon 1, École Normale Supérieure de Lyon, CNRS, UMR5276, LGL-TPE, Villeurbanne, France,

³Institute of Earth Sciences, University of Lausanne, Lausanne, Switzerland, ⁴University of Brest, CNRS, Ifremer, Geo-Ocean, UMR 6538, Plouzané, France, ⁵19 rue de la Fon de Madran, Pessac, France

8A: Deep time biogeomorphology (1), Tāwhirimātea A (Level 2), January 29, 2026, 1:40 PM - 3:10 PM

The recent discovery of the Cabrières Biota provides unique insight into a complex, polar community during the Early Ordovician. This biota was discovered in the southeastern part of the Montagne Noire, within the Pic de Vissou unit (Hérault, France). Although there is general agreement on the marine affiliation of the strata yielding the Cabrières Biota, the detailed processes driving sedimentation during their lifetime, which may have influenced their ecological distribution and preservation, remain unknown. In this study, we examined a stratigraphic succession from the Mont Peyroux unit, which includes the Cluse de l'Orb (Floian; early Fl2), Foulon (Floian; late Fl2), and Landeyran (Floian; early Fl3) formations, and is coeval with the fossil-bearing unit. These sedimentary formations are well exposed along the Rieuberlou and Landeyran rivers, and a 350 m thick composite section was logged and analysed for sedimentary facies. The results indicate that the studied interval records a wave-influenced delta flanked by shoreface environments. While the delta likely shifted through time, the recorded river influence varied stratigraphically. The facies yielding the fossils correspond to the most distal part of the system, likely in prodelta/offshore to shelf environments with limited oxygen conditions, where mud settling and low-density turbidity currents influenced deposition, thus aiding the exceptional preservation of the Cabrières Biota.

Revisiting the Welsh Cambrian: Life-sediment Interactions in a Shallowing Basin During the Interlude of Two Evolutionary Events

Yorick P. Veenma¹, Neil S. Davies¹

¹University of Cambridge, Cambridge, United Kingdom

10A: Ichnology and sedimentary basin research (2), Tāwhirimātea A (Level 2), January 30, 2026,
11:00 AM - 12:30 PM

The Cambrian succession of North Wales (UK) provides a long-term record of marine sedimentation and biological activity on the margin of Avalonia, bridging two major evolutionary radiations: the Cambrian Explosion and the Great Ordovician Biodiversification Event. Trace fossils provide a critical archive of these events, but despite Wales being the namesake of the Cambrian Period, its stratigraphy has remained understudied from a sedimentological-ichnological perspective. The lower to middle Cambrian Harlech Grits Group captures the deposition of turbiditic greywackes and slates, preserving a low-diversity trace fossil assemblage relative to coeval shallower settings where trace fossils had already diversified in response to the Cambrian Explosion. The overlying Mawddach Group captures a transect from slope to shoreface, representing the progressive shallowing of the basin, with sedimentation patterns being influenced by bathymetric highs and spatially variable subsidence rates. As this phase took place during the Furongian (late Cambrian), the Mawddach Group offers ichnological insights into the 'Furongian Gap', an enigmatic interval marked by a global reduction in known fossil diversity. Results indicate that the abundance, diversity, and distribution of trace fossils in the Mawddach Group not only reflect evolutionary and environment-specific ecological factors, but also local sedimentary controls on colonization windows and substrate preservation. The Cambrian of North Wales provides an example of how basin evolution and sedimentation can shape the regional ichnological record of major evolutionary events.

Coastal Sediment Routing Tract (CSRT) Approach: Introduction and Implications for Heavy-mineral Concentrations

Professor Ernesto Schwarz¹, Dr Manuel Isla¹, **Professor Gonzalo Veiga**¹

¹Centro de Investigaciones Geológicas (UNLP-CONICET), La Plata, Argentina

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The identification and characterization of heavy-mineral concentrations, and its potential source for critical minerals, requires an integrated understanding of coastal morphology, sediment provenance, sediment distribution patterns, geological setting, and climate history. All these factors are integrated in the newly defined Coastal Sediment Routing Tract, which is defined as a specific segment within any Sediment Routing System. The CSRT consists of three elements: supplier(s), littoral drift, and storage(s). The suppliers are the key elements providing sand to the coastal areas and range from typical distributaries channels within deltaic systems to river mouths without deltaic morphology. The littoral drift processes are understood as the conveyors distributing sediment at or near the coast. The coastal sand storages are represented by barriers (beaches and shorefaces) and/or deserts (dunefields) that are laterally (and genetically) connected with the suppliers across the littoral cells. The scale of these cells is of great importance and can control whether the sand storages can be found within the deltaic system (if present) or located up to 100s of kms away in a different coastal setting. The coastal climate and/or the presence of minor sediment inputs along extensive littoral cells would impact in the sand composition and its parenthood with supplier initial composition. The geological setting, particularly shallow-marine systems without adjacent deep-water settings, would control whether the temporal sand storages would become final sinks (geologically speaking) or not. Modern heavy-minerals coastal placers (or paleoplacers) are presently the focus of exploration and/or production in nearly every continent, typically associated with relatively long littoral cells. The holistic Coastal Sediment Routing Tract approach provides a new, powerful tool to understand, characterize, and model heavy-mineral coastal placers.

Deterministic Modelling of Sedimentological Processes of a Miocene Reservoir in the Gulf of Mexico.

Enrique Vidal Cordova¹, Luis Julian Alpírez García¹, Mostfa Lejri², Abel Aco Palestina²

¹Pemex, Mexico, Mexico, ²SLB, Villahermosa, Mexico

5A: Can Forward Stratigraphic Modeling enhance geological understanding of the subsurface and predict sedimentation through time and space? (2), Tāwhirimātea A (Level 2), January 27, 2026, 1:40 PM - 3:10 PM

This study presents the integration of seismic-stratigraphic interpretations, sedimentological analyses, and petrographic studies of core samples, which allowed understanding the geological-sedimentological evolution of a Miocene reservoir in the Gulf of Mexico waters. The aim was to generate a 4D sedimentary model that reduces the uncertainty of sedimentary interpretation and serves as support for the field exploitation strategy.

The reservoir sequences were identified as submarine fan deposits (turbidites) at the culmination of growth wedges, deposited during a Falling-Stage-System-Tract event between 11-12 Ma, under an upper bathyal paleobathymetry (~500 m below sea level), mainly composed of sandy and moderately sorted litharenites according to petrographic-sedimentological analyses, with the presence of Phycosiphon and Chondrites ichnofacies.

The result of this integration is the generation of a Forward Stratigraphic Model (FSM) that explains the evolution of the geological-sedimentary events controlling the extension and lateral continuity of lithological facies within the stratigraphic unit of economic interest, as well as understanding the physical processes that originated them.

Salt-influenced Tectonostratigraphic Evolution of Continental Triassic in the Norwegian-Danish Basin, Central North Sea: Implications for Sandstone Reservoir Distribution and Carbon Storage

Miss Venil Volla¹, Dr Sian Evans¹, Dr Simon Blondel¹, Assoc. Prof. Ingrid Anell¹

¹University of Oslo, Oslo, Norway

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Norwegian-Danish Basin in the Central North Sea has a strategic location with potential to serve as a future geo-energy hub. It has several porous units that may be suitable for CO₂ storage, and tight units potentially serving as seals. However, the basin is underexplored, and the sedimentological character of these units, and how their distribution and connectivity are influenced by the underlying and penetrating Zechstein Supergroup, is poorly constrained. The Triassic interval is of particular interest for storage as continental deposits are typically associated with good reservoir quality, although the control of salt tectonics on the depositional systems is likely to have caused important local sedimentological heterogeneities.

A detailed seismic study of the Triassic interval in parts of the Norwegian-Danish Basin was conducted to reconstruct the regional tectonic, halokinetic and depositional evolution. Combined with core logging, small-scale variation in depositional systems, potentially dictated by halokinesis, was implemented to the regional understanding. Results herein reveal three distinct structural domains with divergent present-day salt configuration and coinciding regional, fluctuating depositional trends. Varying rates of alluvio-fluvial sediment aggradation and events of high density or rapid deposits appear to have partly been dictating salt inflation/deflation as well. A combination of mother-daughter and fill-and-spill minibasin processes are documented prograding through the study area in three phases, also coinciding with the structural domains. This study therefore suggests a prominent syn-sedimentary halokinetic impact on the channel-migration and resulting fluvial deposits in the basin throughout the Triassic.

Sand-rich units accumulating in minibasins are observed in Middle to Upper Triassic strata, constituting reservoir candidates. Supradiapir thin-skinned normal faulting, potentially connected to shallow gas accumulations, may constitute a risk of unwanted fluid migration from Triassic reservoirs. However, distance from injection point and resulting residual capping through Mesozoic strata might potentially ensure sufficient entrapment at safe depths.

Rewriting the Source: Seismic Evidence for Norwegian Mainland Provenance in the Åre Formation, Mid-Norwegian Margin

Mr Jan David Wagner¹, Assoc. Prof. Christophe Serié^{1,2}, Tereza Mosociova¹, Israel Polonio³, Prof. Ivar Midtkandal¹

¹University of Oslo, Oslo, Norway, ²Vår Energi, Oslo, Norway, ³Aker BP ASA, Lysaker, Norway

2A: Next Generation Sediment Provenance (2), Tāwhirimātea A (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

This study investigates sediment provenance and the spatio-temporal evolution of depositional environments in the Upper Triassic-Lower Jurassic Åre Formation along the mid-Norwegian continental margin. By utilizing high-resolution seismic imaging, we reveal significant shifts in sediment transport pathways and offer new perspectives on sediment sources.

Understanding sediment provenance is essential for reconstructing the history of rifting, climate, and tectonic shifts in sedimentary basins. Yet, conventional approaches – typically based on sparse, point-source data – often fall short in resolving complex source-to-sink systems, especially in tectonically complex regions like the mid-Norwegian margin. These challenges are addressed through an integrated seismic stratigraphic and geomorphological approach, based on a regionally extensive 3D seismic dataset covering large sections of the mid-Norwegian continental margin. Initial interpretations were refined using PaleoScan to generate a chrono-stratigraphically consistent framework, followed by spectral decomposition to identify key depositional features.

The Åre Formation records the transition from alluvial and fluvio-deltaic to shallow marine depositional systems within a broad, low-relief basin and is part of a retrogradational succession deposited during the early stages of rifting between Norway and Greenland, prior to the final opening of the North Atlantic Ocean.

The results reveal that the Åre Fm. comprises a complex network of large-scale fluvial systems, including channels, meander belts, oxbow fills, as well as unique lacustrine systems with thousands of small, isolated lakes. These findings indicate significant shifts in sediment transport pathways and depositional environments through time, challenging the long-standing assumption of East Greenland as the dominant sediment source and pointing towards substantial input from the Norwegian mainland. This reshapes how sediment routing, landscape evolution, and early rift dynamics in the North Atlantic region are understood. Ultimately, this case study demonstrates how next-generation seismic analysis can overcome traditional limitations and advance our understanding of basin-scale sediment dynamics along passive margins worldwide.

A Modern Analogue for Massive Mudstones: Fowlers Creek (New South Wales, Australia)

Dr Gresley Wakelin-king^{1,2}

¹La Trobe University, Bundoora, Melbourne, Australia, ²Wakelin Associates, Melbourne, Australia

1B: Transport of Mud and Deposition of Mudstones, Tāwhirimātea C (Level 2), January 26, 2026, 10:15 AM - 11:45 AM

Fowlers Creek is a modern analogue for massive mudrock. A whole-of-catchment field study of this drylands creek demonstrates a pathway from hillside regolith, to transported mud-aggregate sediment, to fine-grained fluvial and fan deposits. Grain size, transport, depositional environment and post-depositional alterations were investigated for modern and older floodplain sediments. In this catchment, mud-aggregate sediments originate as vertic (shrink-swell) soils in contributing hillslopes. Clay, silt and very fine sand form sand-sized aggregates which are robust during waterborne transport. Mud aggregates are low-density so travel high in the water column and are distributed by floodwaters across the floodplain. As flow energy wanes they are deposited as bedload, including in sedimentary structures more usually associated with sand-sized sediments. Layering reflects the timing and extent of flood events, and geomorphological influences on depositional loci (e.g. floodout geometry, fan-head switching). Flood pulses and local scour/deposition events deposit occasional sandy or gravelly layers across the mud surfaces. Immediately after deposition, sedimentary layering and sedimentary structures (scours, ripples, laminae) are well preserved and clearly visible. With time, the clarity of layers and structures decreases and disappears as the muds become more consolidated. Bedding becomes massive or very poorly expressed, and structures are not visible unless outlined in non-aggregate coarse sediments. Floodplain stratigraphy demonstrates these post-depositional alterations are not related to burial pressure: the change is gradual from surface to only a few metres deep, sometimes within a single layer. The post-depositional change is most likely a response to aggregate-scale deformation with shrink-swell behaviour during wet/dry weather cycles. In the sedimentary record, these sediments would present as massive or poorly structured mudrock, with occasional lenses or clasts of coarse sediment that apparently “floats” without depositional context. Spatial distribution of the [coarse silt to fine sand] fraction would be irregular and without reference to fluvial transport distance.

Climate Controlled Preconditioning for Pleistocene Submarine Landslides in the Northern South China Sea

Dr Xingxing Wang¹, Vittorio Maselli², Qiliang Sun¹, Luca Flessati³, Markus Kienast⁴

¹China University of Geosciences, Wuhan, China, ²University of Modena and Reggio Emilia, Modena, Italy, ³Delft University of Technology, Delft, Netherlands, ⁴Dalhousie University, Halifax, Canada

9D: Sedimentary evidence of geohazards (2), Rongomātāne A (Level 1), January 29, 2026, 4:25 PM - 5:55 PM

Submarine landslides impact seafloor infrastructures and threaten coastal communities through inducing catastrophic tsunamis. The presence of weak layers (i.e. layers with low sediment strength) within the strata of continental slope is considered an important factor for preconditioning sediments for failure. Thus, understanding the processes controlling weak layer formation is paramount to assess and predict landslide risk. A link between global climate oscillations and weak layer formation has long been proposed, however a mechanistic understanding of why this link exists is yet to be achieved. Based on geophysical data and Ocean Drilling Program core samples from the northern South China Sea, our study shows how changes in regional hydrology, catchment erosion and ocean productivity at Milankovian time scales control the deposition of low shear strength sediment layers. We argue that the increased intensity of the winter monsoon and amplitude of sea level changes after the Middle Pleistocene Transition are the main drivers affecting marine sediment deposition, and thus weak layer formation. Based on these results, we propose a conceptual model for the deposition of low shear strength sediment layers that can be applied to other low latitude settings worldwide.

Fluid-rock Interaction of Deep Hydrothermal Fluids and Its Reservoir Response in Carbonate Rocks: Insights from the Ordovician in the Tarim Basin

Prof. Jian Wang¹

¹China University of Petroleum (east China), Qingdao, China

2B: Carbonate systems and processes (1), Tāwhirimātea C (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

Hydrothermal process is one of the common diagenetic transformations in carbonate strata, which has a significant impact on carbonate reservoirs. The transformation effect of hydrothermal fluids on reservoirs is a controversial hot topic. One viewpoint holds that hydrothermal fluids have a constructive effect on reservoirs, mainly manifested as hydrothermal dolomitization, hydrothermal fracture and hydrothermal dissolution. Another viewpoint suggests that hydrothermal fluids have a destructive effect on reservoirs, mainly manifested as hydrothermal mineral precipitation and recrystallization. Studies have shown that the hydrothermal fluids developed in the Ordovician strata in the study area mainly include Mg-rich hydrothermal fluids and Si&F-rich magmatic hydrothermal fluids. The main activity period of Mg-rich hydrothermal fluids is from the late Caledonian to early Hercynian period, with characteristics of moderately negative carbon and oxygen isotope values, $\delta^{18}\text{O}_{\text{Eu}}$ positive anomaly and $\delta^{13}\text{C}_{\text{Ce}}$ negative anomaly. Si and F-rich magmatic hydrothermal fluids are controlled by tectonic movements in the late Hercynian and magmatic volcanic activities in the early Permian, with characteristics of more negative carbon and oxygen isotope values and strong $\delta^{18}\text{O}_{\text{Eu}}$ positive anomaly $\delta^{13}\text{C}_{\text{Ce}}$ negative anomaly. The comprehensive analysis of geological data and numerical simulation results shows that the diagenetic response of the Mg-rich hydrothermal fluid in the study area to Ordovician carbonate reservoirs is mainly manifested by dissolution, hydrothermal dolomitization, and filling. It has both constructive and destructive transformation effects on the reservoir space, but mainly constructive effects. The diagenetic response of Si&F-rich magmatic hydrothermal fluids to Ordovician carbonate reservoirs is mainly characterized by fracturing, dissolution, metasomatism, and filling, with destructive effects being the main ones. The hydrothermal transformation of carbonate reservoirs is constrained by the strike-slip fault system, and the calcite precipitation filling zone formed in the upper part of the hydrothermal transformation reservoir also plays a certain sealing role.

Quantitative Analysis of Shallow Water Carbonate Factories Based on 3D Digital Outcrops: Implications from Upper Permian Reefs in South China

Dr Xia Wang¹, Mr. Lingzan Meng¹, Ms. Xuanni Xu¹, Mr. Hanting Zhong¹, Mr. Qijian Li²

¹Key Laboratory of Deep-time Geography and Environment Reconstruction and Applications of Ministry of Natural Resources, Institute of Sedimentary Geology, Chengdu University of Technology, Chengdu, China, ²State Key Laboratory of Palaeobiology and Stratigraphy, Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing, China

2B: Carbonate systems and processes (1), Tāwhirimātea C (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

The Middle Permian (Capitanian) mass extinction triggered one of the most severe declines in reef productivity in the Phanerozoic. Subsequently, reef systems experienced the Wuchiapingian global "reef eclipse," characterized by limited reef occurrences and significant reductions in shallow-water carbonate production. In South China, metazoan reefs re-emerged during the Changhsingian, prominently featuring diverse hypercalcified sponges, microbial encrusters, and abundant early-stage cementation. The Changhsingian sponge reefs in South China exemplify typical hybrid carbonates (Riding & Virgone, 2020), resulting from the combined processes of biocontrolled, bioinduced, and abiotic carbonate precipitation.

Traditional single-profile studies of reef outcrops often obscure inherent heterogeneities within reef build-ups. Recent advancements in photogrammetry, particularly the use of commercial Unmanned Aerial Vehicles (UAVs), now allow precise centimeter-scale analyses using three-dimensional digital outcrop models. Utilizing these advanced 3D models and point counting of the reef components on the outcrop, we performed a quantitative analysis of reef lithofacies and reef-building biocommunities within an Upper Permian reef complex exposed at an abandoned quarry in the Jiantianba area, Lichuan City, Hubei Province, South China.

Initially, we quantified reef components through line transects spanning four to five meters, each consisting of forty to fifty points across outcrop surfaces. Cluster analysis of the random quadrat resampled line transect data identified eight distinct reef-building communities and eight lithofacies. Subsequently, the spatial distribution of these communities and lithofacies was visualized using the 3D digital outcrop models. Our results demonstrate that hypercalcified sponges, including *Amblysiphonella*, *Colospongia*, *Lichuanospongia*, *Sollasia*, *Uvanella*, *Tebagathalamia*, *Neogadalupea*, and *Cystothalamia*, were significant yet unevenly distributed reef components. Encrusting organisms such as *Archaeolithoporella* and microbial encrusters played a crucial role in stabilizing the reef framework, further reinforced by syndimentary and early-stage cementation processes. Bio-controlled (metazoans such as hypercalcified sponges), bio-induced (microbial encrusters, microbial micrites), and abiotic (cementation) carbonate precipitation together formed the Changhsingian "Capitan reef" like architectures in South China.

Multi-phase Calcite Cementation and Reservoir Densification in the Ahe Formation Sandstones, Kuqa Depression: Constraints from Geochemistry and Fluid Inclusion Analysis

Dr Hao Wang¹

¹China University of Petroleum (East China), Qingdao, China

1E: Student Research Forum (1), Rongomātāne B (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

Calcite cementation serves as a critical control on reservoir densification in the Ahe Formation sandstones of the Kuqa Depression, with three distinct phases identified through integrated geochemical and petrographic analyses. Phase I calcite, characterized by dark brown cathodoluminescence (CL) with oscillatory zoning, predominantly occurs near the Yiqikelike thrust belt. Elevated fluid inclusion homogenization temperatures ($\sim 130^{\circ}\text{C}$) and clumped isotope ages (~ 23 Ma) suggest deep hydrothermal fluid influx, supported by LREE-enriched patterns ($\text{La/Yb} = 5\text{--}8$) and positive $\delta^{13}\text{C}$ values (-9‰ to -2.5‰ VPDB) with marked Eu anomalies ($\text{Eu/Eu}^* = 1.2\text{--}1.5$). Phase II calcite, exhibiting dark orange CL and matrix-style pore filling along first- to third-order faults, formed under reducing conditions ($\text{Ce/Ce}^* = 1.1\text{--}1.3$) with $\delta^{13}\text{C}$ values of -10.2‰ to -9.5‰ and homogenization temperatures of $90\text{--}110^{\circ}\text{C}$, correlating with early organic matter maturation ($R_o = 0.7\text{--}0.9\%$). Phase III calcite displays bright orange-yellow CL with poikilitic textures, showing MREE enrichment ($\text{Gd/Yb} = 2.5\text{--}3.2$), strongly negative $\delta^{13}\text{C}$ (-12.3‰ to -10‰), and thermal signals ($120\text{--}140^{\circ}\text{C}$) indicative of late-stage organic decarboxylation. Secondary hydrocarbon-bearing fluid inclusions (blue-yellow fluorescence) confirm cementation preceded hydrocarbon charging ($\sim 5.3\text{--}0$ Ma), reducing porosity by $12\text{--}18\%$ and permeability by 2–3 orders of magnitude. This multi-phase cementation process, driven by thrust-controlled hydrothermal activity, redox-sensitive organic-inorganic interactions, and thermal decarboxylation, establishes a genetic framework explaining reservoir heterogeneity and quality degradation in compressional basin settings.

Orbital Forced Climate Change Controls the Enrichment of Organic Matter and Shale Oil in the Cretaceous Lacustrine Black Shale

Huajian Wang¹, Wang Zhang¹, Wenyang Wang¹

¹Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, China, ²Research Institute of Petroleum Exploration and Development, Beijing, China

8C: Sedimentology of Black Shales through Phanerozoic (3), Tāwhirimātea E (Level 2), January 29, 2026, 1:40 PM - 3:10 PM

Typical orbital cycles have been found in the Cretaceous black shale of the Qingshankou Formation in the Songliao Basin, including long eccentricity (E: 405 kyr), short eccentricity (e: 131 kyr, 124 kyr, 99 kyr, 95 kyr), obliquity (O: 54 kyr, 41 kyr, 39 kyr, 29 kyr), precession (P: 24 kyr, 22 kyr, 19 kyr, 17 kyr) and long-term amplitude modulation cycles (2.4 Myr, 1.2 Myr and 173 kyr), etc. We studied the enrichment cycle and main controlling factors of the organic matter and shale oil in the Songliao Basin, and found that the enrichment of shale oil in over-mature areas is mainly controlled by the organic matter abundance cycle forced by the 173 kyr obliquity cycle. The mineral contents of quartz and clay minerals related to lithological composition and reservoir quality are mainly controlled by the 405 kyr eccentricity cycle. The 173 kyr cycle and obliquity cycle that regulate the mid-high latitude water cycle mainly control the carbon cycle and organic carbon burial in the paleo-lake in the Songliao Basin. The eccentricity and precession periods that regulate the low latitude water cycle mainly control the precipitation and terrestrial minerals input in the Songliao Basin. These results indicated that the Late Cretaceous climate change in the Songliao Basin was driven by the combined effects of low latitude monsoons and mid latitude westerlies. Therefore, orbital forced climate change induced may not only have controlled the sedimentary rhythm of organic carbon and lithological composition in the Songliao Basin, but also controls the present enrichment cycle of shale oil.

The Intrinsic Curvature of Non-deltaic Transgressive Shelf Profile and Its Stratigraphic Significance

Assoc. Prof. Junhui Wang¹, Prof. Tetsuji Muto²

¹China University of Petroleum (Beijing), Beijing, China, ²Nagasaki University, Nagasaki, Japan

3C: Coastal to shelf environments across time and space (3), Tāwhirimātea E (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

The longitudinal profile of the continental shelf, a key control on marine geology and paleogeography, commonly exhibits landward steepening. Two mechanisms are widely invoked to explain this curvature: (i) a progressive decrease in the accommodation/sediment supply ratio (A/S) during the late stage of postglacial transgression, and (ii) wave-driven sediment redistribution forming an equilibrium concave-up profile under the modern regime. Here, we propose an alternative view of the origin of the shelf profile curvature based on the autostratigraphy theory of non-deltaic transgression. Non-deltaic transgression happens when the downstream alluvial river feeding the shelf is longer than a determinate critical length. In this background, the entire system lacks the foreset part during transgression. This type of transgression is regarded as non-deltaic because the system differs from the typical tripartite deltaic system. During the non-deltaic transgression, the shelf spontaneously steepens landward under steady conditions of (i) constant sea-level rise, (ii) constant upstream sediment supply, and (iii) no significant sediment reworking processes. This intrinsic curvature is governed by a simple mathematical relationship that has been validated through tank-flume experiments and modern shelf applications. Our model provides a baseline for distinguishing between autogenic and allogenic controls on shelf morphology, offering new insights into sequence stratigraphic interpretations.

Shale Predication and Hydrocarbon Source Rock Evaluation in Igneous-rich Lacustrine Rift Basins: A Case Study of the YC Formation from the Changling Depression, Ne China

Professor Hongyu Wang¹

¹China University of Geosciences, Beijing, 100083, Beijing, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

During the depositional period of the YC Formation of the lower Cretaceous, the Changling Depression in Songliao Basin was a lacustrine rift basin rich in volcanic rocks and intrusive rocks. These igneous rocks have caused complex stratigraphic structures, which make it difficult to predict the distribution of shale and the quality of hydrocarbon source rocks. This paper uses seismic stratigraphy to divide the strata and interpret dark mudstone layers based on logging and seismic. These data are combined with geochemical test data from hydrocarbon source rocks to assess its quality and predict its distribution.

