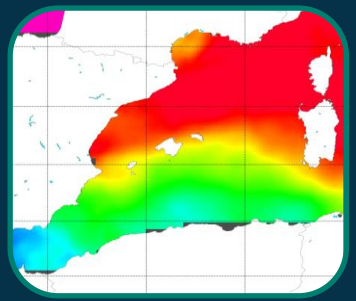
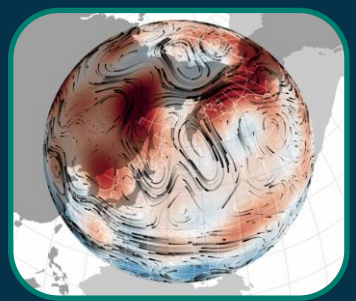

ESA POLAR SCIENCE CLUSTER
EO SCIENCE FOR SOCIETY

Pushing the frontiers of science

Engaging the community



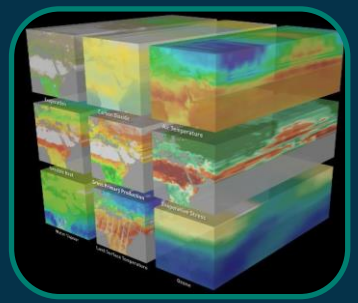
New methods & observation products



Advancing Earth System Science

Advanced simulations & predictability

Training and Education

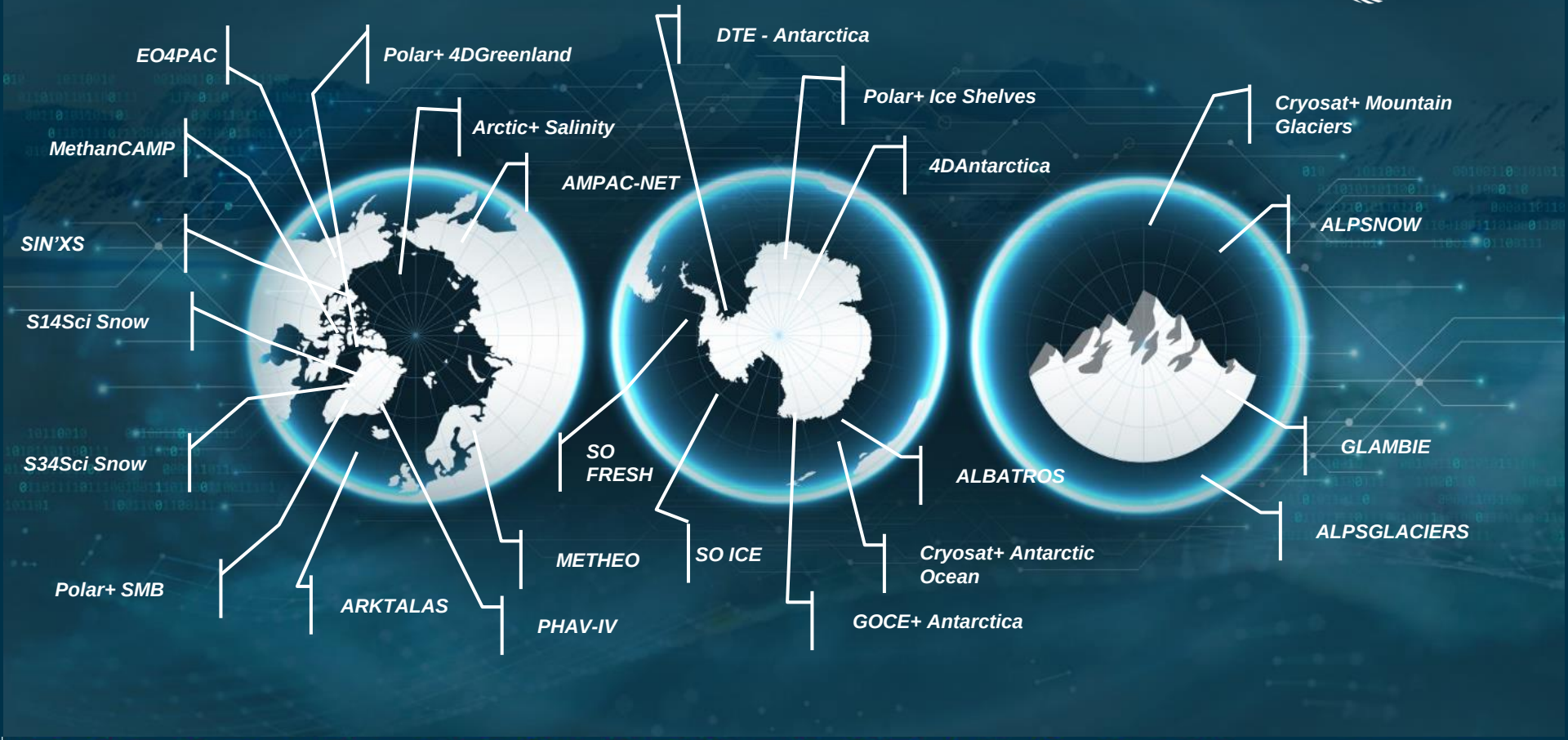


Open Science Tools/Virtual Labs

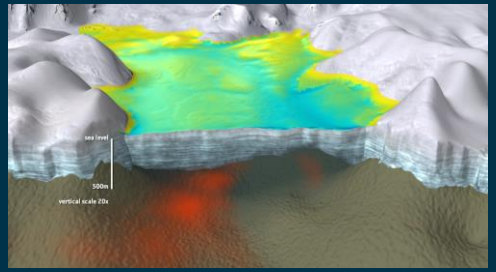
Scientific Campaigns

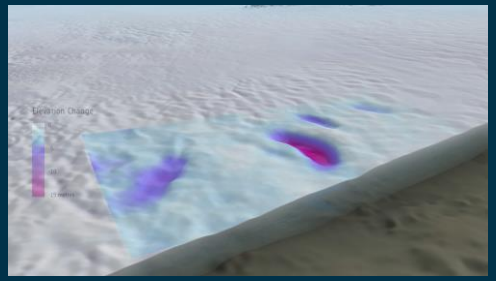
Transfer to future missions

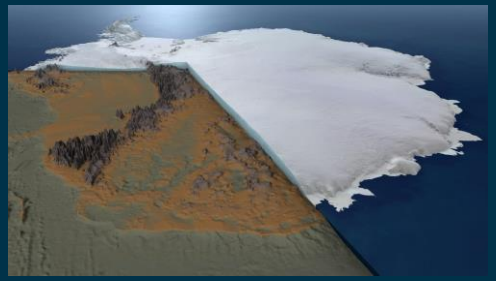