This study indicates that the three types of unconformities identified divide the YC Formation into four members. In their sedimentary process, the number of grabens or half-grabens associated with the Changling Depression decreased, the size of the rift basins increased, and the depositional center migrated to the northwest. During the depositional period of the First and Second Members, volcanic rocks were widely developed, and mud sediments were deposited between several small grabens or half-grabens. During the depositional period of the Third and fourth Members, the study area became a unified lacustrine rift basin with clearly defined geological signatures developed in each sedimentary sequence, which can be divided into three systems tracts. Mudstones in the Lake Transgressive Systems Tract are laterally continuous and widely distributed. The organic matter in these mudstones, with fair to good abundance levels, is predominantly type II2 and type III kerogen and all have reached mature to highly mature stages of thermal evolution, which are favorable hydrocarbon source rock layers. In plan view, the favorable hydrocarbon source rock zones are mostly formed in the Changling Sag, Dongling Structural Zone and Longfengshan Sag.

This study offers guidance and direction for deep hydrocarbon exploration in the Changling Depression, and also provides a reference for methods and ideas to predict hydrocarbon source rock distribution in other lacustrine rift basins which are rich in igneous.

Coupling Mechanisms of Laminae Structures, Pore Architectures, and Hydrocarbon Occurrence in Shale Reservoirs: A Sedimentological Perspective

Professor Guiwen Wang¹, Dr Xiaojiao Pang¹

¹China University of Petroleum, Beijing, Beijing, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Understanding how depositionally modulated laminae govern pore networks and fluid distribution is fundamental to deciphering shale reservoir heterogeneity. Clarifying the interplay among laminae structures, pore architectures, and hydrocarbon occurrence is critical for efficient shale resource exploitation. This study integrates core observations, thin-section analyses, mercury intrusion capillary pressure (MICP), nitrogen adsorption before and after extraction, and two dimensional nuclear magnetic resonance (2D-NMR) under varying states (original, dried, and kerosene imbibed) to unravel multiscale laminae features (laminated, layered, massive), pore heterogeneity, and fluid mobility in the Gulong shale. Key findings reveal: (1) Laminae-controlled pore architectures: Four laminae types (felsic, clay, carbonate, mixed) and five superimposition patterns (I–V) govern pore structure differentiation. Laminated, layered, and massive structures correspond to Type B (medium threshold pressure: 13.77 MPa, pore size: 3–20 nm), Type A (lowest threshold pressure: 0.54 MPa, dominant pore peak: 35–45 nm), and Type C (highest threshold pressure: 41.34 MPa, smallest pore width: 4.9 nm) pores, respectively. Layered structures exhibit optimal porosity and pore-throat connectivity, while massive structures represent the poorest reservoirs. (2) Laminae-driven hydrocarbon enrichment: Felsic laminae and Type I superimposition (clay-felsic interbeds) favor high oil content and mobility due to favorable pore networks and mineral wettability contrasts, followed by layered structures and Type II patterns. The study establishes a genetic model wherein depositional cyclicity controls lamina-scale mineral sorting, which subsequently dictates diagenetic pathways and pore architecture evolution. These results highlight how laminae-induced pore heterogeneity governs fluid distribution and movability, advancing sedimentological theories and providing a predictive framework for sweet-spot identification in laminated shale systems.

UAV-based Digital Preservation and Promotion of the Middle Triassic Luoping Biota Fossil Sites: A Case Applied on Outcrop3D Platform

Dr Xia Wang¹, Dr. Wen Wen³, Prof. Hanting Zhong¹, Prof. Jianhua Chen², Prof. Qiyue Zhang³

¹Key Laboratory of Deep-time Geography and Environment Reconstruction and Applications of Ministry of Natural Resources, Institute of Sedimentary Geology, Chengdu University of Technology, Chengdu, China, ²College of Geophysics, Chengdu University of Technology, Chengdu, China,

³Chengdu Center, China Geological Survey, Chengdu, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

For the protection of fossil excavation sites and the effective dissemination of scientific knowledge, on-site investigations are generally recognized as the optimal approach. However, these investigations often encounter significant limitations due to financial constraints, and the influx of numerous visitors can inadvertently damage in-situ preserved fossils. Recent advancements in unmanned aerial vehicle (UAV) technology, particularly the availability of commercial drones, offer a practical and economical alternative for geological outcrop investigations. UAV-based close-range photogrammetry enables the generation of high-resolution three-dimensional (3D) models with centimeter-level accuracy.

The Middle Triassic Luoping Biota, located in Luoping, Yunnan Province, South China, represents one of the most diverse marine fossil Lagerstätten globally and marks a critical phase of marine ecosystem recovery following the End-Permian Mass Extinction (EPME). In our study, we developed detailed, high-resolution 3D digital models of three key fossil outcrops within the Luoping Biota National Geopark. These comprehensive 3D outcrop models, integrated with detailed 3D surface models of individual fossils, sedimentary structures, and explanatory multimedia materials for observation points, demonstrate a significant advancement in digital geoheritage conservation and education. This methodological approach not only effectively protects sensitive fossil sites but also greatly enhances public accessibility and supports ongoing scientific research into geological heritage.

Tracing Offshore Secondary Lahar Impacts Following the 2008 Eruption of Chaitén, Chile

Dr Sebastian Watt¹, Dr Rodrigo Fernandez², Dr Anke Zernack³, Dr Lorna Strachan⁴, Dr Rebecca Totten⁵, Dr Giulia Matilde Ferrante⁶, Javier Canete⁴, Dr Alastair Hodgetts, Dr Constanza Perales⁸, Dr Ivan Sunye Puchol, Dr Aaron Micallef¹⁰, Kerys Meredew¹

¹University of Birmingham, Birmingham, United Kingdom, ²Universidad de Chile, Santiago, Chile,

³Massey University, New Zealand, ⁴University of Auckland, New Zealand, ⁵University of Alabama, USA,

⁶OGS Trieste, Italy, ⁷University of Edinburgh, UK, ⁸SERNAGEOMIN, Santiago, Chile, ⁹Sapienza University of Rome, Italy, ¹⁰MBARI, USA

5E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (2), Rongomātāne B (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

Secondary lahars, following explosive volcanic eruptions, represent a major sediment source to the oceans at coastal and island volcanoes. However, the factors controlling the rate and magnitude of this input, as well as the dispersal and impact of this sediment within marine environments, are very poorly constrained. Such increased offshore sedimentary flux may exert a significant influence on marine biota and marine sedimentation patterns, and may potentially develop into or trigger submarine mass flows and damage marine infrastructure. The 2008 explosive eruption of Chaitén volcano, Chile, provides an opportunity to explore the mechanisms, impacts, and controls of lahar-driven ocean sedimentation. The eruption dispersed tephra across the surrounding region, forming a widespread fall deposit that extended eastward across Argentina. In the days following the eruption, rainfall remobilised proximal tephra fall deposits, rapidly funnelling material through two local drainage basins and forming lahars that, after terrestrial pathways of 10-15 km, entered the ocean. The southward directed lahars inundated Chaitén town and resulted in the progradation of the river deltas through rapid accumulation of volcanoclastic sediment. A second river system provided a short pathway for coarser-grained lahars to reach the ocean. Here, we report on the first marine investigation of lahar impacts (FKt240902 (RV Falkor(too), Schmidt Ocean Institute; September 2024). A combination of bathymetry, sub-bottom profiling, sediment coring, and seafloor imagery allows us to contrast sediment dispersal patterns offshore two river systems that vary in their initial input and that enter very different ocean current regimes. We present stratigraphic, sedimentological and compositional data that constrain marine sediment dispersal from each system, advancing our understanding of post-eruptive lahar impacts on adjacent marine environments. The results also allow us to evaluate the potential of developing deeper lahar-derived stratigraphies offshore southern Chile's coastal volcanoes, as an alternative route to investigating long-timescale eruption histories.

Lessons From 20 Years of IODP Coral Reef Drilling: Disentangling the Impact of Rapid Sea-level Rise, High Sediment and Nutrient Flux on Reef Drowning

Professor Jody Webster¹, Professor Yusuke Yokoyama², Professor Juan Carlos Braga³, Associate Professor Marc Humblet⁴, Professor Dirk Erler⁵, Dr Thomas Felis⁶, Professor Christina Ravelo⁷, Dr Amanda Thran¹, Associate Professor Tristan Salles¹, Professor Gregg Webb⁸, Dr Luke Nothdurft⁹

¹University of Sydney, Sydney, Australia, ²Atmosphere and Ocean Research Institute, and Department of Earth and Planetary Sciences, The University of Tokyo, 5-1-5 Kashiwanoha, Kashiwa 277-8564, Japan, ³Department of Stratigraphy and Paleontology, University of Granada, Campus de Fuentenueva, 18002 Granada, Spain, ⁴Department of Earth and Planetary Sciences, Graduate School of Environmental Studies, Nagoya University, Nagoya 464-8601, Japan, ⁵Southern Cross University, Lismore, NSW, Aus, ⁶University of Bremen, Germany, ⁷University of California, Santa Cruz, US, ⁸University of Queensland, QLD, Aus, ⁹Queensland University of Technology, QLD, Aus

7B: Carbonate depositional systems from platform, slope to basin (1), Tāwhirimātea C (Level 2), January 29, 2026, 10:15 AM - 11:45 AM

Fossil coral reefs provide important evidence about the former positions of sea level in space and time due to their geological preservation and suitability for dating. of particular interest is the use of submerged coral reefs to: (1) reconstruct the timing, rate and magnitude of sea level rise at tropical locations to better understand the dynamics of past ice sheet melting, and (2) assess the impact of sea level rise and associated environmental changes that cause coral reef drowning (i.e., inability to keep pace with sea-level rise). While studies of drowned fossil reefs from Barbados, Tahiti, Huon Peninsula, Hawaii and elsewhere have produced a broadly consistent picture of ice melt, reflecting eustatic change since the Last Glacial Maximum (LGM), considerable uncertainty remains concerning the nature, timing, and ecological consequences of deglacial meltwater pulses on coral reef systems.

Over the past two decades the International Ocean Drilling Program (IODP) expeditions to Tahiti (Exp. 310), the Great Barrier Reef (GBR) (Exp. 325) and more recently Hawaii (Exp. 389) have shown that the sensitivity of reefs to rapid sea-level rise varies considerably. Some reefs were ‘drowned’ rapidly while others persisted. In this synthesis we integrate geomorphic, sedimentologic, biologic, geochemical proxy data (e.g., major and rare earth elements, carbon and nitrogen isotopes), along with high resolution chronological constraints from these submerged reef sites. Coupled with 3D numerical stratigraphic modelling, this dataset dissects the process of how and why coral reefs drown. We investigate the nature and timing of successive reef demise events and argue that the synergistic effects of sea level rise and poor water quality driven by high sediment and nutrient flux have been crucial in ultimately causing the drowning and demise of these reef ecosystems.

Evolution Mechanism of the Pore System in Microbial Dolomites of the Ediacaran Dengying Formation, Southwest Sichuan Basin, Driven by Multistage Diagenetic Fluids

Dr. Mingyang Wei¹, Professor Xingzhi Wang¹, Professor Zhidong Bao², Dr. Yang Li¹

¹Southwest Petroleum University, Chengdu, China, ²China University of Petroleum, Beijing, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Elucidating the formation and evolution mechanisms of pore systems in microbial dolomites is crucial for microbial carbonate hydrocarbon reservoirs. However, Ediacaran examples, modified over hundreds of millions of years by multistage diagenetic fluids, pose key challenges: (1) unclear coupling mechanisms between microbial fabrics and fluid activities; (2) the complex origins of the diagenetic fluids; and (3) lacking quantitative models for the dynamic evolution of the pore system, limiting insights into the formation of ancient reservoirs. This study analyzes microbial dolomites of the Ediacaran Dengying Formation, SW Sichuan Basin, using integrated methods, including field outcrop and core description, micropetrographic analysis (thin sections, cathodoluminescence), in situ micro-geochemical testing (laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS), stable isotopes), and fluid inclusion microthermometry, to systematically reveal the evolution patterns of the pore system driven by multistage diagenetic fluids. The following innovative insights are obtained: A novel "Microbial Framework - Diagenetic Modification - Structural Fracture Superposition" tripartite coupling pore evolution model is established for the first time. The study clarifies the critical control exerted by microbial binding structures and thrombotic fabrics on the preservation of primary porosity. The differential contributions of three key diagenetic fluid events (syngenetic meteoric water leaching, hypogene karstification, and burial hydrothermal alteration) to secondary porosity formation are quantitatively constrained. Results indicate that burial hydrothermal dolomitization significantly enhances porosity (by approximately 3%-5%), while hypogene karstification dominates the formation of large-scale dissolution vug systems. An innovative "Episodic Fluid Modification - Multi-scale Pore-Fracture Coupling" reservoir development model is proposed. The research unveils a four-stage dynamic evolutionary trajectory of the pore system: "microbial framework-controlled porosity → cementation-induced porosity reduction → dissolution-induced porosity enhancement → infill adjustment." These findings provide important new theoretical support for petroleum exploration in ancient carbonate reservoirs and hold significant reference value for the evaluation of global Precambrian microbialite reservoirs.

Diagenetic Effects from Volcaniclastic Material in Middle Devonian Sandstones, North-East Greenland.

Dr Rikke Weibel¹, Mr Sebastian Malkki¹, Dr Nynke Keulen¹, Dr Gregers Dam¹, Dr Henrik Olsen¹, Dr Benjamin Heredia¹, Dr Tonny Thomsen¹, Dr Benoit Issautier², Dr Pierpaolo Guanieri¹

¹GEUS (Geological Survey of Denmark and Greenland), Copenhagen, Danmark, ²BRGM (Bureau de Recherches Géologiques et Minières), 45060 Orléans, France

3F: Diagenesis of volcaniclastic sediments, Rongomātāne C (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

Devonian sediments in North-East Greenland show compositional variation that controls the diagenetic processes. Clastic sediments (> 8 km) were deposited in the continental Old Red Sandstone Basin. Basin development was associated with changes in drainage direction, basin-wide unconformities and depositional episodes that gave rise to four lithostratigraphic groups (Vilddal, Kap Kolthoff, Kap Graah and Celsius Bjerg). Mafic and felsic volcanism contributed with local and more widespread volcaniclastic material. The aim is to understand to what degree volcaniclastic material controls the diagenetic changes in siliciclastic sandstones. Petrographical investigations of the sandstones were performed by transmitted and reflected light, as well as scanning electron microscopy besides automated quantitative mineralogy (AQM). Carbonate clasts accompanied by sponge spicules and glauconite are common in the Vilddal Group. Quartz together with feldspar are the dominant framework grains in the Kap Kolthoff and Kap Graah groups. Mafic and felsic volcanic particles appear for the first time in the Kap Kolthoff Group and continue with less abundances in the younger Kap Graah and Celsius Bjerg groups.

Evidence of influence from volcaniclastic material include:

1. Zeolite cement enclosed in calcite occurs in the fine-grained lacustrine and meander belt deposits.
2. Pore-filling albite or albite laths partly filling pores in the fluvial sandstones.
3. Patchy occurrences of pore-lining chlorite in porous aeolian sandstones with iron-oxide/hydroxide coatings on framework grains.

The varied composition of volcanic particles in the Middle Devonian sandstone give rise to locally spectacular and unusual diagenetic changes. Degradation of volcanic particles may have promoted zeolites, preserved at shallow burial or during deep burial when enclosed in calcite cement. The unusual albite cement may have been sourced directly from degraded volcanic particles or through a metastable zeolite precursor that hindered mechanical compaction and successively were replaced by albite in the porous sandstone during increased burial.

Grain-size Inheritance from Source Lithology and Relief in Southern Italian Fiumare

Prof. Dr Gert Jan Weltje¹, Dr. Arne Ramisch²

¹KU Leuven, Leuven, Belgium, ²University of Innsbruck, Innsbruck, Austria

1A: Next Generation Sediment Provenance (1), Tāwhirimātea A (Level 2), January 26, 2026, 10:15 AM - 11:45 AM

Grain-size spectra in fluvial systems are often interpreted as products of fluvial transport and depositional processes. However, at active margins where sediment pathways are short and topographic gradients are steep, inherited signals from source lithology and relief may exert a dominant control on grain-size distributions. In this study, we assess the predictive power of upstream geological and geomorphological variables on downstream sediment grain-size spectra in a set of short, steep rivers (fiumare) draining into the Ionian Sea in southern Calabria, Italy.

We combine a high-resolution (30 m) digital elevation model (JAXA) with the CALCOLO database, a comprehensive legacy dataset compiled by Ibbeken et al. containing several decades of grain-size measurements and detailed lithological maps. Using a joint deconvolution approach within a compositional data framework, we relate matrices of relief and lithology to downstream grain-size spectra across multiple catchments.

Our results show that upstream relief and lithological variation explain more than one-third of the total variation in grain-size spectra. This level of predictability is surprising given that no transport-based metrics (e.g., shear stress, stream power) were included. The analysis highlights the importance of grain-size inheritance from source regions, especially in systems with limited downstream reworking and rapid sediment transfer.

These findings challenge the common assumption that fluvial grain-size records primarily reflect in-channel transport dynamics. Instead, they suggest that inherited signals from topography and bedrock composition can persist and dominate even in fluvially active environments. Southern Italy's fiumare, with their short transport distances and tectonically dynamic setting, provide a natural laboratory for isolating and quantifying this effect.

Grain-size inheritance should be considered a key factor in interpreting sedimentary signals at active margins, with implications for provenance analysis, paleohydrology, and sediment routing models.

Growth Patterns of Methane-derived Carbonate Concretions in Lower Jurassic Shale from Tibetan Plateau

Mr Yue Wen¹

¹Southwest Petroleum University, Chengdu, China

6B: Microbial architects of carbonates: Insights from modern to deep-time systems, Tāwhirimātea C (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

The scarcity of modern calcite concretions has left significant questions unresolved regarding their formation mechanisms, environmental contexts, and, most notably, their growth durations. In this study, comprehensive analyses of the EXBJ01+ and EXBJ02 concretions from the Quse Formation were conducted, including carbon and oxygen isotopes, bulk geochemistry, X-ray fluorescence (XRF), and scanning electron microscopy (SEM). Both concretions exhibit distinct two- to three-layered textures in their petrology and elemental distribution, mirrored by a corresponding two- to three-stage shifts in carbon isotopic compositions, supporting a concentric growth pattern. The EXBJ01+ concretion evolved through three separate microbial stages from its core to edge of bacterial sulfate reduction (BSR), anaerobic oxidation of methane (AOM), and methanogenesis (Me), whereas the EXBJ02 concretion experienced only two stages, transitioning from the BSR zone to the AOM zone. The elements contributing to concretion formation originated from porewater, which interacted with the overlying water, thereby enabling the concretions to record its characteristics. Given that astronomical cycles influence the overlying water, their imprint may also be preserved in the concretions. Time series analysis based on calcium content in the EXBJ01+ suggests a sedimentation rate of approximately 0.016 mm/kyr, indicating a growth duration of at least 2.4 Myr. In contrast, the EXBJ02 appears to have grown much faster.

'Resurrected' Concretions – Resumed Cementation After Exhumation, Transport, Re-deposition and Exploitation by Producers of the Trace Fossil Chondrites when Still Being Soft

Professor Andreas Wetzel¹, Dr Maciej J. Bojanowski

¹University of Basel, Department of Environmental Sciences - Geology, Basel, Switzerland

10A: Ichnology and sedimentary basin research (2), Tāwhirimātea A (Level 2), January 30, 2026,
11:00 AM - 12:30 PM

Incipient concretions having argillaceous matrix and methane-derived cement were exhumed, transported and embedded in a fine-sandy tempestite. They were still soft after deposition of the tempestite because subsequently they were preferentially exploited by producers of the trace fossil Chondrites; its tubes are wide-spaced and rare in the tempestite but abundant and narrow-spaced in the concretions. The tubes are filled with fine sand taken from the tempestite. The stable C isotope signature of the concretions ($\delta^{13}\text{C}$ –39 to –22‰) markedly differs from that of the tempestite ($\delta^{13}\text{C}$ –3 to –2‰). Organoclastic sulfate reduction (OSR) and anaerobic oxidation of methane (AOM) dominated the initial cementation of the concretions. During OSR and AOM, sulfate was reduced to sulfidic phases including H_2S being toxic to animals. Nonetheless, Chondrites producers exploited the incipient concretions. Absence of haloes around Chondrites indicates that their tubes were not flushed with oxygenated water. Therefore, the Chondrites producers likely lived in symbiosis with microbes utilizing and detoxicating sulfides and hence, followed a chemichnial behavior. After burrowing ceased, resumed precipitation of early diagenetic micrite filled the remaining porosity of the concretions, whereas the tempestite sand was cemented by late diagenetic carbonate.

Burrowing of the displaced incipient concretions documents their still soft-to-stiff consistency in shallow sediments. Pervasive growth mechanism explains well the plastic state of the concretions which allowed them to be burrowed when they were only partly cemented but already resistant to compaction. This fact explains why early diagenetic concretions are rarely found in modern muddy sediments because they are hardly recognized and easily overlooked in modern sediment cores.

Sediment reworking probably occurred distant from shore on a local swell. There, waves and currents enriched sand while concretions formed on its muddy flanks where they were eroded during a storm.

This work was funded by the National Science Centre grant 2024/53/B/ST10/03806.

Deciphering Depositional Histories Around Ancient Calderas - a Sedimentary Record of Quiescence, Renewal, and Depositional Setting in a Volcanic Rift.

Dr Jack Whattam¹, Professor Ivar Midtkandal¹, Professor Henrik Svesen¹, Dr Dougal Jerram³, Dr Sara Callegaro², Professor Ingrid Anell¹

¹University of Oslo, Oslo, Norway, ²University of Bologna, Bologna, Italy, ³DougalEarth, Solihull, England

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Voluminous pyroclastic eruptions and significant landscape changes typical of caldera settings result in distinctive depositional records reflecting the interplay of volcanic and sedimentary dynamics and volcano-tectonic processes. Ancient eroded calderas expose deeper levels of these records; however erosion also obscures formation and depositional histories, preserving only remnants of the ring-faults, cone-sheet intrusions, and juxtapositions of contrasting deposits. In the continental Permo-Carboniferous Oslo Rift (Norway) several partially preserved calderas are well known, yet the depositional stratigraphy is poorly constrained. Volcano-sedimentary successions within the calderas have typically been viewed as intra-caldera deposits based on juxtaposition with older lavas or younger plutonic rocks along ring faults. To decipher eruption and depositional histories of this caldera-forming volcanism we analysed a ca. 350 m thick volcano-sedimentary succession adjacent to the ring fault of one such caldera remnant. Compositionally, volcanic deposits in the succession are basaltic to trachytic and rhyolitic, with basalts dominating the lower succession and silicic ignimbrites dominating the middle and upper succession. Three volcanic packages are separated by volcanically-derived alluvial to lacustrine deposits and erosional unconformities, although sparse peperitic contacts also indicate intervals of contemporaneous sedimentary and volcanic deposition. Notably, whilst the silicic ignimbrites could be interpreted as the products of caldera-forming eruptions, collapse-breccias or fining-up sequences typical of syn- to post-caldera sedimentation are absent, and sediments largely reflect deposition in a flat-lying rift-valley setting. Additionally, deposits show no indication of a stratigraphic barrier, whilst occasional paleocurrent indicators and depositional dips in alluvial fans indicate transport towards the caldera wall, contrary to expectation. Collectively, and in contrast to long-held ideas, sedimentary characteristics and architecture suggest extra-caldera deposition, with later down-faulting during caldera subsidence leading to preservation of the rift valley succession. This study emphasises the utility of the sedimentary record in deciphering the timing and history of caldera-formation and intra- versus extra-caldera deposition.

Identifying 'at Risk' Carbon in Sediments: Measurements of Carbon Vulnerability in Te Rua-o-te-moko - Fiordland NZ

Mr Luke Whibley¹, Dr Chris Moy¹, Dr Christina Riesselman¹, Dr Craig Smeaton², Dr Rebecca McLeod³, Dr Greer Gilmer⁴

¹University of Otago, Dunedin, New Zealand, ²University of St Andrews, St Andrews, Scotland,

³Fiordland Marine Guardians, Dunedin, New Zealand, ⁴GNS Science, New Zealand

9E: Fjord sediments: Archives of climate and tectonics through time, Rongomātāne B (Level 1),
January 29, 2026, 4:25 PM - 5:55 PM

Fjord systems, situated at the land-sea interface, have been shown to effectively trap both marine and terrestrial organic carbon in protected sedimentary basins. Over the last decade, the fjord depositional environment has been increasingly recognized as a “hotspot” for marine carbon burial. Although they represent a tiny portion of the total marine area (<<1%), the area-normalised quantity of carbon stored in fjord settings is magnitudes higher than on coastal shelves and other marine environments.

When considering carbon burial, accumulation is not equal to sequestration. Degradation and remineralisation during transport and deposition results in carbon burial efficiencies below 100%, meaning some proportion of carbon entering fjords is not retained over long time scales. Before policy intervention can serve to protect areas of vulnerable carbon stocks, we must first understand the preservation of carbon, or lack thereof, in fjord sediments.

We use thermogravimetric analysis to rapidly assess the reactivity of sedimentary organic matter across a range of fjord environments, which gives insight into the preservation of carbon delivered to the sediment, and vulnerability of that carbon stock to further degradation. We also highlight other factors to consider when protecting 'at risk' carbon such as accumulation rates, carbon concentrations and dry bulk density. This holistic perspective allows us to identify both general depositional settings and specific areas within Fiordland where targeted policy interventions could secure the protection of the most vulnerable carbon. Such interventions will hopefully maximise carbon burial efficiency, enhancing the promise of fjord carbon storage as a nature-based solution to rising atmospheric CO₂.

Carbonate Platform Evolution in Response to the Mid-Pleistocene Climate Transition on the North-west Shelf (NWS) of Australia: Insights from Forward Stratigraphic Modelling

Ms Carra Williams¹, Professor Jody Webster¹, Associate Professor Tristan Salles¹, Dr Victorien Paumard², Dr Camille Grimaldi³, Dr Mostfa Lejri⁴

¹University of Sydney, Sydney, Australia, ²University of Western Australia, Perth, Australia, ³Australian Institute of Marine Science, Perth, Australia, ⁴Schlumberger, Oslo, Norway

4A: Can Forward Stratigraphic Modeling enhance geological understanding of the subsurface and predict sedimentation through time and space? (1), Tāwhirimātea A (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

Understanding the response of isolated carbonate platforms to major climatic and eustatic transitions is crucial for reconstructing past environmental changes and predicting future trends. This study applied two data-driven and calibrated forward stratigraphic models to investigate how sea level, subsidence, carbonate production and wave energy influenced the Scott Reef carbonate platforms evolution during the Middle Pleistocene transition (MPT) (ca. 1.2 – 0.7 Ma). Scott Reef, located in the Browse Basin on Australia's NWS, provides a unique archive of uninterrupted Quaternary fossil coral reef growth in response to the MPT on a stable far-field site. Model scenario 1 (578 kyr–present) is calibrated to seismic interpretations, radiometric dates, and carbonate sedimentary facies defined by coral-algal assemblages from three boreholes, modelling five reef growth sequences corresponding to Marine Isotope Stages (MIS) 1, 5, 7, 11, and 13. Model scenario 2 (1.2 Ma–present) illustrates that the Scott Reef platforms were most sensitive to sea-level fluctuations and rates and patterns of subsidence. Both platforms kept pace with sea-level rises, resulting in platform-wide coral reef 'turn-on' during every highstand, except for NSR during MIS 7a. Two platform development phases were identified: (1) (1.2 – 0.7 Ma) an episodic progradational and aggradational accretion phase, resulting in thin (10-30 m) depositional sequences, and (2) (0.7 Ma – present) a thicker (20-50 m) aggradational sequence with longer periods of platform emersion. Current assumptions about eustasy for the Browse Basin are insufficient to match the observed data. Instead, a pulsed and increasing stepwise subsidence pattern with a Holocene rate of 0.70 mm/a is necessary to explain the drowning of the leeward margin. This anomalous estimate suggests that oceanographic factors not captured in the model, likely influenced platform evolution. These findings improve our understanding of past reef dynamics and provide a framework for predicting future reef response to climate-driven sea-level changes.

Evaluating Event Synchronicity Using Tied Age-depth Models of Sedimentary Records

Dr Katleen Wils^{1,2}, Dr Arne Ramisch²

¹Renard Centre of Marine Geology, Department of Geology, Ghent University, Ghent, Belgium,

²Institute of Geology, University of Innsbruck, Innsbruck, Austria

7D: Shaking across the land-to-sea boundary, Rongomātāne A (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

One of the major challenges in paleoenvironmental studies and the construction of regional event chronologies (e.g., earthquakes, floods, tsunamis, volcanic eruptions, pollution) consists of evaluating whether an event imprint in different locations was created synchronously. Differences in applied dating techniques, sampled material, and various local effects all contribute to the complexity and significant uncertainty associated with the integration of multiple depositional records. Moreover, the resolution of existing dating techniques (e.g., varve counting, radiocarbon) generally does not allow to resolve time differences smaller than years, decades or even centuries. We developed a methodology that allows tying various age-depth models using independently established chronohorizons, such as geochemically identified tephra markers or palynological fossil assemblages, to obtain overall improved chronologies for sedimentary event deposits. Subsequently, we robustly test for the possible synchronicity of these event deposits using simple log-ratio calculations that evaluate the age difference between those deposits.

The methodology, which will be distributed as an easy-to-use R package, iteratively calculates the ratio of possible ages of marker beds in a log space using a Monte Carlo (MC) random sampling approach, sets these age differences to zero, and subsequently constructs two tied age-depth models with which the possible synchronous deposition of event beds of interest can be tested using the same MC approach. This methodology allows confidently ruling out synchronicity when event beds are unrelated, or quantifying their potential to be synchronously deposited – within the limits inherent to the uncertainties of the applied dating technique and the distribution of marker layers. While developed within the framework of subaquatic paleoseismology, this methodology has application potential in any scientific discipline that involves (continuous) sedimentary records.

Towards Quantitative Evaluation of the Spatiotemporal Rupture Variability of Megathrust Earthquakes in South-central Chile Using Lacustrine Sedimentary Records

Dr Katleen Wils^{1,2}, Markus Niederstätter², Valentina Moreno Allende², Maarten Van Daele¹, Gonzalo Montalva³, Jürgen Konzett⁴, Ariana Molenaar², Jean Nicolas Haas⁵, Olivier Evrard⁶, Karen Fontijn⁷, Daniel Melnick⁸, Roberto Urrutia⁹, Mario Pino¹⁰, Marc De Batist¹, Jasper Moernaut²

¹Renard Centre of Marine Geology, Department of Geology, Ghent University, Ghent, Belgium,

²Institute of Geology, University of Innsbruck, Innsbruck, Austria, ³Departamento de Ingeniería Civil, Universidad de Concepción, Concepción, Chile, ⁴Institute of Mineralogy and Petrography, University of Innsbruck, Innsbruck, Austria, ⁵Department of Botany, University of Innsbruck, Innsbruck, Austria,

⁶Laboratoire des Sciences du Climat et de l'Environnement (LSCE-IPSL), Université Paris-Saclay,

Gif-sur-Yvette, France, ⁷Laboratoire G-TIME, Department of Geosciences, Environment and Society,

Université libre de Bruxelles, Brussels, Belgium, ⁸Instituto de Ciencias de la Tierra, Universidad Austral de Chile, Valdivia, Chile, ⁹Faculty of Environmental Sciences, University of Concepción, Concepción, Chile, ¹⁰Fundación para los Estudios Patrimoniales Pleistocenos de Osorno, Osorno, Chile

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

In 1960, the Valdivia segment of the Chilean subduction zone hosted the largest instrumentally recorded earthquake (Mw 9.5). Paleoseismic studies have revealed that such a ~1,000 km long rupture occurred on average every ~300 years in the last two millennia. These so-called full-segment ruptures alternate with more frequent partial ruptures, only affecting one or few megathrust asperities. Comprehensive studies evaluating the spatiotemporal rupture variability are thus crucial to test earthquake cycle models and improve local seismic hazard assessment. Lakes in the region have provided highly sensitive shaking records by identification of, e.g., turbidites in their sedimentary infill. The relation between the component(s) of earthquake strong ground motion and their resulting lacustrine sedimentary signature is, however, still not fully established. This hinders characterization and quantification of the source parameters of paleo-earthquakes, such as magnitude and rupture extent.

We present some preliminary results from a newly obtained 12 kyr long lacustrine record from Lago Rupanco (>110 turbidites of >4 cm), significantly extending the existing paleoseismic reconstruction for the recurrence of 1960-like earthquakes and partial or intraplate ruptures. We consider turbidite thickness, an approximation for turbidite volume, a good (relative) measure for the local shaking strength (intensity) as empirically confirmed by comparing event deposits for recent earthquakes in several Chilean lakes. Therefore, it can be used to discern deposits resulting from past strong shaking from those related to lower shaking strength, originating from distant large earthquakes or smaller nearby events. To distinguish those, we correlate the Lago Rupanco record to other long paleoseismic records in the region by matching geochemically identified tephra markers. Finally, we found that turbidite emplacement is not only related to shaking intensity, but also to a combination of PGV and shaking duration. This opens perspectives towards quantitative characterization of the long-term spatiotemporal variability of megathrust earthquakes in south-central Chile.

Climate, Mass Extinction, Oceanography and Tectonics Impacting Basin Margin Carbonate Systems Development for the Devonian - Carboniferous, Canning Basin, Australia

Dr Moyra E.J. Wilson¹

¹University of Western Australia, Perth, Australia

7B: Carbonate depositional systems from platform, slope to basin (1), Tāwhirimātea C (Level 2),
January 29, 2026, 10:15 AM - 11:45 AM

The latest Devonian to Early Carboniferous is a period of major global change with a transition from greenhouse to icehouse conditions, a global anoxic event and one of the 5 main mass extinction events of the Phanerozoic. In the warm shallow seas on the margins of the Canning Basin (northern W Australia) there was significant tectonic activity and major changes in biota are reflected in associated changes in platform structure from a reef rimmed margin to unrimmed ramp-style carbonate systems from the northern margin of the basin. Until recently the carbonate systems of the southern Canning Basin margin, only present in the subsurface, were almost unstudied (e.g. three historic wells had cores in the carbonates of the Southern Fitzroy Trough Margin: SFM). This integrated 12 well investigation (most drilled in the last decade) of core, sidewall core, microscopy, geochemical and fluid inclusion study of carbonate systems and their reservoir development builds on earlier individual well studies from scant historic wells on the Southern Fitzroy Margin (SFM). This Southern Fitzroy Margin had more tectonic complexity, common siliciclastic, and evaporitic interaction (subsurface salt domes) in comparison with the northern Canning Basin Margin. Here we evaluate the impact regional tectonics, regional environmental variation, basin evolution and diagenesis, as well as global climatic, biotic and oceanographic changes have had on the carbonate systems and their reservoir quality of northern W Australia during this critical Devonian-Carboniferous period of global change.

Sedimentary Facies and Depositional Architecture of Supercritical Sand-rich Glaciofluvial Fans

Prof. Dr. Jutta Winsemann¹, Falko Malis², Niklas von Soest¹, Yvonne Spychala³

¹Leibniz University Hannover, Institute of Earth System Sciences, Hannover, Germany, ²LBEG, State Authority of Mining, Energy and Geology, Hannover, Germany, ³RWTH Aachen University, Geological Institute, Aachen, Germany

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Deposits of upper-flow-regime bedforms have been documented from a variety of glacial depositional environments. However, despite the comprehensive studies on glaciofluvial deposits, few sedimentological studies have documented the facies architecture of supercritical sand-rich glaciofluvial systems. Here we present sedimentological and architectural data from different glaciofluvial systems that formed along the Middle Pleistocene Fennoscandian ice sheet. The studied depositional systems comprise steep, small glaciofluvial fans and larger, gently sloping glaciofluvial fans. The steep, small fans occur on the lee side of glaciotectionic ridges. These fans are dominated by sheetflood deposits, including bedforms of cyclic steps, breaking antidunes, stable antidunes and humpback dunes.

The larger glaciofluvial fans are characterized by sandy sheetflood deposits, alternating with coarser-grained, multilateral, multistorey or single storey channel bodies. The sheetflood deposits indicate upper-flow regime deposition by breaking or aggrading stable antidunes. Individual beds are commonly 10 to 70 cm thick and may form bedsets, up to 3.5 m thick, that fine- or coarsen-upwards. The sheetflood deposits probably record high flow-stage conditions. The dominance of aggrading stationary antidune deposits may have been controlled by grain size.

Intercalated shallow channel bodies record the establishment of an ephemeral distributary channel network. Most common are multilateral channel bodies with width/thickness ratios between 4 and 100. Incision of these channels probably occurred during the falling stage of the sheetfloods. A predominance of lateral accretion elements points to sinuous distributary channel networks with high lateral migration rates.

Detrital Zircon Geochronology Constraints on Sediment Provenance of the Mesozoic Rift Basins of Connecticut, USA

Professor Michael Wizevich¹, Jacqueline Giblin², Melissa Mostowy³

¹Central Connecticut State University, New Britain, United States, ²Arizona State University, Tempe, United States, ³Connecticut Department of Energy & Environmental Protection, Hartford, United States

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Hartford basin contains over 4 km of Upper Triassic to Lower Jurassic fluvial, lacustrine and volcanic strata. The Pomperaug basin, a small outlier basin ~20 km west, is composed of similar strata. Both basins developed as half grabens with active eastern border faults tilting strata to the east. Similarity of basin fills has long led to speculation that the basins were once more extensive and connected in a “broad-terranes” basin, with only erosional remnants remaining. In this study, LA-ICP-MS derived U-Pb ages from 13 samples were obtained to enhance provenance and refine paleogeographic reconstructions and tectonic models for basin development.

The samples contain zircons that reflect source areas with igneous or metamorphic activity during Alleghanian (270-320 Ma), Acadian (340-400 Ma), Taconic (420-490 Ma), Pan-African (550-640 Ma), and Grenville (900-1300 Ma) tectonic events. In the Hartford basin zircons from Triassic samples are mostly Acadian except a sample from the SE basin that is dominated by Taconic and Pan-African zircons. Earliest Jurassic samples contain a diverse assemblage, mainly Grenville, Taconic, and Pan-African zircons. Younger Jurassic samples contain primarily Taconic, Pan-African, and lesser Grenville zircons, except a sample from the SE basin which has mostly Pan-African zircons. Triassic Pomperaug basin samples contain mostly Grenville and Acadian zircons, with increasing amounts of the former in younger strata.

The results indicate that detrital zircon distribution within the Hartford basin is controlled by location; samples from the west side are dominated by Acadian zircons and those from the east by Pan-African and Taconic zircons. This demonstrates both eastern and western source areas. Furthermore, provenance changed during basin development; significantly more Grenville zircons in the Jurassic strata indicates increased western or axial drainage into the basin. Similar stratigraphic trends are recognized in the Pomperaug strata, which contain more Grenville zircons, reflecting closer proximity to that source.

Flutes, Striations, and Floating Ice: a Multi-scale Glacial Archive from the Late Palaeozoic of South Africa

Ricarda Wohlschlägl¹, Paulina Mejías Osorio¹, Marie Busfield², Albertus Smith³, Thomas Vandyk⁴, Daniel Le Heron¹

¹University of Vienna, Vienna, Austria, ²Aberystwyth University, Aberystwyth, United Kingdom,

³University of Johannesburg, Johannesburg, South Africa, ⁴University of Leicester, Leicester, United Kingdom

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Subglacially formed flutes with initiating boulders are excellent indicators of former glacier flow direction and, together with other glacial features, provide valuable insights into the dynamics of past glacial environments. Composed of unconsolidated till, flutes are typically poorly preserved and are therefore most commonly found in modern glacial forefields.

A newly identified site in South Africa's Northern Cape region reveals some of the best-preserved flutes with initiating boulders in the Late Palaeozoic Ice Age (LPIA) geological record. Accompanied by striated surfaces on hard bedrock, soft-sediment striated surfaces (such as fluted surfaces), and potential evidence of iceberg activity, this site offers a unique opportunity to examine a ~300-million-year-old glacial outcrop from both macro- and micro-scales.

The diversity of glacial features at this locality represents one of the most comprehensive records of glacially generated landforms from the Late Palaeozoic known to date. It may serve as a critical analogue for interpreting Quaternary glacial landsystems, many of which are either poorly preserved or only observable at low resolution on the modern seafloor.

Integrating Detrital Zircon Geochronology and Magnetostratigraphy to Refine the Paleocene-eocene Boundary in the Naran Bulak Formation, Gobi Desert, Mongolia

Mr William Wolfe¹, Dr Eric Roberts¹, Dr Sarah Slotznick², Dr Michael Novacek³

¹Colorado School of Mines, Golden, United States, ²Dartmouth College, Hanover, United States,

³American Museum of Natural History, New York City, United States

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Recent fossil discoveries in the Naran Bulak Formation of Mongolia's Central Gobi Desert challenge existing Asian Land Mammal Age (ALMA) biostratigraphy, revealing the need for an independent chronostratigraphic framework. The primary aim of this study is to construct a temporal framework of Paleogene stratigraphy within the Gobi Desert to better inform the timing of key paleoclimate events, such as the Paleocene-Eocene Thermal Maximum (PETM) and mammalian diversification associated with this boundary. This study integrates detrital zircon U-Pb geochronology and paleomagnetic polarity stratigraphy to refine the depositional age of key Paleogene sections in the Naran Bulak and Gashato formations.

Fieldwork conducted in 2024 across five localities yielded six measured sections, sub-meter-scale paleomagnetic sampling through each section, eight samples for detrital zircon geochronology, and three basalt samples for Ar/Ar geochronology of interbedded lava flows. These samples were collected in stratigraphic order and are currently in various stages of analysis.

Preliminary paleomagnetic results confirm preservation of primary magnetic signals. Initial detrital zircon data, analyzed by LA-ICP-MS, yield new insights into sedimentary provenance and are expected to provide maximum depositional ages. Ar/Ar dating of basaltic flows aims to provide depositional tie points within the magnetostratigraphy. This framework will enable testing the hypothesis that the PETM is preserved near the Naran-Bumban contact—a boundary previously suggested but not verified.

By anchoring local polarity reversals to the Global Polarity Time Scale, this work enhances regional correlations and facilitates comparison with PETM-bearing terrestrial records in North America and Central China. The outcome will be a high-resolution chronostratigraphic model for a historically under-constrained but fossiliferous basin, contributing new data to global Paleogene climate and faunal reconstructions. This project also recontextualizes over 75 years of fossil research in the Gobi Desert through the lens of modern sedimentological and geochronological techniques.

Deepwater Fan Giants and Mountains of Mud: A Caribbean Kaleidoscope of Ancient Seascapes and Hidden Continents

Professor Lesli Wood¹, Mr. Leiser Silva¹, Mr. Muhamad Harun¹

¹Colorado School of Mines, Golden, United States

Keynote: Prof. Lesli Wood, Tāwhirimātea A (Level 2), January 30, 2026, 9:00 AM - 9:45 AM

The southeastern Caribbean Margin has been tectonically active throughout much of the Miocene to present with the Caribbean plate obducting the Atlantic plate to the east, and obliquely colliding with the South American plate to the south. Mix in two of the largest continent-draining river systems in the world; the Orinoco and the Amazon Rivers, and you have huge sedimentation rates over-filling the basin, generating enormous mass failure, and over-pressuring the subsurface to build mountains of mud on the seafloor. All of these elements interact to produce an area of the world that is likely the most sedimentologically dynamic of anywhere on Earth. A mega-merge of ~50,000 sq km of 3D seismic data, some of which reaches nearly 33,000 m (100,000 feet) deep, is enabling us to view the seismic geomorphologic evolution of this enigmatic and energy rich province as never before. Extensional faults, mobile mud withdrawal and transtensional pull-apart processes produce enormous amounts of accommodation. This accommodation has been filled for the past 15 million years by deltaic progradation, tectonic-activity and over-accumulation triggered mass failures, and alongshore-current transported sediments. This talk will visit the processes and deposits of a basin that does not play by passive margin rules. Where leveed channels weave their way 250 km basinward through extremely complex and enormous seafloor topography to deposit in the Orinoco Fan. This region holds the entire post-Cretaceous history of the northern South American continent. Although its complexity has baffled geoscientists for 100 years, new data are revealing its secrets.

Failures and Fans: Utilizing Seismic Geomorphology to Examine Carbonate Slope Evolution in the Permian of the Midland Basin, Texas, USA

Professor Lesli Wood¹, Mr. Michael Braunschneidel¹

¹Colorado School of Mines, Golden, United States

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Carbonate slope deposits make up a huge portion of the rock record surrounding isolated carbonate platforms, and are known to play a significant role as energy and mineral resource reservoirs as well as posing significant hazards on the modern seafloor. In the resource-rich Permian Basin of west Texas, large amounts of deep-time subsurface data are available to examine the seismic geomorphologic evolution of carbonate slope failures and the surrounding carbonate fans that compose the Leonardian-age deposits in the Permian Basin. This basin hosts the Leonardian-age Central Basin Platform, a source for significant carbonate submarine gravity flows that have built the enormous platform slope apron and run out eastward into the deeper basin. The largest of these carbonate mass failures; the Midland Failure (upper Leonardian) covers 5-15 miles and averages 350' thick. Well penetrations indicate the Midland Failure is composed of calcareous and siliciclastic sediments. Seismic geomorphologic mapping shows multiple compressional zones, separated by north-south oriented transfer faults. Extension-dominated structuring in the mass failure proper results in east-west-oriented elongate minibasins filled during the healing phase with a blocky low gamma-ray, high density and resistivity material. Shearing along the western front creates deep narrow pull-apart mini-basins oriented north-south along the flow's western edge where material is sheared from the CBP for inclusion in the south-moving flow. Material outboard of the contractional toe shows collateral damage with intense compressional fracturing seen in the stacked imbricate thrusts. Intervals of mass failure deposits in the CBP slope are interspersed with periods of large carbonate fan development. Fans appear point-sourced from the platform. Individual fans run out ~10 km and show a maximum width of 3.36 km. The abundance of subsurface data offers a unique opportunity in this area to examine the details of ancient carbonate slopes during a critical period in Earth's history.

Well Logging Proxy of the Volcanic Activity Cyclicity in the Second Member of Lucaogou Formation in Santanghu Basin, northwest China

Dr Xinsong Wu¹, Dr Gang GAO¹, Dr. Zhilong Huang¹

¹China University of Petroleum, Beijing, Changping District, China

6E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (3), Rongomātāne B (Level 1), January 27, 2026, 4:25 PM - 5:55 PM

The second member of the Permian Lucaogou Formation in Santanghu Basin is a typical fine-grained mixed sedimentary rock related to volcano eruption. It is the main source rock and an important shale oil pay-zone in the basin. The main lithologies are tuff composed of volcanic dust, dolomite and their mixture. The sediments are extremely fine particles, low clay mineral and high carbonate content. Determination of the geological and geophysical proxies for volcano activity cycles recognition is of great significance for the fine stratigraphic correlation and sweet spot prediction of the shale oil in the second member of Lucaogou Formation. Based on thin section observation, mineral XRD analysis, element detection, statistics of SGR logs, geochemical testing of the source rock, this study confirmed that the element thorium (Th) mainly comes from Plagioclase from volcanic eruptions, while the potassium (K) comes from the weathering processes which is rich in volcanic dormancy period, so the ratio of Th/K from SGR well logs is an effective proxy to indicate the cyclicity of volcanic activity. The study has also shown that there were five obvious volcanic activity cycles during the sedimentation of the second member of Lucaogou Formation. From the bottom to the top cycle, the total organic carbon abundance of the source rocks shows a gradually decreasing trend, which is controlled by the decreasing of lake salinization. In addition, in this kind of fine-grained sedimentary rocks composed of volcanic dust, the abundance of many elements is mainly controlled by the volcanic activity cycle, and cautions should be exercised in climate and sedimentary environments interpretation.

Pervasive Fabric-retentive Dolomite of the Terminal Ediacaran Dengying Formation, SW China: Syndepositional Dolomitization in the Aragonite-dolomite Seas

Dr Wenhui Wu¹, Dr Yi Ding¹, Prof Zhiwu Li¹, Prof Shugen Liu¹

¹State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Chengdu University of Technology, Chengdu, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Precambrian dolomite exhibits two key distinctions from younger formation. Unlike Cenozoic dolomite, which typically contains abundant calcite and aragonite, and occurs as discrete interbeds with specific lithofacies, Precambrian dolomite commonly forms continuous successions up to hundreds of meters thick over large carbonate platforms, and encompasses multiple lithofacies. Furthermore, unlike Phanerozoic dolomite, which commonly displays crystalline textures, Precambrian dolomite frequently retains exquisite primary sedimentary fabrics. These differences indicate that the formation mechanism for Precambrian dolomite is distinct and cannot be explained by traditional models such as "sabkha," "seepage-reflux," and "microbial".

The terminal Ediacaran Dengying Formation in southwest China comprises platform-wide fabric-retentive dolomite with multiple lithofacies, providing excellent materials for investigating the origin of such dolomite. This study integrates detailed field investigations with laboratory analyses, including thin-section petrography, scanning electron microscopy, and geochemical microanalysis. Our results reveal that: (1) Both microbial dolomite (e.g., stromatolites, thrombolites, etc.) and non-microbial dolomite (e.g., grainstone, micrite, etc.) exhibit well-preserved depositional fabrics with similar crystal morphologies, indicating a common formation mechanism and suggesting that microbial processes should not be overemphasized. (2) The fine-grained and uniform crystal size of Dengying dolomite indicates a single phase of early dolomitization, as burial dolomitization typically produces coarser crystals. (3) Geochemical signatures approximate those of contemporaneous seawater, indicating that the diagenetic fluid was predominantly normal seawater and that isotopic fractionation induced by microbial processes was insignificant. (4) At millimeter to micrometer scales, identical fabrics show heterogeneities in geochemical signals. However, the absence of systematic trends in these signals implies that Dengying dolomite could record high-frequency fluctuations in seawater isotopic composition. Collectively, these characteristics constrain the Dengying dolomite as a product of syndepositional dolomitization. This process occurred within the context of Neoproterozoic "dolomite seas", characterized by a high Mg/Ca ratio of seawater, widespread microbial influence, ocean anoxia, and low sulfate concentrations.