ESA Polar Science Cluster Activities

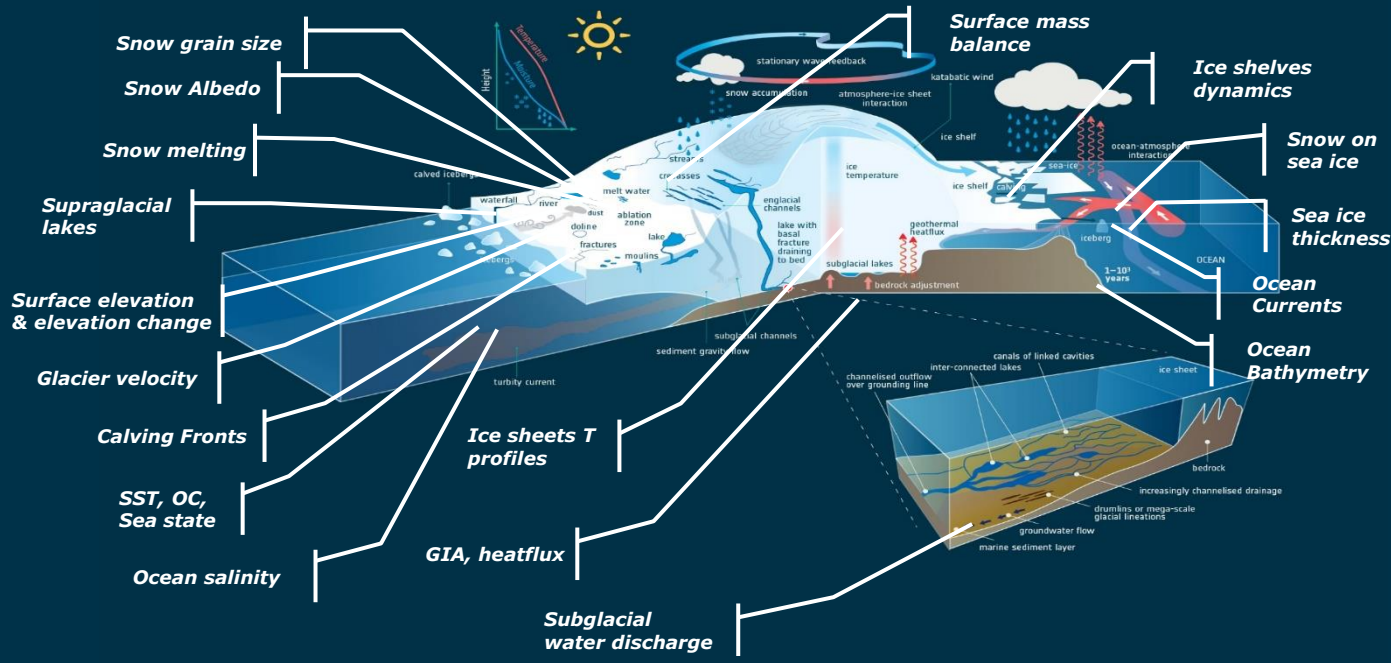


An example: An integrated approach in Polar sciences









Major advances since the last Polar Science Week in 2020

SMOS very thin sea ice below 0.5 m
SMOS + Cryosat sea ice thickness
Snow on sea ice
Sea ice with dynamic snow accumulation
Daily multi-mission radar freeboard
Dedicated Antarctic sea ice thickness products Antarctic SSH, MDT

Cryosat Swath elevation and elevation change over ice sheets
Cryosat Swath elevation and elevation change over mountain glaciers and ice caps
Cryosat Swath based sub-glacial lakes
Active sub-glacial lakes volume discharge
Glaciers an ice cap mass change and attribution
Ice Sheet Basal melting

Ice shelves thickness
Ice shelves surface and basal melting
Ice shelves fractures
Calving fronts

3D Surface velocities
S1 TOP based velocities
Combined INSAR + Offset tracking velocities
Grounding line

Ice thickness temperature profiles

Snow extend
Snow albedo
Snow grain size
Snow melting/wet

Supra-glacial lakes coverage
Supra-glacial lakes volume

SMB Run-off

Sea Surface Salinity Arctic
Sea Surface salinity Antarctica
Bathymetric and tides Arctic
Bathymetry and tides Antarctica