A Multi-parameter X-ray Computed Tomography Approach for Enhancing Core Description

Ms Yen-Hsi Wu¹, Mr Jyh-Jaan Steven Huang¹, Mr Gerald Degenhart², Mr Chih-Chieh Su¹, Mr Neng-Ti Yu³, Mr Jiun-Yee Yen⁴, Mr Shyh-Jeng Chyi⁵, Mr Jia-Hong Chen⁴

¹Institute of Oceanography, National Taiwan University, Taipei City, Taiwan, ²Medical University of Innsbruck, Innsbruck, Austria, ³Center for General Education, National Tsing Hua University, Hsinchu City, Taiwan, ⁴Department of Natural Resources and Environmental Studies, National Dong Hua University, Hualien City, Taiwan, ⁵Department of Geography, National Kaohsiung Normal University, Kaohsiung City, Taiwan

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Reconstructing past environments requires accurate interpretation of sedimentary variability within cores, including internal textures such as grain size and compositional changes that reflect hydrodynamic conditions and sediment provenance. Conventional approaches, such as visual core descriptions and discrete grain-size or geochemical analyses, are often limited by surface-only observation, destructive sampling, and insufficient resolution, which can obscure internal heterogeneity and reduce sampling representativeness. X-ray Computed Tomography (CT) offers a non-destructive method for visualizing sedimentary structures in three dimensions based on attenuation contrasts. While widely applied, most CT use in sedimentology remains qualitative and observer-dependent. To address this, this study explores a parameter-based framework that quantitatively captures CT intensity (attenuation) variability extracted on a slice-by-slice basis. In this study, CT data from sediment cores in Dapeng Bay, southwestern Taiwan, were classified into six attenuation-based regions of interest (ROIs), each reflecting distinct sedimentary features. Volume fractions of each ROI were calculated to track downcore variations. Statistical metrics (mean CT intensity and coefficient of variation) and morphological descriptors (mean thickness of ROI 2 and ROI 6) were derived to capture overall textural variability and characterize the geometry of specific sedimentary features, enhancing the sedimentary characterization. By integrating these parameters, high-resolution (~100 µm) downcore profiles were constructed to preserve internal three-dimensional textures and resolve fine-scale sedimentary changes. Additionally, component labeling was used to derive grain orientations from high CT-intensity particles, providing indicators of preferred grain alignment that may reflect paleoflow dynamics. This multi-parameter approach improves the reproducibility of sedimentary characterization, enables differentiation of visually similar but texturally distinct intervals, such as hemipelagites, homogenites, or event beds associated with floods and earthquakes, and informs targeted sampling strategies. Our findings highlight the potential of this framework to complement the detection and interpretation of sedimentary signatures related to past geohazards in both coastal and offshore environments.

Bedding-parallel Stylolites as a Proxy for the Sealing Capacity of Deep-burial Carbonate Cap Rocks in the Tarim Basin, NW China

Assoc. Prof. Jun Wu^{1,2,3}, Prof. Tailiang Fan^{1,2}, Lecturer Enrique Gomez-Rivas⁴, Prof. Anna Travé³,
Lecturer Daniel Koehn⁴, Prof. Paul D. Bons⁵

¹School of Energy Resources, China University of Geosciences (Beijing), Beijing, China, ²Key Laboratory of Marine Reservoir Evolution and Hydrocarbon Enrichment Mechanism, Ministry of Education, China, Beijing, China, ³Department of Mineralogy, Petrology and Applied Geology, Faculty of Earth Sciences, University of Barcelona (UB), Spain, Barcelona, Spain, ⁴Friedrich Alexander University (FAU) Erlangen Nürnberg, Geozentrum Nordbayern, , Geozentrum Nordbayern, Schlossgarten 5, Germany, ⁵Department of Geosciences, University of Tübingen, Wilhelmstrasse 56, Germany

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The sealing capacity of carbonate cap rocks bearing different stylolite types is analyzed using a combination of petrographic, petrophysical, pore structure and sealing capacity characterization techniques. This study is based on examples of carbonate cap rocks that seal ultradeep hydrocarbon reservoirs of the Tarim Basin (China). Samples from both drill cores and their outcrop analogues are investigated to quantify how morphology does influence the sealing capacity of different types of stylolite-bearing rocks. The study cap rocks consist of mudstone, wackestone to packstone, grainstone and dolomitic limestone. Four stylolite types are identified: rectangular layer, seismogram pinning, suture & sharp peak and simple wave-like types. The difference in the sealing capacity of carbonate cap rocks is attributed to their pore structure connection and stylolite types. Samples bearing simple wave-like stylolites have the best sealing capacity, followed by those with rectangular layer and suture & sharp peak types, whereas carbonates hosting seismogram pinning type have the lowest sealing capacity. The impact of stylolite segments on the rock sealing properties, however, differ from one segment to another. Rectangular layer type stylolites can be divided into three distinct segments (with good, moderate and poor sealing, respectively). Both the seismogram pinning and suture & sharp peak stylolite types are divided in two parts, with the former one having moderate and poor sealing and the latter exhibiting good and moderate sealing. The simple wave-like type has a good sealing capacity all along the pressure-solution seam. The most effective sealing barriers for vertical fluid flow form when: (1) calcite and siliceous cements are pervasively distributed in the vicinity of stylolites, forming highly cemented zones with lower porosity and permeability than their surrounding host rocks; (2) stylolites are enriched in insoluble residues; (3) rare microfractures and dissolution vugs are found along the stylolites. This work provides useful examples for the prediction of the sealing potential of stylolite-bearing carbonate rocks according to stylolite morphology in other geological settings.

Bedload Transport and Deposition of Mud-grade Sediments in Deep-lacustrine Settings: A Case Study in the Triassic Yanchang Formation, Ordos Basin, China

Dr Kelai Xi¹, Dr Miruo Lin¹, Dr Yingchang Cao¹

¹China University of Petroleum (east China), Shandong, China

10F: Sediment gravity flow deposits in lacustrine basins (2), Rongomātāne C (Level 1), January 30, 2026, 11:00 AM - 12:30 PM

With the continuous progress in shale oil and gas exploration and development, the sedimentology of deep-water fine-grained sedimentary rocks remains an important focus for research. In deep-lacustrine settings in-particular, mud-sized sediments are dominated and widely distributed. However, due to the difficulty in identifying the particle structure and sedimentary structure of mud-sized sedimentary rocks, the mud-sized sediments are generally believed to be deposited via suspension settling in deep-lake areas. Here, we conducted detailed thin-section observations, advanced mineral identification and characterization system analyses, scanning electron microscopy observations, three-dimensional reconstruction analysis by focused ion beam-electron beam dual-beam system, and discovered evidence of bedload transport of mud-sized sediments in deep-lake areas. During the deposition of mud-sized sediments, the mud-sized volcanoclastic materials release a large amount of high-valence metal cations into lake water, which promote the flocculation of felsic particles and smectite or mixed layers of illite/smectite through electrostatic forces, forming flocs. Subsequently, the flocs are transported as bedload and deposited on the sediment bed, forming numerous floccule ripples in deep-lake areas. When floccule ripples form, the flocs continuously pass over the crests of the floccule ripples and accumulate downward along the sloping surface of the floccule ripples, forming multiple foreset beds. The foreset beds from different periods occurred lateral migration and their front ends were continuously advancing forward, resulting in many foreset beds being stacked and laterally connected, ultimately forming the accumulation of deep-lake mud-sized sediments. The discovery of floccule ripples and foreset beds confirms that the frequent dynamic depositional condition occurs in deep-lake areas, and the mud-sized particles can be transported as bedload in this dynamic depositional condition and then deposited. A new understanding of the sedimentary process of deep-lacustrine mud-grade particles provides a theoretical basis for clarifying the distribution of mineral composition and organic matter content in mud-grade sediments.

Self-organization in Carbonate Depositional Systems: Insights from Numerical Forward Modelling and Implications for the Subsurface Heterogeneity

Dr Haiwei Xi¹, Prof. Sam Purkis², Prof. Peter Burgess³

¹China National Offshore Oil Corporate, Shanghai, China, ²University of Miami, US, ³University of Liverpool, UK

4A: Can Forward Stratigraphic Modeling enhance geological understanding of the subsurface and predict sedimentation through time and space? (1), Tāwhirimātea A (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

Coherent and ordered patterns are widely observed in both modern and ancient carbonate depositional environments. Regularly patterned reef ridges develop in the lagoons of at least one-third of Earth's coral reefs today, spanning hundreds of meters to kilometers. For microbial carbonates, similar 'ridge-and-runnel' patterns are also well documented. In both cases, the emergence of regular patterns are due to the complex spatial interactions between different system components, independent of initial conditions and unforced by external factors, suggesting the possibility of spatial self-organization. Though some conceptual models are built upon empirical studies, it remains difficult to test such hypotheses given the complex spatial interactions between substrate topography, hydrodynamics regime, in-situ carbonate accumulation and the adjacent sedimentation rates. Numerical forward modelling provides a useful tool to investigate the specific mechanism underlying pattern formation. When combined with empirical observations and carefully calibrated, the model can predict how the patterns develop and evolve through time, and highlight possible key controls on each stage. Using a Turing-type morphogenesis model for coral reefs, the model results suggest that patterned reef ridges develop through a four-phase trajectory, from isolated pinnacles, through low-relief ridges to well-connected ridges with semi-enclosed inter-ridge ponds and finally a dense, highly branching, and anastomosing pattern of reef ridges. Each phase is dictated by changes in the lagoon's hydrodynamic regime. The influence of hydrodynamics is also revealed by the modelling results of *Stromatocyte3D*, a three-dimensional stratigraphic forward model for marine agglutinated microbial carbonate buildups. When the hydrodynamic influence is weak, microbialites grow on the top of antecedent highs as isolated mounds. With increasingly strong influence of hydrodynamics on in-situ growth and suspended sediment deposition, mounds start to coalesce in the dominant flow direction and form elongated mounds and then ridges with inter-ridge runnels, strikingly similar to modern observations.

Origin and Formation Mechanisms of High-quality Clastic Reservoirs in Deep to Ultra-deep Cretaceous Bashijiqike Formation of Zhongqiu Area in Kuqa Depression, West China

Miss Lu Xiao², Professor Jin Lai^{1,2}, Mr Xun Yang², Professor Guiwen Wang^{1,2}

¹National Key Laboratory of Petroleum Resources and Engineering, China University of Petroleum (Beijing), Beijing, China, ²College of Geosciences, China University of Petroleum (Beijing), Beijing, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Cretaceous Bashijiqike formation of the Zhongqiu area in the Kuqa Depression, Tarim Basin, exhibits enormous potential for oil and gas exploration. However, the Bashijiqike Formation is characterized by deep to ultra-deep burial depths, complex tectonic conditions, high stress concentration and strong reservoir heterogeneity. The unclear understanding of the main controlling factors of reservoirs has constrained the evaluation and subsequent development of hydrocarbon reservoirs.

In order to clarify the main controlling factors and establish the well log evaluation methods of high-quality reservoirs, depositional microfacies are analyzed by integrating core data, well logs, and thin section analyses, focusing on the logging response characteristics of different sedimentary microfacies. Diagenetic types and intensities are determined based on reservoir space characteristics.

A combined spring model is applied to determine in-situ stress orientation and magnitude using well log data. Key findings include: The target layer develops in a braided river delta depositional system, with sand bodies primarily distributed in subaqueous distributary channel microfacies. Dissolution and cementation is weak. Lower bidirectional horizontal stress difference correlates with higher porosity in the study area. During reservoir formation, deposition serves as the prerequisite for developing effective reservoirs, diagenesis determines the current porosity-permeability characteristics, and stress adjustments regulate post-diagenetic modifications of reservoir physical properties. Collectively, depositional foundations, diagenetic alterations, and stress adjustments govern reservoir quality. Guided by the "three-element control" concept (deposition, diagenesis, and stress), the developmental characteristics of high-quality reservoirs are analyzed to predict high-quality reservoirs. High-quality reservoirs predominantly develop in: Mid-sections of thick subaqueous distributary channel sand bodies (low clay content, coarse grain size), layers with minimal cementation, moderate compaction intensity, and low stress. These findings will provide technical support for comprehensive evaluation and favorable zone prediction in deep to ultra-deep tight sandstone reservoirs.

Effects of Sediment Types on Sedimentary Processes in Semi-enclosed and Half-open Bays

Dr Qingbin Xie^{1,2,3}, Dr Xin Li^{2,3}, Professor Longwei Qiu⁴, Professor Coco Giovanni⁵

¹China University of Petroleum-Beijing, Beijing, China, ²China University of Petroleum-Beijing at Karamay, Karamay, China, ³Xinjiang Key Laboratory of Intelligent Petroleum Exploration and Engineering, Karamay, China, ⁴China University of Petroleum-East China, Qingdao, China, ⁵University of Auckland, Auckland, New Zealand

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Sediment types and grain size are widely used to infer geological processes. This research aims to reveal the influence of sediment types on sedimentary processes in semi-enclosed and half-open bays. Moon Bay and Chaoyanggang bay on China's Shandong Peninsula are selected as representatives of half-open and semi-enclosed bays with complex sedimentary environments, respectively. Modern sediment reconnaissance was conducted to classify sediment types, calculate grain-size characterization parameters. Delft 3D was used to simulate the sedimentary evolution of deposits under different sediment types in these two bays. The results show that the eight sediment types and their grain-size parameters in Chaoyanggang bay reveal the complexity of the sedimentary environment in semi-enclosed bays. The three sediment types and their grain-size characteristics in Moon Bay indicate a relatively stable sedimentary environment and hydrodynamics in the semi-open bay. Numerical simulations show that under the influence of different sediment types and grain sizes, the proximal part of the underwater shoal in the bay is dominated by erosion, the middle part exhibits slightly stronger deposition than erosion, and the distal part is primarily characterized by significant deposition. The underwater shoal in the semi-enclosed bay has a smaller distribution area and thickness than that in the semi-open bay, whereas the offshore Strip-shaped underwater shoals exhibit the opposite trend. As sediment types increase and grain size coarsens, the offshore shoal gradually decreases in size and thickness, with worsening continuity. In contrast, the fan-shaped underwater shoal within the bay shows a slight increase in size, along with significant growth in thickness and sinuosity, particularly in the distal part, where deposits transition from near-parallel strip-shaped to crescentic-shaped underwater shoals. Modern sedimentation and sedimentary numerical simulation provide a means to reconstruct the time-series evolution of sediments in complex sedimentary environments. This study is expected to support the establishment of sedimentary evolution models and the exploration of reservoir development in such bays.

A Foredeep Crocker Fan Model: Evidence from the Outcrop Area in Sabah, Malaysia

Dr Xinong Xie¹, Dr Yongchao Lu¹

¹China University of Geosciences, Wuhan, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The southern continental margin of the South China Sea, as a convergent margin, is characterized by collision of microcontinental block, development of deep-sea trough and thick sedimentary deposits at the foredeep. The Crocker fan is a deepwater submarine fan formed in the foredeep setting during the Oligocene to Early Miocene after the Sarawak collision orogeny, and is distributed in the Miri zone of the northern Borneo collision zone, with an area of more than 25,000 square kilometers. Those deposits are involved in fold-thrust wedge due to the Sabah orogeny, and exposed in the onshore Sabah of Borneo. This paper summarizes the sedimentary characteristics of the Crocker submarine fan through the observation of the outcrops in the Sabah area of Malaysia.

Depositional features of the Crocker submarine fan include: The fan mainly consists of sandy high-density turbidites with fine to medium sandstones, and muddy low-density turbidites with siltstone. It includes tens of meters thick turbidite channels, medium-thick turbidite channels/natural levee deposits, lobe deposits, thin sheet sand and mudstone interbeds. Hyperpycnites are occasionally visible with coarse sandstone or gravel-bearing deposits. Those deposits composed shallowing-upward sequences with an estimated total thickness exceeding 6,000 meters. In addition, trace fossils are very common. A plentiful plant fragment can be observed on the interlayer surface of sheet sand and mudstone, and lenticular vitrinite stripes are visible in some areas, indicating that coastal peat swamps are transported into deepwater deposits. These well-exposed sections provide excellent examples for submarine fan deposits formed in foredeep environments with a narrow shelf.

Genetic Model of Fan Delta Lithofacies and Its Seismic Sedimentological Interpretation in the Lower Submember of Shahejie Formation, Sanhecun Sub-sag, Zhanhua Sag

博士 Yiming Xu¹

¹China University of Petroleum (Beijing), Beijing, China

9F: Sediment gravity flow deposits in lacustrine basins (1), Rongomātāne C (Level 1), January 29, 2026, 4:25 PM - 5:55 PM

The complex gravel-rich sandstones in the lower submember of the Shahejie Formation (Es_3^3) within the Sanhecun Sub-sag of the Zhanhua Sag are genetically attributed to fan delta deposits. Reconstructing the sedimentary framework of these fan deltas provides critical insights for predicting gravel-rich sandstone reservoirs. Based on sedimentary structures, grain morphology, particle arrangement, and supporting mechanisms observed in core samples from six cored wells, ten lithofacies were identified.

Six lithofacies association sequences were summarized, with their genetic models analyzed to reflect distinct depositional environments: clastic channels, sheetflood deposits, braided channels, braided bars, subaqueous distributary channels, and subaqueous clastic lobes. To characterize the spatio-temporal distribution of fan deltas, three-dimensional seismic data were processed using seismic sedimentology methodologies. Techniques including 90° phase shift, stratal slicing, RGB blending, and seismic facies-controlled waveform-indicated inversion were employed to reconstruct the evolutionary history of the Es_3^3 sedimentary system. These methods enabled precise delineation of depositional architecture, linking lithofacies associations to seismic facies patterns and facilitating interpretation of depositional system evolution in this petroliferous sag.

Shallow Marine Delta-tidal Ridge System Evolutions And Their Control on Reservoir Diagenesis During the Early Miocene Rapid Transgression in Zhu Iii Depression, South China Sea

Mr Caiwei Fan¹, **Assoc. Prof. Jie Xu**², Mr Shunli Li³

¹China National Offshore Oil Corporation, Zhanjiang, China, ²China University of Geosciences (Beijing), Beijing, CHINA, ³China University of Geosciences (Beijing), Beijing, CHINA

2C: Coastal to shelf environments across time and space (2), Tāwhirimātea E (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

The early Miocene Zhujiang Formation in Zhu III Depression, the Pearl River Mouth Basin, northern South China Sea, contains thick shallow marine deposits formed under a rapid marine transgression between 23–16 Ma. However, the detailed depositional facies and evolution, controlling factors, and their impact on reservoir diagenesis remain poorly understood. This study integrates 3D seismic data, well logs, cores, thin sections, and paleontological records to analyze sedimentary facies, depositional environments, and key reservoir controls. The results reveal a clear spatiotemporal evolution: tide-influenced deltaic systems with northwest–southeast progradation dominate the second member (ZJ2) and the lower submember of the first member (ZJ1L) of the Zhujiang Formation, while the upper submember of the first member (ZJ1U) is characterized by tidal sand ridges and shelf mudstones. The paleontological records based on the planktonic foraminifera abundance and diversity also indicate sea level changes from coastal to middle-outer shelf. The evolution of these systems was primarily controlled by sea-level fluctuations, a gradual decline in sediment supply, and local variations in paleogeomorphology. Depositional processes strongly influenced the content of framework grains, matrix, and bioclasts, thereby governing diagenesis and reservoir quality. The ZJ1U exhibits weak cementation, with reservoir quality mainly affected by matrix content. In contrast, ZJ2 and ZJ1L, deposited under stronger hydrodynamic conditions, have lower matrix content and generally better reservoir properties. However, bioclast-rich intervals in these units may experience calcite cementation, leading to a reduction in reservoir quality. These findings provide new insights into the evolution of shallow marine delta–shelf tidal ridge systems during rapid transgression, and their implications for reservoir diagenesis and quality prediction.

Sedimentary Environmental Controls on the Genesis, Distribution, and Diagenetic Evolution of Illite in the Pinghu Formation, Xihu Sag

Fangyu Xu¹

¹China University of Petroleum (east China), Qingdao, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The East China Sea Basin constitutes a primary petroliferous province, harboring the Xihu Sag—a hydrocarbon-enriched depression with considerable exploration prospects. The Pinghu Formation, which developed in a semi-enclosed bay braided delta-tidal lagoon system, is a crucial stratigraphic interval for tight sandstone gas exploration. Sedimentation and diagenesis profoundly alter the formation and evolution of clay minerals within reservoirs. Illite's widespread distribution greatly affects reservoir porosity and permeability, highlighting its importance in tight reservoir appraisals. Through the application of core observation, scanning electron microscopy (SEM), and quantitative X-ray diffraction (XRD) analysis, this study aims to systematically examine the genetic mechanism of illite and its implications for reservoir properties. Highly dispersed illite content is negatively correlated with porosity and permeability. The fibrous and filamentous structures occlude or bridge pore throats, thereby substantially reducing permeability and causing reservoir densification. The sedimentary environment constitutes the material basis and sets the initial geochemical context for illite development, via precursor mineral regulation. The exploration covers kaolinite, I/S mixed-layers, and initial pore-water chemistry. In comparison to semi-enclosed, freshwater-influenced environments, open depositional systems like tidal flats and delta fronts are more favorable for initial illite enrichment and subsequent authigenic cementation. The diagenetic phase is essential for the final formation of illite, with primary pathways being smectite transformation, kaolinite illitization, and the dissolution-reprecipitation of silicate minerals, including K-feldspar. Transformational effects are contingent upon burial depth, geothermal gradient, and the alteration of pore fluids. The combined processes of sedimentation and diagenesis are essential in defining illite's formation, distribution, and morphological attributes. The comprehension of this relationship is essential for the precise prediction of high-quality reservoir distribution and for improving comprehension of accumulation mechanisms in the region's tight sandstones. The comprehension of this relationship is essential for the precise prediction of high-quality reservoir distribution and for improving comprehension of accumulation mechanisms in the region's tight sandstones.

Sediment Mixing by Along-strike Currents on Miocene Shelf of Western Pearl River Mouth Basin, Northern South China Sea: Constraints from Detrital Zircon and Clay Mineral

Assoc. Prof. Jie Xu¹, Caiwei Fan², Hao Wang¹, Yang Yang¹, Yangyang Song¹

¹China University of Geosciences (Beijing), Beijing, China, ²China National Offshore Oil Corporation Zhanjiang Branch, Zhanjiang, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Longshore currents played a critical role in shaping sediment dispersal on the Miocene shelf of the western Pearl River Mouth Basin, challenging the conventional view that sediment delivery followed a direct river-delta-deep sea pathway. Sediments in the Zhujiang Formation have long been attributed to adjacent uplifts, but our new provenance data suggest a more complex scenario.

This study integrates newly acquired and published detrital zircon U–Pb ages and clay mineral data to reconstruct sediment transport patterns. In the Oligocene Zhuhai Formation, deposited during a lowstand and initial transgression, zircon age spectra are dominated by 120–200 Ma (Yanshanian Orogeny) and 400–500 Ma (Caledonian Orogeny) components, indicating local sediment sourcing. In contrast, the early Miocene Zhujiang Formation shows increased zircon age contributions from 200–300 Ma, 750–950 Ma, 950–1200 Ma, and 2300–2700 Ma, pointing to more distal provenance.

Comparisons with coeval detrital zircon data from the Pearl River reveal strong similarities in both age spectra and multidimensional scaling (MDS) plots, indicating a long-distance sediment connection likely driven by along-strike longshore currents. The influence of nearby uplifts appears to have diminished during this time.

Clay mineral assemblages further support this interpretation. When compared with potential sources such as the Pearl River, Hainan Island, and Taiwan, the shelf samples show strong mineralogical affinity to the Pearl River. These results demonstrate that longshore currents could transport fine-grained sediments, including silt-sized zircon, over distances greater than 200 km, establishing them as the dominant sediment delivery mechanism during the Miocene transgression.

Tsunami Inundation and Sedimentation Patterns from the 2024 Noto Peninsula Intraplate Earthquake: Influence of Riverine Overflow in a Low-lying Coastal Area

Dr Masaki Yamada¹, Gen Sasamoto¹, Hajime Naruse², Daisuke Ishimura³, Ryo Nakanishi⁴, Katsuya Maehashi¹, Yoshiaki Kiyozuka¹

¹Shinshu University, Japan, ²Kyoto University, Japan, ³Chiba University, Japan, ⁴National Institute of Advanced Industrial Science and Technology, Japan

8D: Sedimentary evidence of geohazards – past and present (1), Rongomātāne A (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

The Mw 7.6 earthquake that struck the Noto Peninsula on January 1, 2024, was an intraplate event along the eastern margin of the Japan Sea. The earthquake generated a tsunami that caused severe local inundation along the northeastern coast of the peninsula, where tsunami dynamics remain poorly understood due to the absence of nearby tide gauges. Such meso-scale tsunamis generated by intraplate earthquakes are smaller than those from Mw9 trench-type earthquakes but occur more frequently, posing a threat to regional disaster prevention. Thus, this study examines and details the tsunami deposits from the 2024 Noto Peninsula earthquake, addressing the lack of research on meso-scale tsunami deposits. We conducted field investigations in the coastal region of Uchiura, which is one of the hardest-hit areas, in late January 2024. The study area lies at the head of a semi-enclosed bay and is bisected by a small river. The tsunami inundated up to 750 m inland, with an observed inundation height over 4.5 m. We described tsunami deposits at 172 sites and collected samples at selected locations. The deposits were mostly sandy and lacked the landward thinning and fining trends observed in typical tsunami deposits. Instead, the thickest layers occurred near the inundation limit, where low riverbanks allowed tsunami overflow from the river into adjacent lowlands. A two-layer structure, divided by a mud drape or a layer of plant debris, was commonly observed, indicating at least two tsunami inundations. These results suggest that inundation in this area was dominated by riverine overflow rather than direct run-up from the sea, producing a non-typical tsunami deposit distribution pattern. Our results highlight that small-scale topography can strongly influence sedimentation from meso-scale tsunamis, especially in inland areas affected by tsunami inflow via river channels. This study provides a significant example for interpreting paleotsunami records in similar settings.

The Bedrock Strength Does Not Affect River Profile: Significance of Sediment Dynamics in Controlling River Morphology

Ms Nanako Yamanishi¹, Mr Hajime Naruse¹

¹Kyoto University, Kyoto, Japan

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

To comprehensively understand the sedimentary basin-filling process from a source-to-sink perspective, it is necessary to understand how much erosion in mountainous areas is controlled by lithology. Bedrock strength has been believed to be a key parameter influencing incision rates. However, in actual landscapes, lithological boundaries often do not coincide with changes in river gradient, implying that erosional rates do not vary depending on local lithology.

This study reveals that bedrock strength does not significantly influence erosional rates in bedrock rivers. We applied a sediment-flux-dependent erosion model to rivers in the Abukuma River basin in northeastern Japan to evaluate the influence of bedrock strength and channel-bed gravels on river profile, considering the sediment cover effect. The sediment-flux-dependent model assumes that erosion occurs when transported gravels collide with bedrock and that no erosion occurs when sediment fully covers the bed. Thus, the model explicitly incorporates erosion-related parameters such as grain size, bedrock strength, and sediment flux, allowing field-measured rock properties to be input. The field surveys were conducted to obtain bedrock strength and gravel size data, and landscape evolution was modeled until rivers with a constant gradient reached equilibrium. For comparison, we also performed calculations using a simpler stream power model that does not explicitly incorporate the physical processes of erosion.

The numerical examination showed that the model considering the sediment covering effect best explains the observed topography. The local lithology does not affect the erosional rates because softer lithologies tend to have a higher sediment cover, suppressing erosion. In contrast, harder lithologies had lower cover rates, allowing erosion to proceed more actively. These findings demonstrate that bedrock strength does not directly control the river profile. In contrast, sediment supply and grain size distribution in source areas could strongly influence the gradient, highlighting the significance of sediment dynamics in shaping river morphology. Future work should consider the effects of lithology-dependent variations in sediment supply and grain size on topographic gradients. Moreover, incorporating mixed grain-size distributions into the model will provide a more detailed understanding of sediment influences on river topography.

Sediment Gravity Flow Deposits in Lacustrine Basins: Processes and Products

Professor Tian Yang¹

¹Chengdu University of Technology, Chendu, China

9F: Sediment gravity flow deposits in lacustrine basins (1), Rongomātāne C (Level 1), January 29, 2026, 4:25 PM - 5:55 PM

An improved understanding of the transport process and products of sediment gravity flow deposits in lacustrine basins is critical for revealing their geological transient event records. Two case studies are analyzed to exhibit the unique characteristics of sediment gravity flow deposits with the effect of paleo earthquake and ancient flood. Sediment gravity flow deposits from the Eocene Shahejie Formation in the Linnan Sub-sag, Bohai Bay Basin, provide a rare case study to reveal paleo-earthquake activities. The seismite sequences are composed of a belt of seismic breccias, step micro faults, liquefied deformation, to normal strata from bottom to top, reflecting the effects of earthquakes weakening upwards. Earthquake-related shaking probably induced sediment failures at the delta front, and formed massive sandstone-dominated sediment gravity flow deposits. Floating mud clasts and shear structures between beds are observed. The common liquefied deformation structures in the massive sandstones further support paleo-earthquake shaking.

Sediment gravity flow deposits in the Baijiantan Formation of the central Mahua Sag, Junggar Basin, provide a rare case study to reveal the effect of flood. The grain size of deep-water sediments is significantly coarser than that of the delta-front deposits. In addition, widespread inverse-to-normal grading bedding, frequent subtle grain-size variations within thick massive sandstones, carbonaceous fragments uniformly dispersed or stratified in massive sandstones, well-developed flaser, wavy, and lenticular bedding, hummocky cross-stratification in relatively coarse-grained deposits, and banded-to-lobate sandbody distribution patterns, collectively indicate a typical hyperpycnal flow origin. A humid climatic background serves as the prerequisite for extensive hyperpycnal flow development. Delta-front troughs control hyperpycnal flow transport directions, while low-lying topography governs the distribution of hyperpycnal flow deposits.

Therefore, understanding the origin, transport, and distribution of sediment gravity flow deposits in lacustrine basins can provide valuable insights into how geological transient events affect sediment dynamics.

Diagenetic Characteristics and Diagenetic Evolution of Mesozoic Volcaniclastic Rocks in the Dongyingtanhai Area of the Bohai Bay Basin, China

Professor Shaochun Yang¹, PhD Student Dongmou Huang¹, Engineer Chunmin Xue¹

¹China University of Petroleum (East China), Qingdao, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Mesozoic in the Dongyingtanhai area of the Bohai Bay Basin in China has undergone tectonic movements such as Yanshan and Xishan, and developed volcaniclastic rocks in fluvial-lacustrine environment such as tuff, volcanic breccia and sedimentary tuff, which have complex diagenesis and strong heterogeneity in reservoir space. In this paper, the diagenesis and evolution characteristics of volcaniclastic rocks are studied based on the analysis of rock thin sections, scanning electron microscopy, cathodoluminescence and X-ray diffraction.

Mesozoic volcaniclastic rocks have undergone four diagenetic stages, including condensation consolidation, hydrothermal fluid, weathering leaching and burial diagenesis, and the condensation and consolidation stage undergoes condensation and consolidation, compaction, devitrification and recrystallization, and the molten slurry condenses and solidifies into rocks, forming unstable vitreous materials such as stomatal structure, condensation shrinkage fracture glass cuttings, and plastic cuttings, which are gradually transformed into stable crystalline materials with the increase of temperature and pressure during the burial process. In hydrothermal stage, cementation and filling occur, and the free ions in the formation fluid enter the pores and fractures of the volcaniclastic rocks to precipitate and precipitate or form secondary minerals to fill the pores. In the weathering leaching stage, volcaniclastic rocks are subjected to strong weathering denudation and surface water leaching, which causes some soluble minerals such as feldspar and calcite or rock matrix in the rock to be dissolved to form dissolution holes and fractures. In the burial stage, especially in the secondary deep burial, compaction, siliceous and carbonate cementation, carbonate metasomatism, dissolution and other diagenesis occur.

The diagenetic evolution of volcaniclastic rocks shows the characteristics of pore compaction and pore reduction caused by gradual condensation and consolidation of eruptive magma, pore reduction by hydrothermal cementation filling, pore increase by atmospheric freshwater dissolution, pore reduction by buried diagenetic cementation, and pore increase by dissolution of organic acids.

Effects of Basin Tectonic Evolution on Multi-phase Dolomitization: Insights from the Middle Permian Qixia Formation of the NW Sichuan Basin, SW China

Dr Zhe Yang^{1,2}, Dr Haitao Sun³

¹Beijing Institute of Uranium Geology, Beijing, China, ²National Key Laboratory of Uranium Resource Exploration-Mining and Nuclear Remote Sensing, Beijing, China, ³China University of Petroleum-Beijing, Beijing, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The platform-marginal shoal carbonates of the Middle Permian Qixia Formation in the NW Sichuan Basin, as important ultra-deep (> 5000 m) hydrocarbon reservoirs, experienced multi-phase dolomitization and recrystallization during the long-term and complex basin tectonic evolution; however, there is no consensus on the dolomitization mechanism. Four types of dolomites have been identified: medium- and coarsely-crystalline dolomites within patchy dolomitized limestone (LD) at the top of the carbonate strata, massive medium to coarsely-crystalline dolomites categorized as porous dolomites (MD1) and tight dolomites (MD2) at the bottom of the carbonate strata, and cement coarsely saddle dolomites (SD) in the vugs and fractures. All dolomites exhibit similar the REESN pattern to the host limestone with an obviously positively Ce anomaly, and show Sr isotopes falling in the range of Permian seawater. However, the LD dolomites display a higher Sr but lower Mn concentration, and more positive $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ than other types of dolomites. The petrographic and geochemical results suggest the dolomites of the Qixia Formation replaced precursor grainstone by the seawater-derived fluids. A comprehensive dolomitization model is proposed, incorporating seawater-reflux, intermediate-burial and tectonic-squeegee, and hydrothermal dolomitization for forming different types of dolomites. LD dolomites are early diagenetic products after selective dissolution under a near-surface or shallow burial environment, in which the weak-evaporated Permian seawater mixed with minor meteoric water accounting for dolomitizing fluids. MD1 and MD2 dolomites are likely to form due to the residually buried seawater for widely dolomitization driven by the Late Triassic tectonic compression. Subsequently, the dolomitic strata underwent hydrothermal modification due to rejuvenation of the thrust belt to enable saddle dolomites filling pre-forming porosity. This study integrates outcrop, petrographic, geochemical and dating analysis with paleogeography and tectonic events, providing a new perspective to establish a conceptual model for multi-phase dolomitization as an analogue in comparative tectonic setting worldwide.

Sedimentary Characteristics, Diagenesis and Reservoir Significance of Algal Dolomite in the Central Tectonic Belt of Laizhou Bay Sag

Mr Zhihu Yang¹, Professor Jinqiang Tian¹

¹China University of Petroleum (East China), Qingdao, Shandong, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The algal-dolomite in the central tectonic belt of the Laizhou Bay Sag is of great significance in the study of oil and gas reservoirs. It has been studied by various means such as core observation, thin section identification, scanning electron microscopy, and geochemical analysis. It is found that the algal-dolomite in this area is developed in a specific sedimentary environment, mainly within confined platform facies, and the sedimentary structure is mainly laminated and stromatoid, reflecting the low water energy, high salinity and relatively stable sedimentary conditions. In terms of diagenesis, it has undergone multiple stages of complex transformation, and the early dolomitization has changed the structure of the original rock and formed a unique structure, which has an important impact on the initial development of reservoir pores. The later dissolution further expanded the pore space and improved the physical properties of the reservoir. The cementation effect filled the pores to a certain extent and reduced the reservoir quality. From the perspective of reservoir characteristics, the pores of algal-dolomite reservoirs are abundant, including intergranular pores, dissolution pores, and interlayer seam, and different pore types are combined with each other to form a complex pore network. The physical properties of reservoirs are controlled by multiple factors such as sedimentary facies, diagenesis and fracture development, and high-quality reservoirs are mainly distributed in areas with favorable sedimentary microfacies, strong dissolution and good fracture communication. The study of the algal-dolomite in the central tectonic belt of Laizhou Bay Sag provides an important geological basis for oil and gas exploration and development in this area, and is helpful to deeply understand the formation mechanism and distribution law of carbonate reservoirs.

Implications of Multi-stage Deformation on the Differential Preservation of Lower Paleozoic Shale Gas in Tectonically Complex Regions: new Structural and Kinematic Constraints from SW China

Professor Wei Yang¹, Professor Zhenxue Jiang¹, Professor Yan Song¹, Ph.D. Haodong Hou¹, Ph.D. Jiankang Lu¹, Master Ke Miao¹

¹China University of Petroleum - Beijing, Beijing, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The strength of tectonic deformation in tectonically complex regions, particularly multi-stage superimposed tectonic regions, can have a significant impact on shale gas preservation conditions. However, differential tectonic deformation has still not been quantitatively constrained, and its impact on the preservation conditions of shale gas is thus poorly understood in the Upper Yangtze Platform, southwest China. This study investigates differential preservation conditions of marine shale gas in four eroded synclines (including Shixi, Daozhen, Zhongguan, and Fuyan Synclines) of the northern Guizhou Province. Interpretation of structures in field outcrops, geometry and kinematic analysis, and typical gas reservoir anatomy are combined to quantitatively explore the effect of superimposed deformation on preservation conditions of shale gas. According to a set of new structural and kinematic constraints, the Riedel shear model for strike-slip faults is firstly conducted in eroded synclines in the northern Guizhou Province, which innovatively established a linkage between detailed structural analysis and evaluation of shale-gas preservation conditions. The results indicate that (1) fault strikes in the Shixi Syncline are more concentrated than Zhongguan and Fuyan Synclines, whereas fault strikes in the Zhongguan and Fuyan Synclines are more scattered. There is only one direction of maximum principal stress (σ_1) in the Shixi and Daozhen Synclines. There are two maximum principal stress directions (σ_1) in the Zhongguan and Fuyan Synclines. The Zhongguan and the Fuyan Synclines have tensional environments, whereas the Shixi and the Daozhen Syncline have compressional settings; (2) the formation dip angle, distance to a class II fracture, average detachment layer thickness, intensity of superimposed modifications, and interlimb angle may be positively correlated with gas content; (3) the progressive transformation pattern is established. These findings lay the foundation for future research on the differential preservation mechanisms of eroded synclines and may be useful for enhancing research on worldwide strike-slip faults controlling hydrocarbon accumulation.

Sedimentary Environment Changes in Chinese Continental Margin During the Quaternary Period

Professor Zhengquan Yao¹, Professor Xuefa Shi¹, Professor Jianxing Liu¹, Professor Shuqing Qiao¹, Professor Yanguang Liu¹

¹Key Laboratory of Marine Geology and Metallogeny, First Institute of Oceanography, Ministry of Natural Resources, Qingdao, China

10C: Mapping marine sediments in the world (2), Tāwhirimātea E (Level 2), January 30, 2026, 11:00 AM - 12:30 PM

The sedimentary environment of the shallow continental shelf offers key insights into past sea level changes, climatic fluctuations, and regional tectonic activity at orbital timescales. In this study, we conducted detailed chronological and sedimentological investigations on sediment cores from the Bohai Sea and the Yellow Sea. By applying astronomical tuning techniques, we constructed high-resolution age frameworks spanning the last ~1 million years. Analyses of sediment characteristics and environmental proxies reveal cyclic transitions between shallow marine and coastal/alluvial depositional settings, primarily driven by glacial-interglacial sea-level oscillations. These findings support previous models that emphasize sea-level variation as the primary control on sedimentary succession in this area. Notably, while only long-period (~100 kyr) sea-level signals are recorded in the South Yellow Sea cores, both 100 kyr and shorter-term (~40 kyr) cycles are evident in the shallower Bohai Sea sediments. Although regional differences exist, this study indicates that the sedimentation patterns across the eastern Chinese continental margin have consistently responded to sea-level dynamics over the past million years.

Possible Origins of Upslope-migrating Subsurface Sand Waves on the Southeastern Continental Slope of Korea

Ms Dawn Yeom¹, Prof Young Jae Shinn¹, Dr Sookwan Kim², Dr Seonghoon Moon², Mr Chung Ho Kim²

¹Department of Convergence Study on the Ocean Science and Technology, Korea Maritime and Ocean University, Busan, Republic of Korea, ²Ocean Climate Response and Ecosystem Research Department, Korea Institute of Ocean Science and Technology, Busan, Republic of Korea

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

This study examines the possible origins of subsurface wavy structures discovered on the southeastern continental slope off the Korean Peninsula, based on analysis of Chirp sub-bottom profiles and piston core sediments. The Chirp profiles reveal that the wavy structures occur beneath a gently sloping flat seafloor ($< 0.7^\circ$) at water depths greater than 200 m. They are buried along the upper to mid continental slope, adjacent to a submarine canyon that incises the outer continental shelf and extends down to the continental slope. The structures exhibit wavelengths of 200–300 m and heights of 9–23 m (assuming a seismic velocity of 1550 m/s for unconsolidated sediments). The shapes vary from nearly symmetrical to asymmetrical, with crests displaying upslope-migrating patterns. A piston core penetrating the upper part of the wavy structures shows that the sediments mostly consist of shelly fine sand. The wave dimensions, upslope-migrating patterns, grain size, slope gradients, and proximity to the submarine canyon suggest that the sand waves were most likely formed by sediment-laden flows, such as cyclic steps generated by turbidity currents. Alternatively, intensified bottom currents during a sea-level low may also account for their formation. Most of the observed sand waves exhibit signs of plastic deformation, including upturned crests, folds with shear planes, and sliding or rotation along basal detachment surfaces. These features raise the possibility that plastic deformation occurred simultaneously with sand wave formation or that the sand waves originated primarily as deformation structures.

Constraining Rock Salt Stratigraphy Via Accessory Mineral Geochronology: Implications for Underground Hydrogen Storage

Dr. Jiankang Yi¹, Christopher Kirkland¹, Milo Barham¹, Martin Danišík⁴, Julien Bourdet^{2,3}, Andrew Feitz⁵, Peter Haines⁶, Brad McDonald⁴, Bruno Ribeiro¹, Emanuelle Frery², Claudio Delle Piane²

¹Timescales of Mineral Systems Group, Curtin Frontier Institute for Geoscience Solutions, School of Earth and Planetary Sciences, Perth, Australia, ²CSIRO Energy Resources, Perth, Australia, ³Rocks and Bubbles Pty Ltd, Perth, Australia, ⁴John de Laeter Centre, Curtin University, Perth, Australia, ⁵Geoscience Australia, Canberra, Australia, ⁶Geological Survey of Western Australia, Department of Mines, Industry Regulation and Safety, Perth, Australia

8F: Sedimentology and Sustainable GeoEnergy, Rongomātāne C (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

Rock salt caverns enable large-scale underground hydrogen storage, with potential significance for the green energy transition. However, in many salt-bearing basins, salt stratigraphy remains enigmatic due to a lack of direct age constraints and inherent stratigraphic mobility. Here, we present geochronological and geochemical data on apatite and zircon grains from salt within the Canning Basin, Western Australia, which hosts Australia's most extensive evaporite unit. The recovered apatite grains are euhedral, with distinct cores and rims. Cores have igneous trace element affinity, high- $\delta^{18}\text{O}$ (7.1–11.0‰), and yield a U–Pb age of 482 ± 13 Ma. Rims are low in Th, U, are depleted in rare earth elements, and have very high- $\delta^{18}\text{O}$ (~12.0–14.3‰), suggesting interaction with fluid sourced from metasedimentary rocks. The apatite core U–Pb age is coeval with local volcanic ash beds (479–470 Ma) and the crystal morphology strongly implies a volcanic origin. A syn-depositional interpretation of the apatite constrains salt growth to ca. 482 Ma and is supported by the indistinguishable U–Pb age of the youngest zircon within the salt (483 ± 12 Ma). The results suggest that salt deposition in the Canning Basin initiated ca. 40 Ma earlier than previously thought and occurred in multiple discrete intervals. Salts devoid of clastic input preferentially retain volcanic detritus, offering significant potential to better constrain evaporitic basin histories and stratigraphy despite salt dynamism, ultimately supporting better hydrogen storage exploration.

Black Shales and Anoxic Events in Turkey: Paleoceanographic and Economic Importance

Prof. Ismail Omer Yilmaz¹

¹Middle East Technical University, Ankara, Turkey

6C: Sedimentology of Black Shales through Phanerozoic (1), Tāwhirimātea E (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

Black shales are recorded in different basins in Turkey including Silurian, Silurian/Devonian, Late Devonian-Carbonifereous, Permian, Triassic, Late Jurassic, Early Cretaceous, Late Cretaceous, Paleocene-Eocene successions in NW, CW, SW and SE Anatolia.

Lower Silurian black shale are considered as source rocks for oil and gas in N Arabian Platform in SE Turkey. Silurian/Devonian, Late Devonian-Carbonifereous, Triassic, Late Jurassic, Early Cretaceous, Late Cretaceous, Paleocene-Eocene black shale occurrences are very common in Taurides in SW and S Turkey. These black shale occurrences are also potential source rocks in the region. and Trace and REE element contents of these black shale can also be considerable for future prospects.

The presence of black shales in Mid-Barremian, Aptian, Albion, Cenomanian-Turonian in Central Pontides (NW Turkey) and Central Taurides (S. Turkey) are widely exposed. The Mid-Barremian black shales (MBE) have been recorded within turbidite succession in deep marine settings display 2 ‰ carbon isotope change but with low TOC value. The Aptian black shales (OAE1a) are recorded in pelagic carbonate slope environments represented by a negative carbon isotope shift with 2 ‰, and TOC around 2%. In the Sakarya zone of Pontides, Cenomanian/Turonian (OAE2) is recorded in pelagic slope deposits with a carbon isotope curve that has a more than 1 ‰ positive shift and >2 % TOC. OAE2 was recorded in Antalya Nappes of Taurides with TOC >20%.

Silurian, Triassic and Jurassic shales, OAE2 and OAE1a have an economic potential for energy and critical elements in Turkey and can be correlated with global equivalents

Rapid Formation of Antidune Cross-stratification Due to the Intrusion of the 2011 Tohoku-oki Tsunami into the Sendai Plain: Considerations from Flume Experiments

Professor Miwa Yokokawa¹, Mr. Haruki Imura², Mr. Haruto Shibue¹, Mr. Akihiro Shoda¹, Professor Kazuhisa Goto²

¹Osaka Institute of Technology, Hirakata, Japan, ²University of Tokyo, Bunkyo, Japan

8D: Sedimentary evidence of geohazards – past and present (1), Rongomātāne A (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

Tsunami deposits are important because they are a key to estimating the scale of past tsunamis. In this study, we conducted a series of flume experiments based on the observation of a peel sample of tsunami deposits deposited at the Takaose site in Iwanuma City, Miyagi Prefecture, Japan by the 2011 Tohoku-oki tsunami, and a numerical simulation about the tsunami.

The peel sample was collected about 1.2 km landward from the coastline, on the landward side of the beach ridge. The tsunami deposit is about 30 cm in thickness and consists of medium to coarse sand, becoming finer toward the top. In addition, antidune cross-stratification is observed at the upper part.

A simulation of the tsunami using a fault model suggested that the flow caused by the tsunami that entered the location of this sample was in a supercritical state 1-2 minutes after the tsunami passed, suggesting that most of the sedimentation may have occurred in the short period immediately following the tsunami's arrival.

Based on the above, we conducted experiments to verify whether antidunes can be formed and cross-stratification can be preserved in the very short time when a tsunami enters. A flume 400 cm long, 40 cm high, and 8 cm wide was used for the experiment. Considering the topography of the sampling site and to recreate the condition in which large amounts of water and sediment are rapidly transported, a sand pile was placed in the upstream part of the flume, and water was supplied directly upstream of this using a pump. The experiment was performed under different conditions of flume gradient, and antidunes were formed in the downstream part of the flume in the 3 cases (1.8°, 1.2°, 1.0°), leaving a structure of antidunes in which backset lamination and shallow dish-shaped lamination intersect.

Weathering, Redox Proxies and Carbon Isotope Data from the Maokou Formation, South China: Implications for the Guadalupian P3 Glaciation of the Late Paleozoic Ice Age

Runan Yong^{1,2}, Anqing Chen^{1,2}, Shi Sun^{1,2}, Shenglin Xu^{1,2}

¹Key Laboratory of Deep-time Geography and Environment Reconstruction and Applications, MNR & Institute of Sedimentary Geology, Chengdu University of Technology, Chengdu, China, ²State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Chengdu University of Technology, Chengdu, China

1F: Earth's sedimentary record of glaciation (1), Rongomātāne C (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

Late Paleozoic Ice Age (LPIA) was a key climate event of the deep-time earth evolution system. Although the sedimentary successions from eastern Australia have well constrained the timeframe of the glacial-nonglacial intervals, the link between these glaciations and coeval geological events is still being explored. The Guadalupian (Middle Permian) P3 glaciation was the prelude to the upcoming end of LPIA, which is a key window to examine the uncertainty of the climatic transition from icehouse to greenhouse and linkages with the geological and biological events. In South China, there is a widespread change from shallow-water carbonate rocks of the uppermost Chihhsia Formation (latest Cisuralian) to nodular limestones of lowermost Maokou Formation (early Guadalupian), and the timing suggests that it may be related to the onset of the P3 glacial. This study focuses on the marine sedimentary succession of the Shangsi outcrop located in the low-latitude Yangtze block, investigating the carbon/strontium isotopes, redox proxy, and chemical index of alteration (CIA). Multiple weathering indices revealed climatic fluctuations during the Guadalupian, corresponding to the onset and demise of the high-latitude P3 glaciation. The high level of CIA following the Kungurian-age Large Igneous Provinces (LIPs) event indicates that the weathering of basic rocks caused the positive ¹³C drift, which was the main factor for the onset of the P3 glaciation. Then the breakup of Pangea, enhanced ocean oxidation, and a series of volcanic activities including Emeishan LIP could contribute to the accumulation of CO₂ and consequently cause the demise of the P3 glaciation in middle Capitanian. Enhanced continental weathering was synchronous with the eruption surge of the volcanic activities, indicating a following global warming event, which may play a crucial role in triggering the Mid-Capitanian extinction event.

The Main Controlling Factors on the Cambrian Carbonate Platform in the Tarim Basin and Its Implications for the Distribution of Ultra-deep Dolomite Reservoirs

Assoc. Prof. XueLian You¹

¹China University of Geosciences (Beijing), Beijing, China

2B: Carbonate systems and processes (1), Tāwhirimātea C (Level 2), January 26, 2026, 1:40 PM - 3:10 PM

The genesis of deep-to-ultra-deep dolomite reservoirs in the Tarim Basin is crucial for exploration and development. The Cambrian subsalt dolomite reservoirs in the Tarim Basin are widely distributed, marking significant prospects for ultra-deep reservoir exploration. Based on big data methodologies, this study collects and analyzes porosity and permeability data of carbonate reservoirs in the western Tarim Basin, specifically targeting the Cambrian deep-oil and gas-reservoir research. The characteristics and evolution of the Cambrian Tarim prototype basin are mainly controlled by the break-up of the Rodinia supercontinent. Terrenewian sedimentary framework was mainly controlled by the development of paleo-uplift caused by structure and the change of seawater properties caused by sea level rise and fall.

The Series2 and Miaolingian widely developed carbonate platform is mainly controlled by sea level rise and fall. With the hot and dry climate and gradually increasing salinity, it may play an important role in the development of dolomite. During the Furongian, the basin ended the evaporation lagoon sedimentary environment mainly due to the rise of sea level and developed a restricted platform environment again. In summary, the Series2 of the Tarim Basin and the Miaolingian period mainly have good exploration prospects in the Tazhong area, while the Furongian period mainly has good exploration prospects in the Keping area. Due to favorable sedimentary environments and early diagenesis, the Series2 and Furongian played a favorable role in maintaining porosity and permeability. The combination of such sedimentary environments and diagenesis processes needs to be taken seriously and is a factor for consideration for the exploration of high-quality dolomite reservoirs.