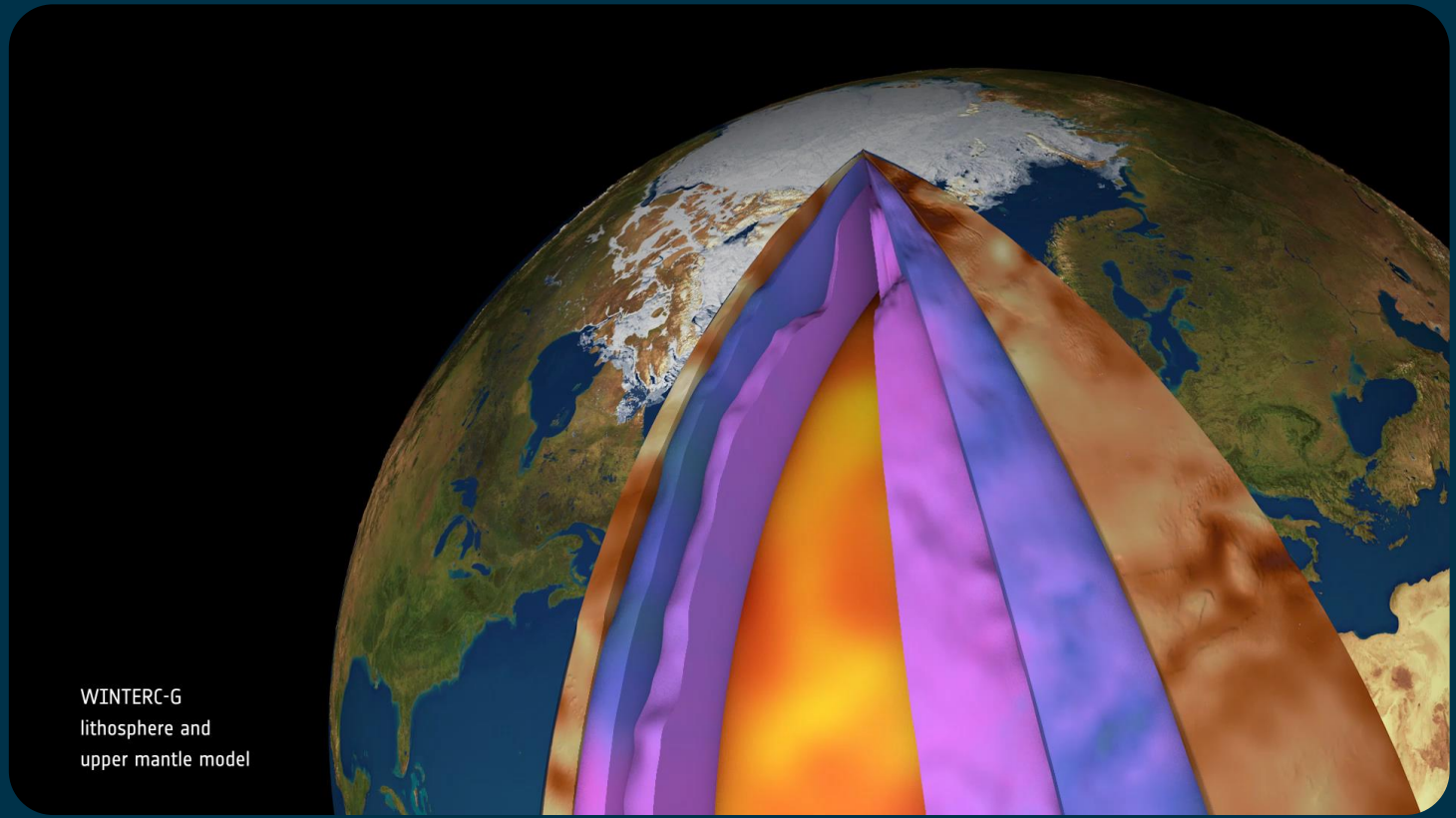
Antarctic lithosphere model
Arctic/Greenland lithosphere model
Arctic heat-flux and GIA
Antarctica heat-flux and GIA

Greenland integrated hydrology assessment
Antarctica integrated hydrology assessment
Artic ocean process studies
Antarctic ocean ice shelves interactions pro
Antarctic ocean sea ice and salinity proces