A Fifteen-hundred-year-long South China Sea Paleotsunami Record on Penghu Islands, Taiwan

Ph.D. Neng-Ti Yu¹, Associated Professor Cheng-Hao Lu², Ph.D. I-Chin Yen³

¹National Tsing Hua University, Hsin-Chu City, Taiwan, ²National Penghu University of Science and Technology, Penghu County, Taiwan, ³National Central University, Taoyuan City, Taiwan

8D: Sedimentary evidence of geohazards – past and present (1), Rongomātāne A (Level 1), January 29, 2026, 1:40 PM - 3:10 PM

Tsunami risks are omnipresent in the South China Sea and diverse in source origins from trench megathrust to intraplate earthquake and landslide and remain poorly understood, because historical and geological records are scarce. Recently in 2019 and 2023, four cliff-top shelly gravels dating from the fourth to seventeenth centuries were identified in six soil–colluvial exposures on Penghu Islands in the Taiwan Strait in the NE South China sea. To verify and explore the gravel occurrences and recurrences, additional ten exposures with candidate gravels were investigated in this study on this tectonically stable archipelago where local sea level has been continuously falling from a 2.4 m highstand since 4.7 ka. Coeval to the previously reported four gravels, the candidates further represent two new deposits in the eighth to tenth and the eighteenth to nineteenth centuries. All the gravels are sharp-based, matrix-supported, and poorly sorted, overlying paleosols and situated above the modern 100-year surge level after calibrating for ancient sea level. According to the gravel facies, calibrated elevation/minimum run-up, and wave height estimates from incipient motion formulas, the gravel deposits reflect suspension-rich turbulent flow and/or bore-like wave processes probably of tsunami origins. The modeled recurrence intervals ranged widely from 600 to 20 years and averaged at 251 ± 30 years, apparently reflecting the diverse tsunami sources in the region. Three abnormal tide or wave inundation accounts in 1781, 1661, and 1353 are age-comparable to the youngest, second, and fourth gravels, respectively. The second gravel is also likely related to the 1627 tsunami ensuing a M7.5 earthquake in the northern Philippines.

Two Stages of Rifting Control the Crust Thinning and Basin Evolution: Insights from the Southern Qiongdongnan Basin, NW South China Sea

Jingyuan Yu¹, Hu Chen¹

¹China University of Geoscience (Wuhan), Wuhan, China

2E: Student Research Forum (2), Rongomātāne B (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

In rifted margins or rifted basins, the structure of the basin is often complex due to the multistage development of fault systems. As we can only see the result of the basin evolution, it is difficult to judge the influence of early fault activity on the later stages. Here, we present a case study from the southern part of Qiongdongnan Basin (QDNB) where the influence of the early stage can be clearly recognised. Using newly acquired high-resolution 3D seismic datasets, we analyse the prototype and temporal evolution of the study area since the Cenozoic. Three fault systems (FS1, FS2 and FS3) were identified according to fault activities and fault strike. Observation results show a rotation of the stress field at the end of the Eocene, dividing the whole rifting into two stages. FS1 initiated in NW-SE extension at rift stage I (42.5–33.9 Ma), showing a typical basement-involved structure while FS2 and FS3 developed in N-S extension at rift stage II (33.9–23.03 Ma). The faults in FS1 were either crosscut to form a zigzag plane geometry by FS2 and FS3 faults, or became long-lived active faults throughout the rifting period, resulting in a localisation of strain and extremely thinning of the crust. It can also be compared with adjacent basins which have undergone the same regional tectonic evolution history at the northern margin of the South China Sea. The long-lived NE–SW trending faults cause significant variation in the subsidence history, basin structure, and crust thickness along strike in the study area, indicating that faults developed in rift stage I play a significant role in basin evolution at rift stage II.

Origin and Palaeo-oceanic Conditions of Guadalupian Bedded Chert in the Northern Margin of the Upper Yangtze Region: Implication for Marine Anoxia and Permian Chert Event

Dr Yu Yu¹, Prof Liangbiao Lin¹, Dr Qian Li², Dr Gang Lu²

¹Chengdu University of Technology, Chengdu, China, ²Southwest University of Science and Technology, Mianyang, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Unusual accumulation of chert depositions developed worldwide in the Permian over tens of millions of years during the Permian period and are referred to as the Permian Chert Event (PCE). The Middle Permian cherts, in the forms of nodules and bedded cherts, are widely distributed in the Yangtze region. A comprehensive study was conducted on Middle Permian cherts from the Xibeixiang section (XBX) on the northern margin of the Upper Yangtze region. This study combined micropaleontology and geochemical analyses to determine the age attribution, palaeo-oceanic conditions, and implications for the PCE. Identification results for conodonts and brachiopods showed that the XBX cherts belong to the *Jinogondolella granti* Zone, late Capitanian. The XBX cherts can be divided into two subunits. The lower section (Sc1) consists of a thin interbedded layer of bedded chert, shale, and limestone, which are strongly influenced by upwelling with relatively low temperatures. The upper section (Sc2) comprises a thin interbedded layer of bedded chert and shale. The intermediate CIA values of Sc2 suggest a temperature increase compared to Sc1 and a weakening of upwelling activity. The Sc2 of the XBX cherts is consistent with the end-Capitanian oceanic anoxia event and coincides in time with the end-Guadalupian biotic crisis, supporting the connection between the biotic crisis and marine anoxia. The PCE distributions in the Guadalupian period exhibit substantial temporal and spatial heterogeneity on a global scale. Alterations in the oceanic environment have caused the shoaling of the lysocline and calcite compensation depth (CCD). This allowed cherts to be deposited instead of carbonates, even in relatively shallow marine areas, such as continental margin environments.

Hierarchical Architecture Characterization and 3D Modeling of Braided River Delta Reservoirs: A Case Study from LF14-4 Oilfield, Pearl River Mouth Basin, South China Sea

Master Li Yujing¹, Zhijun Yin¹

¹China University of Petroleum, Beijing, Beijing, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The fifth member of the Paleogene Wenchang Formation in the Lufeng 14-4 Oilfield, South China Sea, is characterized by braided river deltaic sediments under the dual control of tectonics and sedimentary processes. The reservoir architecture is complex, connectivity is poor, and heterogeneity is strong. Conducting fine-scale characterization and modeling of reservoir architecture at multiple hierarchical levels provides critical guidance for oilfield development. Based on integrated analysis of core, well logging, and seismic data, this study employs a novel well-seismic integration approach to establish an innovative hierarchical classification scheme for 5th-order and 4th-order architectural units in braided river deltas, elucidating the geological significance of bounding surfaces at each level. Geostatistical inversion enabled spatial prediction of architectural units, with quantitative characterization of their scale, geometry, and connectivity, establishing a reservoir architecture database. Building upon this, we extracted multiple seismic attributes and calibrated them with well-constrained architectural element interpretations. By applying deep learning-based seismic multi-attribute fusion, we established a high-resolution 3D reservoir architectural model, successfully overcoming key technical challenges in architecture modeling of braided fluvial-deltaic reservoirs in offshore sparse-well areas. The findings have delineated reservoir architectural units in detail, unraveled the distribution patterns of high-quality sand bodies, and provided a geological basis for well pattern optimization and favorable zone evaluation. This study not only deepens the theoretical understanding of braided river delta sedimentation but also provides critical technical references for exploration and development in similar reservoir settings. It further offers new perspectives and practical cases for studying sedimentary processes in the time domain of active plate margins.

Challenges and Opportunities of Cyclostratigraphy in Mesozoic Shallow Marine Settings: Evidence from the Middle Jurassic of Southern Germany

Dr. Christian Zeeden¹, Katharina Leu¹, Dr Arne Ulfers¹, Dr Mehrdad Sardar Abadi¹, Prof. Shahin Dashtgard², Dr. Thomas Mann², Dr. Jochen Erbacher³

¹LIAG-Institute for Applied Geophysics, Hannover, Germany, ²Department of Earth Sciences, Simon Fraser University, Burnaby, Canada, ³BGR, Hannover, Germany

7E: Deciphering climate and environmental records in shallow marine environments across space and time (1), Rongomātāne B (Level 1), January 29, 2026, 10:15 AM - 11:45 AM

Germany holds shallow marine strata of different ages, lithologies and depositional systems. While some of these are visually clearly cyclic in lithology or in downhole logging data, cyclostratigraphy has been applied to only a few Mesozoic stratigraphic successions to determine the duration of stages and lithological units. In this study, we apply both visual and numerical cyclostratigraphic methods to multiple Mesozoic shallow-marine datasets, wherein the age and position of successions is typically determined using biostratigraphy. We demonstrate that shallow marine systems can preserve lithological cycles related to Milanković forcing across different shallow marine settings and lithologies.

Our focus is on Middle Jurassic strata from Southern Germany, where partly well-defined cycles are preserved in borehole logging data. These cycles enable estimation of duration and sedimentation rates recorded in stratigraphic intervals. In contrast, some intervals do not show clear quasi-cyclic patterns and do not allow for determining reliable time constraints. The controls on the preservation or non-preservation of cycles remains unclear, although subsidence, sedimentation rates and sediment preservation clearly play roles.

Monsoonal Intensity Controlled the Eocene Evolution of Paleovegetation and Paleoclimate in the Weixi'nan Sag, Northern South China Sea

Dr Jinhua Zeng¹, Professor Tao Jiang¹

¹China University of Geosciences, Wuhan, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Eocene was the warmest period of the Cenozoic era. During the Eocene, the Asian tectonic-climate system underwent significant transformation. The superimposed effects of global temperature variations and regional tectonic changes jointly drove the spatial differentiation of Eocene climate in East Asia. Located in the northern South China Sea, the Beibuwan Basin is adjacent to the core moisture source region of the East Asian summer monsoon (EASM) system, providing critical insights to study Eocene climatic revolution. Analyzing its paleovegetation and paleoclimate not only offers a crucial window into the history of moisture transport in low-latitude East Asia, but also helps reveal the difference between global temperature and regional climate, thereby refining the Eocene evolutionary framework of EASM. This study reconstructs vegetation succession and climate evolution in the Weixinan Sag through palynological assemblages and geochemical proxies (CIA, CI, ICV, WIP, K_2O/Al_2O_3 , Mg/Ca, Rb/Sr), exploring underlying driving mechanisms. Results indicate that the Weixi'nan Sag experienced mid-Eocene humidification and late Eocene cooling-aridification, with peak chemical weathering intensity during the mid-Eocene. Early Eocene deciduous broadleaf forests transitioned to evergreen-deciduous broadleaf forests in the mid-Eocene, followed by fern proliferation in the late Eocene. Pronounced seasonal precipitation/temperature variations and climatic fluctuations suggest localized monsoon circulation emerging in the early Eocene, dominating subsequent climatic evolution. Comparative analysis with contemporaneous East Asian climate records reveals that large-scale monsoon systems established during the mid-Eocene, potentially linked to paleogeographic changes. However, weak monsoon circulation already existed in coastal low-latitude regions during the early Eocene, experiencing mid-Eocene intensification and late Eocene decline. This process suggested that the Early Eocene coastal breeze prototypes established the blueprint for subsequent monsoon systems, while Middle Eocene tectonic-climatic synergy enabled true monsoonal emergence through combined landmass elevation and preserved greenhouse conditions, ultimately following to Late Eocene climatic decay as planetary cooling overwhelmed regional thermodynamic disequilibrium states.

Understanding Lahar Emplacement Processes by Linking Sedimentary Records and Flow Observations – the 2007 Ruapehu Crater Lake Breakout Lahar, New Zealand

Dr Anke Verena Zernack¹, Prof Jonathan Procter¹

¹Massey University, Palmerston North, New Zealand

5E: Terrestrial and marine volcano-sedimentary interactions in modern and ancient environments (2),
Rongomātāne B (Level 1), January 27, 2026, 1:40 PM - 3:10 PM

The 1995/96 Mt. Ruapehu eruptions emplaced a tephra dam that subsequently blocked the volcano's crater lake outlet. The increasingly unstable dam collapsed on 18 March 2017 following a rainstorm, releasing 1.3 million m³ of water into the Whangaehu River channel. The resulting long-anticipated breakout lahar provided a unique opportunity to capture a complete dataset of a single mass-flow event.

Focusing on medial reaches after the flow reached its highest sediment concentrations (25-40 km), our study evaluates sedimentary processes during the lahar passage by combining the depositional record with pre- and post-event topographic data and detailed flow observations. We identified several discrete units within the resulting lahar deposits where differences in grain-size, texture, thickness and distribution could be linked to local channel conditions and time-variant flow rheology. The rapidly rising, turbulent bow-wave ahead of the lahar caused erosion in the channel and emplaced bedded, moderately sorted medium sands on mid- to upper riverbanks, classed as transitional streamflow to hyperconcentrated flow deposits. The highly concentrated main lahar body deposited massive, reversely graded, very poorly sorted sandy gravels that marked the transition from hyperconcentrated to debris flow. Decreasing stage height shifted deposition to near-channel sites where thick, normally graded gravelly debris flow units accumulated at channel bends. The final depositional stage was marked by bedded, moderately to poorly sorted sandy deposits in near-channel sites, with pulses in the waning flow producing alternating layers of coarse and medium sands (hyperconcentrated flow deposits). The stepwise drop in flow stage resulted in simultaneous erosion of the previously deposited sediments and successive cutting of terraces.

The 2007 lahar event has provided valuable insights into the influence of tempo-spatial flow variations and local river channel morphology on depositional processes and the nature of the resulting sedimentary record that can help with interpreting prehistoric and ancient lahar deposits globally.

Karst Topography Paces the Deposition of Lower Permian, Organic-rich, Marine–continental Transitional Shales in the Southeastern Ordos Basin, Northwest China

Dr Xi Zhang¹, Professor Tingshan Zhang¹

¹Southwest Petroleum University, School of Geosciences and Technology, Chengdu, China

6C: Sedimentology of Black Shales through Phanerozoic (1), Tāwhirimātea E (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

Organic-rich continental and marine–continental (i.e., transitional) shales are characterized by numerous hydrocarbon production layers having an uneven horizontal distribution, which are challenging to locate and exploit. We examined the effects of karst topography on organic carbon accumulation during the early Permian in the southeastern Ordos Basin, northwestern China, using outcrop and well data. Our study involved geomorphological, sedimentological, petrological, and geochemical methods. We identified a regional unconformity on the Dongdayao Limestone (DDYL) that formed in the early Permian (Asselian; i.e., in the Shanxi Formation) in the study area based on: (1) cave, pore, and breccia development in outcrops and drill cores; (2) high Mn–Fe and low Sr contents associated with negative $\delta^{18}\text{O}$ and normal $\delta^{13}\text{C}$ values, which are indicative of strong leaching by meteoric waters; and (3) the irregular thickness of the DDYL that is indicative of differential karstification, resulting in the formation of horizontal gullies. The karst topography of the DDYL was identified based on the moldic and residual thickness methods, including karst highland, gentle slope, and microbasin geomorphic units. We propose that the karst topography controlled the redox environment and led to enrichment of the organic-rich transitional shales in the selected submember of the Shanxi Formation. The U/Th, V/Cr, and V/(V+Ni) ratios exhibit a linear relationship with geomorphic unit types. The karst microbasins had a weakly oxic environment, which widely preserved thick, organic-rich, transitional shales having high total organic carbon content and gas-bearing potential.

References:

Zhang Xi, Zhao Xiaoming, Ge Jiawang, Li Shuxin, and Zhang Tingshan. Karst topography paces the deposition of lower Permian, organic-rich, marine– continental transitional shales in the southeastern Ordos Basin, northwestern China. AAPG Bulletin, 2024, DOI:10.1306/11152322091.

Provenance Properties and Sedimentary Environment Evolution in the Huachi Area, Central Ordos Basin: Evidence From U-Pb Age, Geochemistry, and 3D Seismicity

Miss Huanmeng Zhang¹

¹Northwest University (China), Xi'an, China

3A: Next Generation Sediment Provenance (3), Tāwhirimātea A (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

The Huachi area is a key exploration block in the central Ordos Basin. Due to the low exploration level of the Chang 3 section of the Yanchang Formation, the source and palaeodepositional environment of the strata in this period are still unclear. This study is based on the heavy minerals as well as the major and trace element contents of the Chang 3 formation. Detrital zircon U-Pb isotope analyses to trace the source area and analyse the paleodepositional environment of the Chang 3 section in the study area. The La-Th-Sc, Th-Co-Zr/10, and $\text{SiO}_2\text{-K}_2\text{O}/\text{Na}_2\text{O}$ discrimination diagrams indicate that the tectonic setting of the sources was a continental island arc. In addition, the U-Pb age spectral peaks of detrital zircons in the northern and eastern parts of Huachi area are basically the same, and the peak segments are mainly concentrated in the late Late Palaeozoic (258-236 Ma), late Palaeoproterozoic (1964-1847 Ma) and early Palaeoproterozoic (2545-2482 Ma). The detrital zircon ages in the southwestern part of the study area are mainly concentrated in 304-234 Ma. Comprehensive comparison with zircon ages from the Ordos potential source area suggests that the source of the Chang 3 section of the Huachi formation in the extended area is mainly from the North China Craton in its northeastern part as well as from the North Qinling in its southwestern part. The Sr/Cu and Sr/Rb indices indicate that the palaeo-sedimentary environment was an arid hot climate. The Sr/Ba and Th/U ratios indicate that the palaeosalinity of the water body is mainly semi-saline-freshwater. Based on the $\text{V}/(\text{V}+\text{Ni})$ and V/Cr values, the Chang 3 depositional periods in the study area were oxygen-rich environments. Combined with the 3D seismic data, it is concluded that a delta front depositional environment is developed in the Chang 3 section of the study area.

Nannoplankton Response Indicates Intra-OAE2 Cooling (Plenus Cold Event) in Southeastern Tethys (Qiangdong, Tibet)

Dr Yi Zhang¹, Dr Hanwei Yao¹, Professor Paul Bown², Dr Huifang Guo¹, Dr Kaibo Han¹, Professor Cinzia Bottini³, Professor Chengshan Wang¹, Professor Xi Chen¹

¹China University of Geosciences (Beijing), Beijing, China, ²University College London, London, United Kingdom, ³Università degli Studi di Milano, Milan, Italy

8C: Sedimentology of Black Shales through Phanerozoic (3), Tāwhirimātea E (Level 2), January 29, 2026, 1:40 PM - 3:10 PM

The Cretaceous Oceanic Anoxic Event 2 (OAE2, ~93.9 Ma) was a period of rapid global environmental change and one of the warmest intervals in the Phanerozoic. Despite its global significance, we still know little about the effects of this greenhouse event from the shallow marine shelf environments of the Southern Hemisphere. Here, we present a paleoenvironmental reconstruction from the eastern Tethys Ocean based on calcareous nannofossil paleoecological records from an OAE2 section (Qiangdong) in southern Tibet. Our nannofossil temperature index indicates onset of warming ca. 75 kyrs before the OAE2, peaking in the early OAE, but followed soon (~60 kyr after the OAE onset) by a phase of climatic instability. This cool interval correlates well with the Plenus Cold Event (PCE), previously documented in the Northern Hemisphere (e.g., western Europe). The PCE cooling is followed by further warming in the later OAE, continuing into the post-OAE2 early Turonian interval consistent with peak warmth of the Cretaceous thermal maximum (KTM). A calcareous nannofossil productivity index reveals dynamic surface water productivity trends with maximum values during the PCE cool interval indicating that sequestration of CO₂ through elevated marine primary productivity was likely an important feedback during this carbon cycle perturbation event.

Sedimentological and Diagenetic Study of the Mixed Siliciclastic/carbonate Lacustrine Sediments in the Junggar Basin, Northwestern China

Miss Hualing Zhang¹, Miss Youjing Wang¹, Mr Cunyou Zou¹, Mr Xiulin Hou¹, Mr Jie Fan²

¹Research Institute of Petroleum Exploration&Development (RIPE), PetroChina, Beijing, China,

²Zhundong Oil Production Plant, Xinjiang Oilfield Company, PetroChina, Fukang, China

6B: Microbial architects of carbonates: Insights from modern to deep-time systems, Tāwhirimātea C (Level 2), January 27, 2026, 4:25 PM - 5:55 PM

The middle Permian PD Formation in the northeastern Junggar Basin was deposited in a mixed lacustrine system which is characterized by the siliciclastic sediments mixed with dolomite dominated carbonates. Such a depositional system provides a template to decipher the sedimentation process and facies heterogeneity of this less documented mixed depositional system. Based on the integration of petrographic observation and geochemical log measurements of the most recent drilling cores, five lithofacies in the PD Formation were defined based on sedimentary structures, grain size, texture and mineral composition. The lithofacies include: (1) dolomitic mudstone, (2) silty mudstone, (3) laminated dolomitic siltstone, (4) massive dolomitic medium sand-fine sandstone, and (5) massive micrite dolomite. The PD succession reveals a complex diagenetic history, ranging from compaction, pyrite replacement, silica cementation, dissolution, and calcite cementation. The PD succession reveals a complex diagenetic history, ranging from compaction, pyrite replacement, silica cementation, dissolution, and calcite cementation. Primary pores were reduced significantly due to compaction showing concavo-convex grain contacts. Silica cement is present only in the siliciclastic-dominated interval, and is found in the form of partial to complete quartz overgrowth. However, dissolution demonstrated by partial to pervasive dissolution of silica and feldspar grains created considerable pore spaces. Based on the analysis of paleontology, lithofacies characteristic and element geochemistry, the PD succession is interpreted to be a salty (alkaline) lake basin depositional setting. In the early stage, the study region was a semi-deep lake-shore-shallow environment with external sediment inputs mainly from the northeastern Kelameili Mountain, accompanied by fan delta and gravity flow deposits. Evaporation was later enhanced with evidence of pervasively presented dolomitized lithofacies, forming a closed-lake chemical depositional along with evaporation environment. As a result, a set of fine-grained sediments were deposited under the influence of mechanical, chemical and biological deposition and later on adjusted dolomitization.

Geological Controlling Factors and Logging Evaluation of Fractures in Deep to Ultra-deep Tight Sandstone Gas Reservoir

Dr Yongjia Zhang¹, Professor Guiwen Wang¹, Assoc. Prof Jin Lai¹, Dr Xiaojiao Pang¹

¹China University of Petroleum, Beijing, Beijing, China

2E: Student Research Forum (2), Rongomātāne B (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

Deep to ultra-deep reservoirs contain huge hydrocarbon resources and are important exploration hydrocarbon targets worldwide. Fractures are widely developed in deep to ultra-deep reservoirs, and fractures are important hydrocarbon storages and fluid flow channels. Therefore characterization and evaluation of fractures using geological and geophysical well logs are of great importance. Core, thin section and CT scanning data are used to clarify the fracture development characteristics. Conventional and image logs are used to recognize and quantitatively characterize the subsurface fractures and clarify fracture combination patterns. Even in oil-based drilling muds, more than 87% natural fractures can be recognized using U-net neural network method and array acoustic log data. The effectiveness of fractures is mainly controlled by lithology, diagenesis, structure and in-situ stress. Lithology is the basis of fracture development, and fractures are more developed in sandstone than in mudstone. The extension of the fracture is more easily limited by mudstone when the mudstone is thicker. Diagenesis is an important condition to determine the effectiveness of fractures. Cementation reduces the fracture porosity. Dissolution can expand the fracture surface and improve effectiveness of fractures. The structural position is the key to control the formation of fractures. The core of the anticline and the upper section of the reverse fault are conducive to the formation of the fracture formation. In-situ stress has a negative effect on the effectiveness of fractures. The smaller the difference between the present maximum and minimum principal stresses, the better the fracture effectiveness. According to the Mohr-Coulomb failure criterion, when the rock's stress state lies above the Mohr-Coulomb failure line, the fracture is in a mechanically active state and considered effective. The research results will be beneficial for the comprehensive evaluation of fracture effectiveness.

Exploratory Study on Lacustrine Fine-grained Hyperpycnal Flow Sediments Routing of Qingshankou Formation, Gulong Sag, Songliao Basin

Dr Tianshu Zhang^{1,2}, Prof. Rukai Zhu^{1,2}, Prof. Li Liu³, Dr. Yi Cai¹, Dr. Surong Zhang⁴, Prof. Zhi Yang¹, Dr. Haiyan Zhou^{1,2}, Prof. Youliang Feng¹, Dr. Chang Liu^{1,2}, Dr. Xiuli Fu^{2,4}, Dr. Ning Cui⁴, Prof. Laisheng Cao⁵, Dr. Jianzhi Zhao⁵

¹Research Institute of Petroleum Exploration & Development, PetroChina, Beijing, China, ²State Key Laboratory of Continental Shale Oil, Daqing, China, ³Science Institute, China University of Geosciences (Beijing), Beijing, China, ⁴Daqing Oilfield Company, Daqing, China, ⁵ Bureau of Geophysical Prospecting INC, Zhuozhou, China

10F: Sediment gravity flow deposits in lacustrine basins (2), Rongomātāne C (Level 1), January 30, 2026, 11:00 AM - 12:30 PM

A large lake transgression in Qingshankou Formation formed 200~500m thick shales dominated by fine-grained sediments, which is the main target of Gulong shale oil. However, further prediction of favorable areas/layers remains a challenge on account of the heterogeneity of lithofacies. As lacustrine sedimentary models are derived from knowledge gained in continental shelf- deep marine basins, few detailed study on sedimentary micro-facies in lacustrine deep-water areas results in no sedimentary model is qualified for lithofacies distribution prediction.

Unlike marine shales, lacustrine shales have the sedimentary structures and components that are more sensitive to small-scale changes in climate, lake level and provenance. Previous studies have suggested that as extrabasinal gravity flows, fine-grained sediments hyperpycnal flows which are loaded by a turbulent suspension dominantly composed of a mixture of silt and clay-sized particles can be generated in river floods discharge and travel downslope before spreading out across deep-water area. Thus, the fine-grained hyperpycnal flow sediments routing is a helpful way to outline the distribution of lithofacies in deep-water systems.

This study started with probing the origin of the felsic laminated shales interbedded with wavy-bedding siltstones in the deep-water area of Gulong Sag, which challenged the Bouma sequence interpretation. Subsequently, based on core samples, thin sections, seismic profiles, well-logging data and geochemical data, this study applied rare earth element analysis and zircon depth profiling chronological method to determine the sources of fine-grained sediments specifically for lacustrine basins. Consequently, the use of sedimentary numerical stratigraphic forward modelling made it possible to figure out the fine-grained sediments routing in 10^2 - 10^3 kyr timescales. The multi-provenance fine-grained sediments routing system corrects the previous model of single-provenance slope turbidite fan and provides new insights into shale oil target area prediction in lacustrine basins.