Cryosphere Virtual Lab
Prototype Antarcti
Product

GOCE and SWARM sensing the Earth interior…

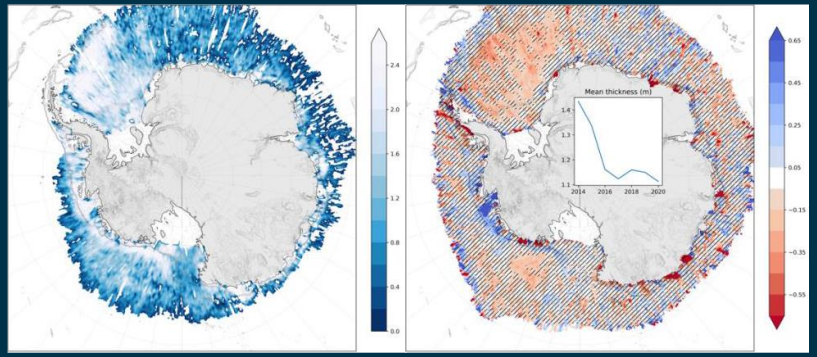
Source: 4DEarth team

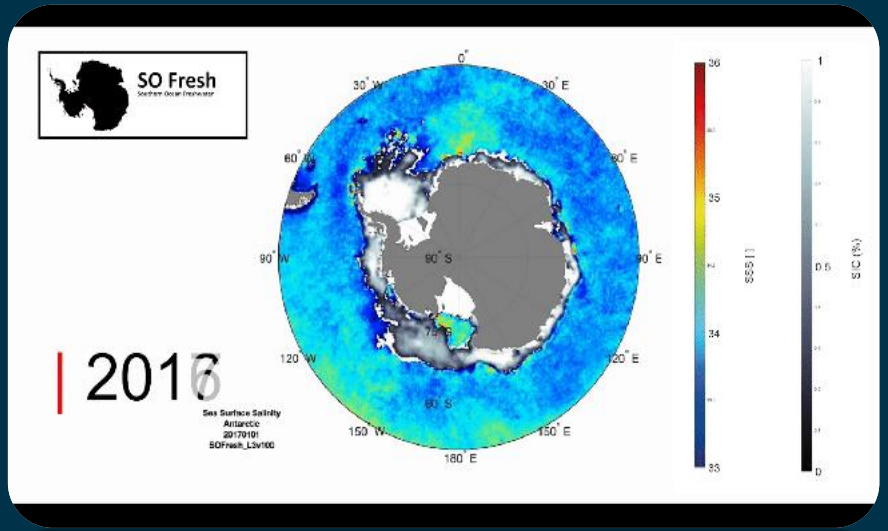


First summertime sea ice thickness observations, SO Sea Ice Thickness and enhanced Sea Surface Salinity in Polar regions ….

Source: Jack Landy (Un. Tromso), SO-FRESH Team and CSAO Team

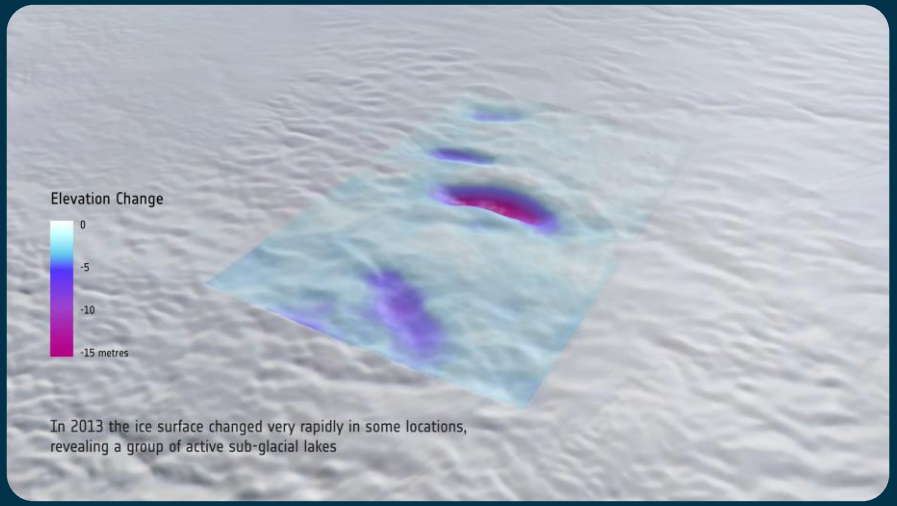
Left: September sea ice thickness (m)
Right: September sea ice thickness trend (m/yr)