Diagenetic Characteristics of Lacustrine Carbonate in the Yixian Formation, Western Liaoning, and Their Potential Implications for Paleoclimate and Paleoelevation

Ms Yifan Zhang¹, Mr Yuan Gao¹, Mr Jiquan Chen¹, Ms Tian Dong¹

¹China University of Geosciences Beijing, Beijing, China

3B: Carbonate systems and processes (2), Tāwhirimātea C (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

During the Early Cretaceous, the exceptionally preserved Jehol Biota prospered in western Liaoning, offering key insights into biodiversity and evolutionary history, yet linked paleoenvironmental and paleoclimatic data are still limited. The carbonate strata widespread in the western Liaoning could shed light to address this shortcoming. However, possible diagenetic overprinting significantly hampers the precise reconstruction of paleoenvironmental information. This study integrates petrographic observations, stable isotopes and clumped isotopes ($\Delta 47$) on lacustrine carbonates from the Yixian Formation, aiming to investigate their diagenetic characteristics and the implications for the depositional environment.

According to the luminescent properties, our samples are categorized as slightly luminescent and mostly luminescent, indicating a general diagenetic alteration. Specifically, the Lujiatun section characterizes by abundant detrital carbonate grains, slightly luminescent and depleted $\delta^{18}\text{O}$ values, reflects shallow burial diagenesis influenced by both detrital components and ^{18}O -enriched fluids.

Both slightly luminescent and pervasive dolomitization are exhibited in the Maoshenmiao-Songbahu section, indicating partial dolomitization during diagenesis. The Huangbanjigou section shows the mostly luminescent and high-temperature euhedral quartz, suggesting advanced recrystallization with potential hydrothermal fluid influence. In addition, we also use the $\Delta 47$ results from Lujiatun carbonates, shallow-burial diagenesis, to determine the maximum environmental temperature in Western Liaoning during the Early Cretaceous. A maximum temperature recovered by $\Delta 47$ is 29 °C, which aligns well with the contemporaneous reconstruction of mountain-top temperature in the same region (corrected by the elevation-temperature gradient with 4.0-6.0 °C/km). This supports the hypothesis that a relief topography may have existed in the Western Liaoning during the Early Cretaceous.

the Provenances and Source-to-sink System Evolution of Lacustrine Basin: a Case Study from Permian in NW Junggar Basin, China

Dr Zhijie Zhang¹, Dr. Xingyu Chen², Mr. Chuanmin Zhou¹, Dr. Li Wan¹, Dr. Dawei Cheng¹

¹Research Institute of Petroleum Exploration and Development, Petrochina, Beijing, China,

²Petrochina Hangzhou Research Institute of Geology, Hangzhou, China

3A: Next Generation Sediment Provenance (3), Tāwhirimātea A (Level 2), January 26, 2026, 3:40 PM - 5:10 PM

Recent research on source-sink systems has mostly focused on the land-ocean systems since the Mesozoic-Cenozoic era, while few involved terrestrial systems before Mesozoic. This study takes Permian in Junggar basin as an example to discuss the provenances and source-to-sink system evolution of lacustrine basin, including investigating the evolution of the provenance system based on the chronostratigraphy data, analyzing the stratigraphic and sedimentary pattern in the basin-scale geological sections.

Statistical analysis of heavy mineral assemblage and detailed petrographic investigation, combined with detrital zircon U-Pb geochronology, were conducted from sediments in different periods to understand the sediment provenance and unravel the source-to-sink processes. Through heavy mineral assemblage and gravel composition analysis, it is clear that the parent rocks of the northwestern margin of Junggar Basin during the Permian are mainly intermediate-basic igneous rocks and intermediate-acid igneous rocks, mainly from the central West Junggar. There is a small amount of mixed remote sources in the northern Mahu Sag and Zhongguai Uplift, which come from the northern and southern parts of West Junggar respectively.

In Early Permian, Carboniferous of the basin's periphery provided the majority of sediments. Fan delta to lacustrine sedimentation with proximal provenance is dominant in most regions. High-quality hydrocarbon source rocks and delta front sandbodies constituted favorable reservoirs in Mahu and other depressions, In Middle Permian, the sedimentation center and subsidence center obviously migrated to the inner basin, and the early-formed faulted sags tended to be connected. The northwestern part of the basin was still dominated by fan delta to lacustrine sedimentation systems with proximal provenance. The large-scale hydrocarbon source rocks with high connectivity in the central basin, can form source-reservoir association with the delta front. In Late Permian, a large shallow lake allowed the development of regressive river-delta systems with distal provenance. They provided the reservoir for the basin-scale stratigraphic reservoirs.

Decoupled Trace Metal Enrichment and Suboxic Depositional Constraints in the Early Cambrian Phosphorites of South China

Dr. Yunlong Zhang¹, Dr. Ziyang Li¹, Dr. Bin Zhu¹, Dr. Mingming Tian¹, Dr. Wenqi Jiang²

¹Beijing Research Institute of Uranium Geology, Beijing, China, ²Peking University, Beijing, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Early Cambrian Ocean of South China has been extensively studied to elucidate trace metal enrichment and its implications for paleoenvironmental conditions. The occurrence of phosphorite, notably enriched in phosphorus, within the Early Cambrian sedimentary succession signifies a critical shift in oceanic conditions. To investigate the sedimentary environment and enrichment mechanisms of uranium (U), phosphorite samples were collected from the Early Cambrian strata of South China with petrological and geochemical analysis conducted. The outcrop study shows that phosphorite layers are interbedded with mudstone and fine-grained sandstone. The phosphorite is predominantly composed of phosphatic grains, exhibiting seven distinct facies. Diagenetic processes, including quartz cementation and replacement, iron phosphate cementation, and phosphate recrystallization, were the primary controls on facies development. Enrichment of redox-sensitive elements (V, Mo, U) coupled with negative cerium (Ce) anomalies indicates deposition under suboxic to anoxic conditions. Integration of these findings with low organic carbon to phosphorus (C_{org}/P) ratios—suggestive of oxic conditions within the phosphorite and adjacent mudstone—constrains the sedimentary environment to a suboxic state, positioned slightly crossing the T1 threshold on the redox ladder proposed by Algeo et al. (2009). Differential enrichment patterns observed for V, Mo, and U suggest decoupled behavior, with U and Mo enrichment primarily governed by redox conditions, adsorption onto organic matter, phosphate minerals, and Ti-Fe oxides. This study provides new constraints on the sedimentary environment of Early Cambrian phosphorites and the enrichment dynamics of trace metals, contributing to our understanding of ocean evolution during this period.

Tectono-sedimentary Control on Shale Reservoirs and Fault Systems and Its Implications for Hydraulic Fracturing Slip Risk Assessment: A Case Study from Dazu Area, Sichuan Basin

Mr. Yuxuan Zhang¹, Mr Zifan Zhu¹, Mr Zhengshuo Miao¹, Mr Yangwen Pei¹

¹China University of Petroleum (East China), Qingdao, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The complex tectonic evolution of southeastern Sichuan has profoundly controlled both the depositional framework of organic-rich marine shales and the development of fault systems. This dual control established the geological foundation for shale gas enrichment and accumulation, while simultaneously preconditioning geomechanical risks during hydraulic fracturing. In Dazu area, stimulation activities are prone to reactivate inherited faults, leading to wellbore deformation, stimulation uncertainty, and long-term production challenges. To establish a predictive framework that links tectono-sedimentary processes with engineering risks, we integrated 3D seismic, well-log, and geological data to construct a regional three-dimensional geomechanical model that accounts for complex structures and lithological variability. The Wufeng–Longmaxi Formation, characterized by strong sedimentary heterogeneity and facies-controlled lithological contrasts, plays a critical role in governing both stress partitioning and fault reactivation potential. Numerical simulations of the present-day stress field reveal highly heterogeneous distributions. Based on the Coulomb slip criterion, we quantitatively assessed the fault-slip tendency and found that the spatial distribution of slip risk is closely tied to ancient tectono-sedimentary units. Slip susceptibility is highest within the central inherited fault zones, lower in the eastern and western sectors, and particularly elevated at fault bends, intersections, and overlapping segments. Model-predicted high-risk zones are spatially consistent with observed clusters of microseismic events and documented wellbore deformation. More importantly, our analysis demonstrates that certain high-risk faults, although readily activated during fracturing, may connect non-reservoir intervals or induce significant fluid leak-off, thereby undermining long-term productivity. This study highlights the essential role of integrating tectonic and sedimentary perspectives in geomechanical risk evaluation and provides a critical geological basis for well pattern design and stimulation optimization in the Dazu region.

Category-wise Sequence Correlation Filter for Lithology Identification with Well Logs

Dr Zitong Zhang¹

¹China University of Petroleum (Beijing), Beijing, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Well log data play a crucial role in lithology identification, given their nature as petrophysical measurements of stratigraphy that reflect lithological successions and depositional processes. Extracting recognizable features from well logs has become a focal point in lithology identification tasks. Recent advancements in machine learning (ML) have improved feature extraction by incorporating neighborhood information, particularly through filtering techniques that integrate sequence dependencies from well logs. However, traditional filters are often constrained by predefined theoretical models, posing adaptability challenges across varied reservoir conditions. To address these limitations, we propose a novel category-wise sequence correlation (CSC) filter for lithology identification, which is data-driven and model-free. Notably, the CSC filter captures the sequence structural variations arising from category heterogeneity by utilizing labeling information derived from well logs. Building on this, the CSC filter banks (CSCFBs) model is developed. It uses a series of CSCFBs as 1-D convolution templates acting on each logging curve to extract discriminative features associated with lithological categories. Application studies on several oil and gas fields demonstrate that the CSCFB model outperforms competitors in classification performance, proving its effectiveness and utility across diverse reservoir types.

Sedimentary Characteristics and Influencing Factors of Gravity Flows in Saline Lacustrine Facies: A Case Study of the Fengcheng Formation in the Mahu Sag, Junggar Basin

Dr Youjin Zhang^{1,2}, Dr Gang Gao^{1,2}, Dr Xinsong Wu^{1,2}, Weiguo Sun^{1,2}, Dr Keting Fan^{1,2}

¹China University of Petroleum, Beijing, Beijing, China, ²State Key Laboratory of Petroleum Resources and Engineering, Beijing, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Lower Permian Fengcheng Formation(P1f) in the Mahu Sag, Junggar Basin (Xinjiang, NW China), hosts an alkaline-lake mixed sedimentary system, with gravity-flow deposits of hydrocarbon reservoir potential developed in deep-water central sag areas. Integrated analyses of cores, thin sections, and geochemical data elucidate the characteristics and controlling factors of gravity-flow deposition. The findings of this study demonstrate that gravity-flow deposits occur throughout the Fengcheng Formation, dominantly triggered by combined mechanisms of slope failure and flood events, with their spatiotemporal distribution patterns controlled by interactions among volcanic, tectonic, and climatic processes. During the early deposition of the Fengcheng 1 Member(P1f1), intense volcanism formed effusive and explosive volcanic facies in the eastern sag, while contemporaneous slope collapses triggered slump-dominated gravity-flow deposits in the western region. Subsequent post-volcanic crustal weakening enhanced terrigenous input, promoting small-scale slumps under semi-humid and low-salinity conditions. The early stage of the Fengcheng 2 Member(P1f2) was characterized by aridification, leading to increased salinity and lake-level fall, during which slump-dominated gravity flows persisted. The late stage of P1f2 experienced semi-humid/semi-arid transitions with freshwater influxes, forming interbedded slump- and flood-induced hyperpycnal flows in weakly-reducing environments. The Fengcheng 2 Member(P1f3) recorded a shift toward semi-humid climates, with desalinated waters promoting hyperpycnal flow-dominated fine-grained sedimentation. This study establishes a multifactorial coupling model for saline lacustrine gravity flows, advancing sedimentological frameworks for continental saline basins and providing predictive criteria for unconventional reservoir exploration.

Study on Oil and Gas Control Effect of Bodong Low Uplift Fault

Yunlong Zhang¹, Jinqiang Tian²

¹Nztional Key Laboratory of Deep Oil and Gas, China University of Petroleum (East China), China,

²School of Geosciences, China University of Petroleum (east China), China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Bodong low uplift is one of the Mesozoic oil-rich tectonic units in the Bohai Bay Basin. However, the control mechanism of multi-stage fault activities on oil and gas transport, sealing and accumulation processes is still unclear, which restricts the optimization of oil and gas exploration targets in deep igneous rock zones. Based on mud logging, geochemical and rock-mineral analysis of new drilling wells in Bohai Sea, combined with three-dimensional seismic data, this study reveals the transport-closed coupling mechanism of Bodong low uplift and the control effect of deep faults on the differential charging of deep source fluids. Research suggests: 1) The activity rate of deep faults > 25 m / Ma is dominated by vertical transport, and low-rate faults form effective sealing through the difference between fault throw and caprock thickness and mudstone smear effect, 2) The quantitative characterization of the compressive and torsional strength of the strike-slip transition zone shows that the synergistic effect of the curvature of the main fault and the activity intensity of the associated fault controls the dominant migration path of oil and gas. The area with enhanced compressive and torsional stress increases the permeability of the fault zone and forms an efficient migration channel, and 3) Structural-sedimentary dynamic coupling analysis reveals that the shallow layer of the low uplift is controlled by extensional-strike-slip faults, and structural-lithologic composite traps are developed, while the volcanic reservoirs in the deep strike-slip transformation area of the low uplift have significant exploration potential. This study innovatively proposes a dynamic model of dual-power source fault control, and clarifies the cascade control effect of fault activity, fluid filling intensity and caprock overpressure on oil and gas enrichment, which provides a theoretical basis for the optimization of deep oil and gas exploration targets in Bohai Sea.

The Paleocene-Eocene Thermal Maximum Event Cause Mass Organic Matter Accumulation in Lakes: Evidence from the Miaoxi Area, Bohai Bay Basin, China

Ms Donglin Zhang¹, Professor Meijun Li¹, Mr Rongzhen Qiao¹

¹China University of Petroleum Beijing, Beijing, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The red mudstone of Member 4 of the Shahejie Formation (Es4) in the Bohai Bay Basin is interspersed with a set of high-quality black source rocks. A large amount of petroleum is believed to originate from these source rocks. The Paleocene-Eocene Thermal Maximum (PETM) event occurred during the deposition of the Es4 in Bohai Bay Basin, and the organic matter enrichment model under this event is worth further investigation. In this study, we integrate total organic carbon (TOC), Rock-Eval pyrolysis, microscopic observation, vitrinite reflectance (VRo), elemental analysis, and gas chromatography-mass spectrometry (GC-MS) to evaluate the hydrocarbon generation potential, organic matter types, thermal maturity, and sedimentary environment of Es4 in the Miaoxi area. The analysis of maceral, TOC, and rock pyrolysis data reveals that Type I and Type II organic matter make up the majority of Paleogene mudstones. It has high organic matter abundance and oil-generation potential. The measured vitrinite reflectance of Paleogene mudstone ranges from 0.3% to 0.74%, which is in the immature to mature stage. The analysis of biomarkers in the mudstone samples indicates that most of the mudstones are in lacustrine and brackish-hypersaline lacustrine systems under a reducing environment, and some of the red mudstones in the Es4 are formed under a suboxic environment. Based on the size and morphology of the pyrite framboid, the redox conditions of the water mass during deposition or diagenesis were further analyzed. The ratio of the size of framboid pyrite (D) to the size of its micrograins (d) suggests that the Es4 black mudstone is in an anoxic sulfuretted water environment. Both the inorganic and organic geochemical indexes show that the paleogene paleoclimate has a great influence on the source rocks of the Es4 in this area. Combined with the Paleogene paleoclimate background, a set of source rock formation models of the Es4 in this area have been constructed. This study not only contributes to our understanding of the geological processes shaping the Bohai Bay Basin but also provides valuable insights into the potential causes of organic matter enrichment during significant paleoclimatic events like the PETM.

Study on the Formation Mechanism of Favorable Reservoirs Dominated by Provenance Differences: Case Study of the Shahejie Formation, Southern Gentle Slope Belt, Zhanhua Sag

Yuxiang Zhang¹

¹China University of Petroleum (East China), Qingdao, Shandong of China, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The deep heavy oil with huge reserve potential is mainly concentrated in the southern gentle slope belt in Zhanhua Sag of Bohai Bay Basin. However, attributed to multi-provenance, the distribution law and formation mechanism of high-quality reservoirs with deep heavy oil are unclear, which seriously restricts exploration research. In this paper, rock components, petrophysical properties, pore throat structure, diagenesis and evolution process of clastic rock reservoirs in the Shahejie Formation of different regions in the southern gentle slope belt are analyzed comprehensively by means of core observation, thin-section petrography, cathodoluminescence(CL), scanning electron microscopy(SEM) and X-ray diffraction (XRD). The results show that, first, the main provenances are the Chenjiazhuang and Gudong uplifts. Second, the rock components in the Luoxi and Kenxi regions exhibit the characteristics of "high quartz and lithic fragments, low feldspar", with the lithic fragments being a combination of "metamorphic and igneous lithic fragments(MLF&ILF)". In the Luodong and Sanhecun regions, the characteristics are "high lithic fragments, low quartz and feldspar", and the lithic fragments are mainly composed of "sedimentary lithic fragments(SLF)", with a significant presence of carbonate rock lithic fragments. Third, different lithic fragment combinations and contents are the important reasons for the reservoir differences. In the MLF&ILF reservoirs, compaction and cementation are not fully developed, and more primary intergranular pores are preserved. The reservoirs are mainly of medium-low porosity and permeability. In the SLF reservoirs, the particles are mostly in line contact, and carbonate cementation is developed, with a small amount of secondary dissolution pores. The reservoirs are mainly of medium-low, ultra-low and extra-low porosity and permeability. Finally, provenance differences and the distribution of sedimentary facies under their control have a significant impact on the development of favorable reservoirs. Overall, the reservoir performance in the Luoxi and Kenxi regions has a relative advantage.

Sedimentary Facies and Nano-geochemical Insights into Sandstone-hosted Uranium Exploration in the Ordos Basin, Northern China

Xin Zhang¹

¹East China University of Technology, Nanchang, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The strategic role of sedimentology in facilitating green energy transitions has gained global prominence, particularly in the context of unconventional resource exploration and carbon-neutral technologies. Our study focuses on the application of sedimentological principles to enhance the discovery and evaluation of sandstone-hosted uranium deposits in northern China, a critical domain for securing low-carbon nuclear energy raw materials. Based on advancements in energy sedimentology, our study employs an integrated approach combining high-resolution sedimentary facies analysis with basin-scale sequence stratigraphic frameworks to delineate the spatiotemporal evolution of paleo-redox conditions and sediment dispersal patterns within the Ordos Basin of North China. Through synergistic application of nanoscale petrophysical characterization techniques (Nano-CT, TEM-EDS) coupled with multi-proxy geochemical fingerprinting, we systematically decipher the genetic mechanisms governing uranium mineralization in fluvial-deltaic sedimentary systems, demonstrating a causal relationship between hierarchical stratigraphic architecture and metallogenic processes. Our findings establish that epigenetic hydrothermal overprinting and subsequent diagenetic modification constitute critical processes controlling the formation of high-grade uranium deposits, fundamentally redefining current genetic models for sandstone-type uranium mineralization in continental basins. These findings directly support sustainable nuclear energy development by optimizing exploration efficiency and reducing environmental footprints.

Intensified Chemical Weathering and Ice Sheet Advancing Sequence at the Beginning of the Cryogenian Sturtian Glaciation

Dr Kun Zhao¹, Professor Xianguo Lang¹, Dr Shengxian Zhu¹

¹Chengdu University of Technology, Chengdu, China

1F: Earth's sedimentary record of glaciation (1), Rongomātāne C (Level 1), January 26, 2026, 10:15 AM - 11:45 AM

The global synchronous occurrence of glacial diamictite at the boundary of the Tonian-Cryogenian suggests a rapid onset of the Neoproterozoic Sturtian glaciation. However, uncomfortable contacts between the Tonian and Cryogenian successions obscure our understanding of ice sheet dynamics and continental chemical weathering during the initiation of the global glaciation. Here, we perform a detailed facies analysis and magnesium isotopic compositions ($\delta^{26}\text{Mg}$) of two successions (the Tonian Gongdong to the Cryogenian Chang'an Formation) from the deep-water facies of the Nanhua Basin, South China. Seven main lithofacies were recognized, including massive to laminated siltstone/muddy siltstone (Fm), ripple cross-laminated siltstone (Fr), massive to horizontal sandstone (Sm), gravely sandstone (Sg), matrix-supported massive diamictite (Dmm), weakly stratified diamictite (Dms) and dropstone bearing siltstone (Fdl). These facies were deposited from turbidity currents to glacial-influenced debris flows in deepwater environments. The top of the Gongdong Formation is mainly composed of massive to laminated siltstone/muddy siltstone and thin-bedded massive sandstone. The base of the Chang'an Formation is primarily constituted by massive to stratified diamictite. The gradual transition from massive to laminated siltstone to dropstone bearing siltstone and massive diamictite at the boundary between Gongdong and Chang'an formations indicates an ice sheet advancing sequence. The presence of abundant ice-rafted dropstones and rippled siltstone at the basal Chang'an Formation suggests active glacier calving and subglacial debris flows during ice sheet advancing. $\delta^{26}\text{Mg}$ data show a significant positive shift at the top of the Gongdong Formation, recording enhanced chemical weathering before the beginning of the Sturtian glaciation. Also, the advancing ice sheet and glacial-influenced deposition are also supported by frequent changes in organic carbon isotope values (ranging from -26.5‰ to -29.3‰) that result from increasing terrestrial inputs. These findings provide the initial comprehensive sedimentological and geochemical evidence for the rapid onset of Snowball Earth.

Internal Tide-induced Remobilization of Sandy Sediments in Submarine Canyons

Dr. Yulong Zhao¹, Dr Zhifei Liu¹, Dr Yanwei Zhang¹, Dr Xiaodong Zhang¹, Dr Baozhi Lin¹, Dr Pengfei Ma¹

¹State Key Laboratory of Marine Geology, Tongji University, Shanghai, China

2D: Controls on sedimentation at submarine active margins (2), Rongomātāne A (Level 1), January 26, 2026, 1:40 PM - 3:10 PM

Submarine canyons represent pivotal conduits for terrestrial-to-marine sediment transfer, where sedimentary dynamics are conventionally attributed to gravity flow processes. However, extended moored observations in the Taiwan Canyon, northern South China Sea (May 2013–May 2016), revealed a low frequency of gravity flow activity, with no events recorded over the three-year monitoring period. To elucidate sedimentary processes in this canyon, a benthic tripod was deployed at ~2,900 m water depth in the canyon's lower reach from August 2019 to June 2020. No gravity flows were detected during the deployment. Intriguingly, between December 30, 2019, and January 2, 2020, an optical transmissometer positioned 0.5 m above the seabed (mab) captured recurrent high suspended sediment concentration (SSC) events, each persisting 4–7 hours. ADCP volume backscatter strength data indicated that influences of these high SSC perturbations extended up to 100 mab. Concurrent measurements from a LISST-Deep instrument at 1 mab identified suspended particles spanning 80–200 μm (fine sand grade). Hydrodynamic profiling during high SSC events revealed near-bed velocities of 0.3 m/s within 1 mab, accelerating to 1–1.5 m/s between 6–100 mab, with flows oriented southwest to southeast. Current velocity and direction exhibited pronounced tidal cyclicity, with flow direction generally perpendicular to the canyon thalweg during high SSC events. This spatiotemporal pattern implicates internal tide-topography interactions—rather than gravity-driven mechanisms—as the primary driver of high SSC events. The findings demonstrate that in gravity flow-inactive submarine canyons, internal tide-induced hydrodynamics may govern sedimentary processes, generating near-bed currents with intensities comparable to those of gravity flows. Such dynamics enable suspension of fine sand-grade sediments tens of meters above the seabed, unveiling an alternative sediment transport and resuspension mechanism in submarine canyons.

Sedimentary System and Their Controlling Factors of the Es4u to Es3l in the Gentle Slope Zone of the Southern Zhanhua Sag, Bohai Bay Basin

先生 **Guanghao Zhao**¹

¹China University of Petroleum (east China), Qingdao, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

Three sedimentary systems, including fan deltas, shallow/deep lakes, and saline lake deposition, were identified in the upper Fourth Member to Lower Third Member of the Shahejie Formation of the southern gentle slope belt in the Zhanhua Sag, Jiyang Depression, through integrated analysis of drilling cores, well logs data, and 3D seismic data. Routine core analysis, thin section petrography, and geochemical measurement were used to understand the factors affecting the development of these sedimentary systems. The results suggest that fault activity and paleoclimate jointly controlled the distribution and evolution of sedimentary systems in the Zhanhua Sag. With the transformation of the regional tectonic stress field, the pre-existing NW trending faults coexist with the newly formed NE trending faults. Weak fault activity results in shallow burial depth of the lake basin, and the fan delta sedimentation with a large development range and extended distance in the southern gentle slope zone. The relatively arid climate promoted intense evaporation, and in the deeper waters of the central lake basin, carbonate rocks and gypsum rocks have successively deposited and distributed in a ring-like pattern. During the late stage of the Fourth Member of the Shahejie Formation, intense activity of NE-trending faults such as the Gunan and Yidong faults, coupled with a shift to a warmer and wetter climate, caused lake basin expansion and rapid lake-level rise. This triggered the southward retrogradation of fan delta, gradually reducing their areal extent. Within the lake basin, deep lake sediments dominated by calcareous mudstone and marl developed. Based on these findings, a sedimentary system development model controlled by fault activity and paleoclimate was established.

Genesis of Shale Lithofacies and Reservoir Development Characteristics of the Shahejie Formation Member 3 in the Bonnan Sag, Bohai Bay Basin

Zilong Zhao¹

¹China University of Petroleum (east China), Qing Dao, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Paleogene shale in the Bonnan Sag of the Bohai Bay Basin holds significant exploration potential for shale oil due to its wide distribution, high organic matter content, and favorable reservoir properties. However, the genesis of lithofacies and the mechanisms controlling reservoir heterogeneity remain poorly understood. This study aims to investigate the sedimentary evolution and reservoir development characteristics of the Bonnan Sag by integrating sedimentological, diagenetic, and structural analyses. Special focus is given to the influence of depositional environment, tectonic activity, and burial diagenesis on pore structure and permeability variation.

Through high-pressure and high-temperature porosity-permeability testing and detailed lithofacies classification, the study identifies distinct pore systems and clarifies their links to depositional and post-depositional processes. The results highlight that differences in facies associations significantly affect reservoir quality, and that tectonically induced subsidence and compaction have played a critical role in shaping shale heterogeneity. These insights improve the understanding of black shale development under varying tectonic and sea-level regimes and provide a reference for exploring metalliferous and hydrocarbon-rich shale systems in similar settings.

This research not only supports efficient shale oil resource evaluation in the Bonnan Sag, but also contributes to broader knowledge of black shale sedimentology and its economic implications in tectonically active basins.

Facies Architecture Characterization of a Meandering-river Deposit Based on Seismic Attributes Fusion: A Case Study of Kl-a Oilfield, Bohai Bay Basin, East China

Dr Yin Zhijun¹, Li Yujing, Guan Zhaojie

¹China University of Petroleum, Beijing, Beijing, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The KL-A Oilfield, located in Bohai Bay Basin, East China, is a high-productivity reservoir with hundred-million-cubic-meter reserves. Its primary hydrocarbon-bearing interval, the Lower Member of the Minghuazhen Formation (NmL), consists of meandering river deposits characterized by high porosity and permeability. The reservoir architecture and sandstone connectivity are critical factors influencing oilfield development. Core observations and well-log interpretations reveal four main lithofacies in the NmL: massive sandstone, horizontal-bedded sandstone, trough cross-bedded sandstone, and ripple cross-laminated sandstone, each with varying thicknesses from 2 meter to 10 meter. we apply an intelligent seismic attribute fusion technique, supervised by well-log data, to delineate the spatial distribution of architectural elements. Through correlation analysis, we select five key seismic attributes, that is, reflection intensity, relative impedance, sweet point, amplitude, and envelope for fusion using a Deep Feed-Forward Neural Network (DFNN) algorithm, supervised with interpreted porosity from 9 wells. The resulting 3D DFNN attribute volume significantly improves the detection of thick point-bar deposits and thin channel sandstones. Seismic stratal slicing of DFNN attribute enables precise mapping of point-bar and channel sandstone geometries, revealing reservoir compartmentalization and connectivity patterns. This detailed architectural analysis highlights the high complexity of the meandering river system, providing critical geological insights for optimizing waterflood development strategies in the KL-A Oilfield.

Late Cenozoic Seismic Stratigraphy and Sedimentary Fill of the Huatung Basin Offshore Eastern Taiwan: Implications for Linkages to the Taiwan Orogeny

Dr Guangfa Zhong¹, Dr. Chi-Yue Huang

¹Tongji University, Shanghai, China

3D: Controls on sedimentation at submarine active margins (3), Rongomātāne A (Level 1), January 26, 2026, 3:40 PM - 5:10 PM

The Taiwan orogeny, resulting from the collision between the Luzon Arc and the northern continental margin of the South China Sea (SCS) since ~6.5 Ma, represents a significant plate-tectonic event in the western Pacific. This collision has resulted in a tremendous amount of sediment dispersed from Taiwan Island into surrounding seas, including the Huatung Basin (HB) to the east and the SCS to the west. The HB is a closed basin, bounded by the Taiwan orogen and Luzon Arc to the west and southwest, the Ryukyu subduction zone to the north, and the Gagua Ridge to the east. This enclosed setting offers a unique opportunity to study the source-to-sink processes of sediments derived from the Taiwan orogeny.

Here we utilize multichannel seismic data to investigate the syn-orogenic sedimentary fill in the HB. Two syn-orogenic seismic sequences are subdivided. Five main types of seismic facies are recognized, characterized respectively by high-amplitude (facies 1), chaotic or transparent (facies 2), upslope-migrating wavy (facies 3), and parallel to sub-parallel (facies 4) reflections. These facies are interpreted as follows: turbidites (facies 1), mass-transport deposits or debrites (facies 2), supercritical turbidity-current bedforms (facies 3), and pelagic deposits (facies 4). The first three facies types are primarily distributed in the western and northern parts of the HB, forming features including submarine canyons, submarine fans, and sediment-wave fields. In contrast, facies 4 is mainly found in the abyssal plain in the southeastern portion of the basin. Thickness of the syn-orogenic sequences overall decreases toward the east and south. Multiple lines of evidence, including E-W oriented submarine canyons, eastward-prograding submarine fans, and westward migrating supercritical bedforms, suggest that sediments derived from the Taiwan orogen have been predominantly transported into the HB by gravity-driven flows and associated processes. This work was supported by the National Natural Science Foundation of China (42476073).

Sedimentary Characteristics, Material Sources, and Genetic Mechanisms of Fine-grained Sedimentary Rocks in the Upper Es4 Member of the Boxing Sag

太太 **Lulu Zhong**¹, Qiu Longwei Qiu, Yang Yongqiang Yang, Qi Jingbin Qi, Ling Can Ling

¹中国石油大学(华东), 青岛, China, ²中国石油大学(华东), 青岛, 中国

9F: Sediment gravity flow deposits in lacustrine basins (1), Rongomātāne C (Level 1), January 29, 2026, 4:25 PM - 5:55 PM

The study of the provenance of fine-grained sedimentary rocks is a crucial first step in the "source-to-sink" system theory of fine-grained sedimentary rocks. It is important for restoring the ancient sedimentary environment, understanding the formation mechanism of fine-grained sedimentary rocks, and predicting the distribution of unconventional oil and gas resources. To investigate the sedimentary characteristics and genetic mechanisms of fine-grained sedimentary rocks in the Boxing Subbasin, core observations, thin-section identification, chemical experiments, and XRD diffraction analysis were conducted. The results reveal that the upper Es4 (Es4s) fine-grained sedimentary rocks are dominated by organic-rich laminated mudstones and shales, with siliceous, calcareous, and mixed fine-grained lithofacies developed. The sedimentary characteristics exhibit high-frequency lamina alternations, enriched pyrite, and organic matter (TOC content averaging 2.5%–4.0%), indicating a deep-water anoxic environment. The mineral composition is primarily calcite, quartz, and clay minerals, with minor feldspar and dolomite. Provenance analysis suggests that the mineral components were derived from: (1) terrigenous input (Paleogene detritus and volcanic materials from surrounding uplifts); (2) intrabasinal biogenic silica (e.g., diatoms) and chemical carbonate precipitation; and (3) lacustrine algae-dominated organic matter. The genetic mechanisms were controlled by paleoclimate (seasonal stratification under semi-arid to arid conditions), paleo-water depth (semi-deep to deep lake), tectonic activity (intermittent gravity flows triggered by syn-sedimentary faults), and lake stratification (saline stratification promoting anoxic preservation). The coupling of these factors formed a fine-grained sedimentary model driven by the synergistic interaction of "high-frequency climate-tectonic-biological" processes, providing high-quality hydrocarbon source rocks for shale oil exploration.

Holocene Dolomite Formation in the Coastal Sabkha of Abu Dhabi

Doc. Hanting Zhong^{1,2,3}, Professor Chengshan Wang⁴, Professor Mingcai Hou^{1,2,3}, Dr Chao Chen^{1,2,3}, Dr Meng Ning^{1,2,3}, Dr Yuzhu Ge^{1,2,3}, Dr Xia Wang^{1,2,3}, Dr Xinyu Wang⁵, Dr Han Wang^{1,2,3}

¹State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Chengdu University of Technology, Chengdu, China, ²Key Laboratory of Deep-time Geography and Environment Reconstruction and Applications of Ministry of Natural Resources, Chengdu University of Technology, Chengdu, China, ³Institute of Sedimentary Geology, Chengdu University of Technology, Chengdu, China, ⁴China University of Geosciences (Beijing), Beijing, China, ⁵College of Earth and Planetary Sciences, Chengdu University of Technology, Chengdu, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The “dolomite problem” is a significant basic geological problem that has perplexed geologists for over two centuries. Research on dolomite formation has primarily focused on ancient deep-time carbonate rocks, where complex diagenetic processes have posed significant challenges to understanding its formation mechanisms. Notably, studies utilizing modern dolomite can effectively avoid interference from late diagenetic processes. Here, we employ multiple analytical approaches to investigate the process of dolomite formation by analyzing modern dolomite in the Abu Dhabi sabkha sequence. Petrographic analysis reveals complex carbonate mineral compositions in the sediments, including aragonite, high-Mg calcite, low-Mg calcite and dolomite. To address this complexity, a methodology employing disodium ethylenediaminetetracetic acid (EDTA-2Na) is used to chemically separate dolomite crystals from coexisting carbonate minerals. The slight enrichment of MREE, high Fe and Mn concentrations and low Y/Ho suggest that the formation of dolomite under suboxic to anoxic conditions. The significantly lower carbon and oxygen isotopic values of the dolomite compared to those of the bulk carbonate indicate that its formation was likely influenced by groundwater or meteoric freshwater input. The $\delta^{26}\text{Mg}$ trend of dolomite correlates closely with sea-level fluctuations, indicating that dolomitization was controlled by sea-level changes. The Al-Khidayrah profile experienced two phases of penecontemporaneous dolomitization: initiation during the transgressive phase (hardground formation) and termination at the top of the supratidal zone. This research provides a modern sedimentary analog for elucidating the genetic mechanisms of ancient dolomites formed in arid and hot tidal flat environments with low terrigenous input. It offers critical scientific insights into deciphering the formation processes of dolomite in analogous geological settings.

Controls on Natural Gas Accumulation and Enrichment Models in the Western Bonan Low Uplift, Bohai Bay Basin

Miss Hongfei Zhou¹, Professor Jinqiang Tian¹

¹China University of Petroleum (east China), Qingdao, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

The Bonan Low Uplift is an important natural gas exploration zone in the Bohai Bay Basin. In recent years, multiple medium-sized gas reservoirs and high gas-oil ratio oil reservoirs have been discovered in its western segment. However, the main controlling factors for reservoir formation and the enrichment patterns remain unclear, which restricts further exploration and deployment. Based on 2D seismic data, logging data, core samples, and geochemical data, this study reveals the key control mechanisms for natural gas accumulation in the western segment. The research results show that: (1) The oil and gas sources are mainly from the Sha-3 Member source rocks (TOC 1.5%-3.2%, Ro 1.0%-2.0%), and hydrocarbon generation-induced overpressure (pressure coefficient >1.3) provides the main driving force for natural gas migration; (2) The NE-trending fault system (activity rate 0.05-0.15 mm/yr) and delta front sand bodies (porosity 8%-15%) form a dominant transport network, controlling the vertical-lateral migration pathways of natural gas; (3) The regional sealing of thick mudstones (>50 m thick) in the Minghuazhen Formation and local structural crests jointly determine the differential enrichment of natural gas. On this basis, an enrichment model of "fault-sand coupling transport, late-stage rapid charging, and structural-lithological composite reservoir control" has been established. A systematic analysis and comprehensive study of its oil and gas accumulation conditions, as well as the summarized oil and gas distribution patterns, are of great practical significance for further evaluating the oil and gas exploration prospects in the Bohai Sea area.

Sediment Gravity Flows Enhanced Organic Carbon Degradation During the Cryogenian Marinoan Glaciation

Dr Shengxian Zhu¹

¹Chengdu University of Technology, Chengdu, China

7A: Applications of Sedimentology for the Green Energy Transition & The role of subaqueous sediment gravity flows in carbon sequestration, Tāwhirimātea A (Level 2), January 29, 2026, 10:15 AM - 11:45 AM

Sediment gravity flows have the potential as a significant carbon sink due to their high sediment volumes and organic carbon (OC) content. However, their role for OC burial throughout geological history is poorly known. We therefore studied the Cryogenian Marinoan glaciation (~650-635 Ma) during which varied sediment gravity flows occurred globally at relatively high frequency triggered by the high sediment mass accumulation rate when huge ice sheets advanced and by the sudden steepening of the slope when ice sheets retreated. We analyzed the Nantuo Formation in South China for granularity, C-N-S content, and their isotope compositions ($\delta^{13}\text{C}_{\text{org}}$, $\delta^{15}\text{N}$, $\delta^{34}\text{S}_{\text{py}}$) to obtain new insights into the function of ancient sediment gravity flows for carbon cycling. We found an upward sequence of coarsening-fining granularity coupled to decreasing-increasing TOC content and heavy-light $\delta^{13}\text{C}_{\text{org}}$ values that remains parallel to the C=M (the 1% and 50% granularity, respectively) baseline. At the base of the sequence, the fine granularity is associated with lighter $\delta^{15}\text{N}$ values and higher content of pyrite with heavier $\delta^{34}\text{S}_{\text{py}}$ values compared to coarse granularity sections. We propose that low-density turbidity currents triggered by glacial retreat were characterized by low OC degradation in the sediments. Reversely, high-density turbidity currents and/or glaciogenic debris flows triggered by glacial advance were characterized by high OC degradation in the sediments. Modeling the co-variation between granularity and carbon geochemical data revealed that the coarse deposits of the sediment gravity flows in the anoxic glaciomarine environments enhanced sedimentary OC degradation, thereby reducing burial of the OC generated by the sustained productivity during the Marinoan glaciation.

The Formation Stages of Calcite Veins in the Ordovician, Southeastern Slope of Tahe Oilfield, Are Significant for Determining the Hydrocarbon Charge History

Qinghua Zhu¹

¹China University of Petroleum (east China), Qingdao, China

Poster Session 1 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 27, 2026, 3:10 PM - 4:25 PM

The Tahe Oilfield is located in the middle of the Akkule Uplift in the northern Tarim Basin. The southeastern slope is situated in the subsalt area to the southeast of the Tahe Oilfield. The Ordovician system is the main oil and gas reservoir in this region. Determining the formation stages and timing of calcite veins in the Ordovician reservoir is of great significance for identifying the oil and gas charge times and stages. Rare earth isotopes, C and O isotopes testing and analysis were carried out on calcite veins with hydrocarbon inclusions in the study area. It was considered that the paleofluids of veins indicating oil and gas charging were sourced from deep-seated formation hydrothermal fluids.

Through cathodoluminescence characteristics, hydrocarbon inclusions, homogenization temperature of coeval saline inclusions, burial history simulation combined with U-Pb dating of calcite veins and other analysis and testing, it was comprehensively analyzed that there are three stages of calcite veins in the study area. The formation times are the Caledonian period (420-463Ma), the late Hercynian period (245-290Ma) and the Himalayan period (10-20Ma), respectively. Hydrothermal calcite is an important host of primary oil inclusions. The precipitation of hydrothermal calcite may occur simultaneously with oil charging. By determining the formation time and stages of these three phases of veins containing primary hydrocarbon inclusions, we believe that these three periods may also be the main oil and gas charging periods in the Ordovician of the southeastern slope. This study reveals the source and evolution of diagenetic fluids at different periods, providing an important basis for further understanding the diagenesis of the Ordovician reservoirs in the southeastern slope of the Tahe Oilfield.

Response of Seismic Geomorphology for Different Systems Tracts in Dainan Formation of Gaoyou Sag, Eastern China

Prof. Xiaomin Zhu¹

¹China University of Petroleum (Beijing), Beijing, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Focusing on the Paleogene Dainan Formation in the Gaoyou Sag of Subei Basin, eastern China, this study integrates seismic termination patterns, sedimentary cyclicity analysis, and well-to-seismic calibration to subdivide the Formation into three third-order sequences containing lowstand (LST), transgressive (TST), and highstand (HST) systems tracts, whose spatio-temporal configuration is governed by the evolutionary characteristics of the first flooding surface (FFS) and maximum flooding surface (MFS). Five distinct sedimentary facies are identified: deltas, fan deltas, nearshore subaqueous fans, slump turbidite fans, and lacustrine deposits. Facies distribution exhibits marked tectonic zonation controlled by basin architecture and structural evolution, with steep slope zones dominated by nearshore subaqueous fan-fan delta complexes, gentle slopes developing normal deltaic systems, littoral-shallow lacustrine facies forming annular belts along basin margins, and deep-semideep lacustrine facies with slump turbidite fans concentrating in depositional centers. Through novel application of 90° phase adjustment, spectral decomposition technique, and multi-attribute fusion techniques, robust correlations between seismic amplitude attributes and lithologies are established via seismic lithology calibration, where red hues correspond to sand-rich zones and black/dark blue tones indicate shale-dominated areas. Detailed analysis of sequence evolution demonstrates that during the LST, the northern gentle slope of the sag developed a delta system comprising five lobate bodies, while the southern steep slope formed small-scale fan deltas, with depositional centers predominantly accumulating restricted deep lacustrine shales. The TST witnessed significant shrinkage of delta-front lobate bodies accompanied by expansion of deep lacustrine environments, alongside reduced dimensions of fan delta deposits in southern steep slopes. During HST, laterally continuous delta lobe complexes emerged across gentle slopes, contemporaneous with the development of slump turbidite fan clusters in depositional centers and enlarged fan delta scales in steep slopes compared to LST.

Sedimentary Environment, Diagenetic Characteristics and Reservoir Formation Effect About Lower Paleozoic Carbonate Rock Buried Hill Reservoir of the Zhuangxi Area in Bohai Bay Basin, China

Professor Yixiu Zhu^{1,2}, Student Chenyang Ji^{1,2}, Student Xiaolong Ha^{1,2}, Student Chengshan Li^{1,2}, Student Yi Zhong^{1,2}

¹College of Geosciences, China University of Petroleum, Beijing, Beijing / Changping District, China,

²State Key Laboratory of Petroleum Resources and Prospecting, China University of Petroleum, Beijing, Beijing / Changping District, China

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Carbonate rock forming in The Lower Paleozoic Cambrian–Ordovician of the Zhuangxi area in the Jiyang Depression, Bohai Bay Basin, China, has potential in developing high-quality buried hill reservoir. By using experimental testing methods such as core analysis, thin sections, SEM, and cathodoluminescence and combining with well logging, seismic data and a series of studies, the Lower Paleozoic carbonate sequences are conducted on the formation environment, diagenesis and reservoir-controlling factors. Results show that the target strata is deposited in a tidal flat to shallow-platform, which sedimentary microfacies can be divided into dolomite flat, muddy- dolomite flat, calcite flat, intertidal and subtidal. The lithology mainly consists of argillaceous limestone, grain limestone, wormkalk, crystalline dolomite and grain dolomite. There have been formed weathering crust and inner reservoir through diagenetic modification of the rocks, experienced compaction, pressure dissolution, cementation, dolomitization, recrystallization, weathering dissolution and tectonic brecciation. Among these, pure dolomite, karstic limestone, and fragmented limestone and dolomite are the dominant reservoirs, with high-productivity wells predominantly clustered in areas where dolomite facies overlap with fracture-developed zones. Karstification is the main cause of pore and cavity formation, while tectonic activity controls the development and distribution of fractures. Differences in rock composition and igneous intrusions jointly influence the distribution of buried hill reservoir. These factors collectively dominate the distribution of hydrocarbon accumulations and result in pronounced reservoir heterogeneity within the buried hill system.

The Sedimentary Mill in the Wheel of Time: Tracking the Fate of Detrital Minerals

Dr Yousef Zoleikhaei^{1,2}, Professor Peter A. Cawood¹, Dr Jacob A. Mulder², Professor Alan S. Collins²

¹Department of Earth Sciences, University of Adelaide, Adelaide 5005, Australia, ²School of Earth, Atmosphere and Environment, Monash University, Melbourne 3800, Australia

1A: Next Generation Sediment Provenance (1), Tāwhirimātea A (Level 2), January 26, 2026, 10:15 AM - 11:45 AM

Multi-mineral provenance analysis enables us to establish the ultimate fate of detrital minerals within the sedimentary cycle, often extending over timespans of hundreds of millions of years. Our study of Cambrian to Triassic stacked sedimentary basins of Iran explores detrital mineral behavior over a continuous sedimentary cycle of some 350 million years in which lengthy periods of sedimentation are interrupted by basin inversion and erosion. We determined the U–Pb age and degree of roundness of detrital zircon, rutile, and apatite grains with contrasting physical and chemical stabilities. Results indicate that the primary sediment sources were the Neoproterozoic basement of the Arabian-Nubian Shield (ages > 600 Ma) and the Neoproterozoic to Triassic (600–200 Ma) crystalline rocks of the local basement in Iran, whereas Paleoproterozoic detritus (ca. 1850 Ma) from an exotic source, possibly Afghanistan or Eurasian blocks to the north, is only observed in Triassic units. Zircon grains that entered the sedimentary cycle during the Cambrian survived multiple recycling events, reappearing in the Devonian and Triassic units alongside newly introduced zircons from syndepositional crystalline sources. Detrital rutile grains partially survive recycling, reappearing in younger units alongside new grains derived from syndepositional sources. However, a significant proportion of detrital rutile grains are destroyed during sediment recycling, leading to the gradual disappearance of older age peaks in the stratigraphic record. Detrital apatite grains in each unit are predominantly young and derived from syndepositional sources, suggesting that older detrital apatite grains from underlying units did not survive sediment recycling.

The new data reveal that first-cycle detrital zircon is almost always angular, whereas recycled grains exhibit variable degrees of roundness. Rutile shows increased roundness even in the first cycle, and apatite exhibits higher degrees of roundness than both zircon and rutile in the same unit. These findings highlight that detrital minerals are continuously recycled and eventually lost, illustrating the ultimate fate of sedimentary materials within the dynamic Earth system.

Something From Nothing: Where and How Much Apparent Cyclicity Appears Out of Autogenic Processes

Dr Valentin Zuchuat¹, Dr Thomas Poulet¹, Dr John Shepherd²

¹CSIRO, Kensington, Australia, ²UWA Oceans Institute, Crawley, Australia

4A: Can Forward Stratigraphic Modeling enhance geological understanding of the subsurface and predict sedimentation through time and space? (1), Tāwhirimātea A (Level 2), January 27, 2026, 10:15 AM - 11:45 AM

Autogenic processes are internally-driven changes that occur due to natural system dynamics, such as river meandering, delta switching or compensational stacking, while allogenic processes are externally forced by factors like climate change, sea-level fluctuations, tectonic activity, or a mix of thereof, which influence sedimentation on a larger scale. Both autogenic and allogenic processes impact the deposition and preservation of sedimentary strata, but decoupling their respective influence remains a major challenge when studying the evolution of a sedimentary basin. This task becomes even more challenging when accounting for the spatial and temporal variability of weathering, transport, and depositional processes, their interactions, and their individual responses to changing conditions. A fundamental principle is that energy-variations trigger changes in transport and depositional styles, ultimately shaping the architecture of depositional elements.

Basin-evolution models serve as predictive tools for subsurface geoscientists, integrating local core and outcrop observations with large-scale datasets such as reflection seismic profiles. However, these models depend heavily on geoscientists' interpretations of preserved stratigraphic patterns. How, then, should we interpret coarsening-upward or fining-upward sequences? and what if such signals appear to be cyclical?

This project studies the emergence of allogenic artifacts in deltaic environments using stratigraphic forward models driven solely by autogenic processes, without external forcing. This study highlights that cyclical patterns can occur in most parts of the basin. The distribution of these artifacts, however, seems to be independent of the depositional environment in which they appear. Additionally, despite the wide range of dominant periodicity within a specific depositional environment, some of these cycles appear to match the periodicity of known allogenic signals, such as Milankovitch-style cycles. Ongoing work aims at quantifying the degree of cyclical-artifact potential of the various depositional environments in the basin in greater detail, but initial results suggest that a generalised multiple-hypotheses approach could be necessary for a robust and accurate basin reconstruction.

Restore, Fill, Inject. How We Derisk Mineral Exploration in a Deformed and Data-deprived Basin – Example from the Tonian-aged Yeneena Basin, Western Australia

Dr Valentin Zuchuat¹, Dr Chirantan Parui¹, Dr Giovanni Spampinato², Dr Thomas Poulet¹, Dr Heather A. Sheldon³, Dr Susanne Schmid¹

¹CSIRO, Kensington, Australia, ²CSIRO, Lindfield, Australia, ³CSIRO, Black Mountain, Australia

Poster Session 2 & Afternoon Tea, Level 1 Foyer (Tākina Convention & Exhibition Centre), January 29, 2026, 3:10 PM - 4:25 PM

Sedimentary-hosted mineral deposits play a critical role in supporting renewable energy development and global electrification. However, discovering large strategic- and critical-metal deposits such as copper is increasingly difficult due to their depth and lack of geophysical signatures, resulting in declining discovery rates. Many of these deposits also occur in basins that were later deformed by tectonic event(s), further complicating exploration efforts.

In Australia, one of the largest sedimentary-hosted copper systems occurs as stratabound and vein-style mineralisation in the dolomitic mudstones and siltstones of the Tonian-aged Broadhurst Formation. These units were deposited in the Yeneena Basin, an extensional basin that developed along the eastern margin of the Pilbara Craton, which is exposed in Western Australia. The Yeneena Basin, consisting mostly of marine sediments, was connected southward to the Officer Basin, dominated by continental and shallow-marine deposits. Together, they formed a large regional source-to-sink system and have brought favourable ingredients for the localisation of sediment-hosted mineral deposits in the Yeneena Basin.

Exploration in this area is hindered by multiple factors: (1) the basin was inverted, folded, and segmented by at least two major compressive events; and (2) current datasets are minimal—geophysical surveys lack the resolution to characterise the basin internal architecture, and available boreholes do not penetrate deeper potential metal source rocks. These issues complicate the construction of reliable regional and local 3D geological models.

To overcome these challenges, we propose a multidisciplinary, multi-scale workflow integrating structural restoration, stratigraphic forward modelling, and fluid-flow simulation, all calibrated to existing datasets. This combined approach enables rapid hypothesis testing, iterative model refinement, and adaptability to diverse exploration targets.

We illustrate the capabilities — and limitations — of this approach using the Tonian interval of the Yeneena Basin as a case study, with a particular focus on multi-scale stratigraphic forward modelling based on structurally restored cross-sections.