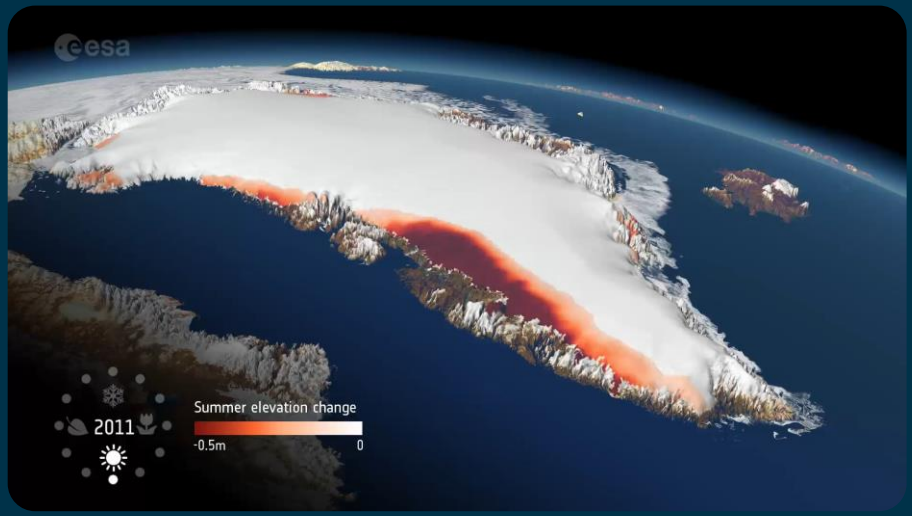




CRYOSAT OPEN NEW OPPORTUNITIES

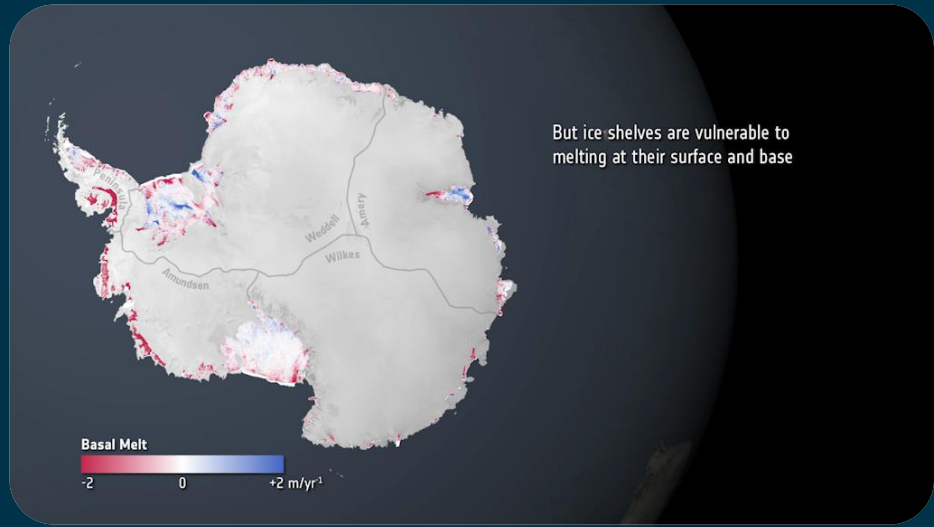
Source: Univ. of Edinburg and U. of Leicester





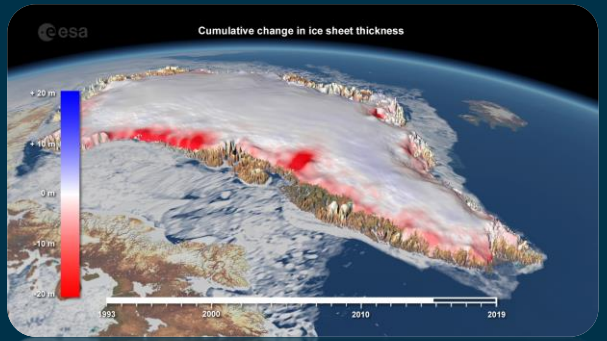
Enhancing observations and understanding of ice shelves

Source: Noel Gourmelen (U. of Edinburgh) and Anna Hogg (. Of Leeds)



Advances in International cross-Atlantic collaboration

Source: IMBIE Team, GLAMBIE Team and AMPAC Team

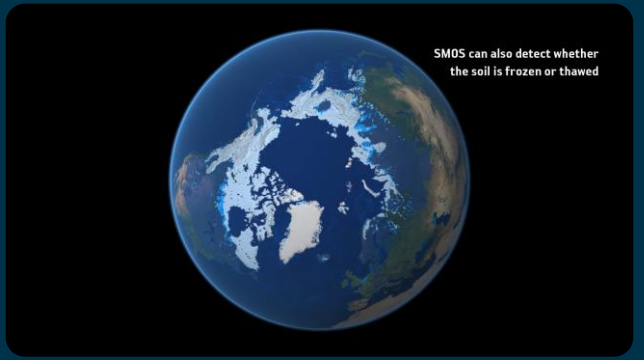


IMBIE

Ice sheet mass balance inter-comparison exercise

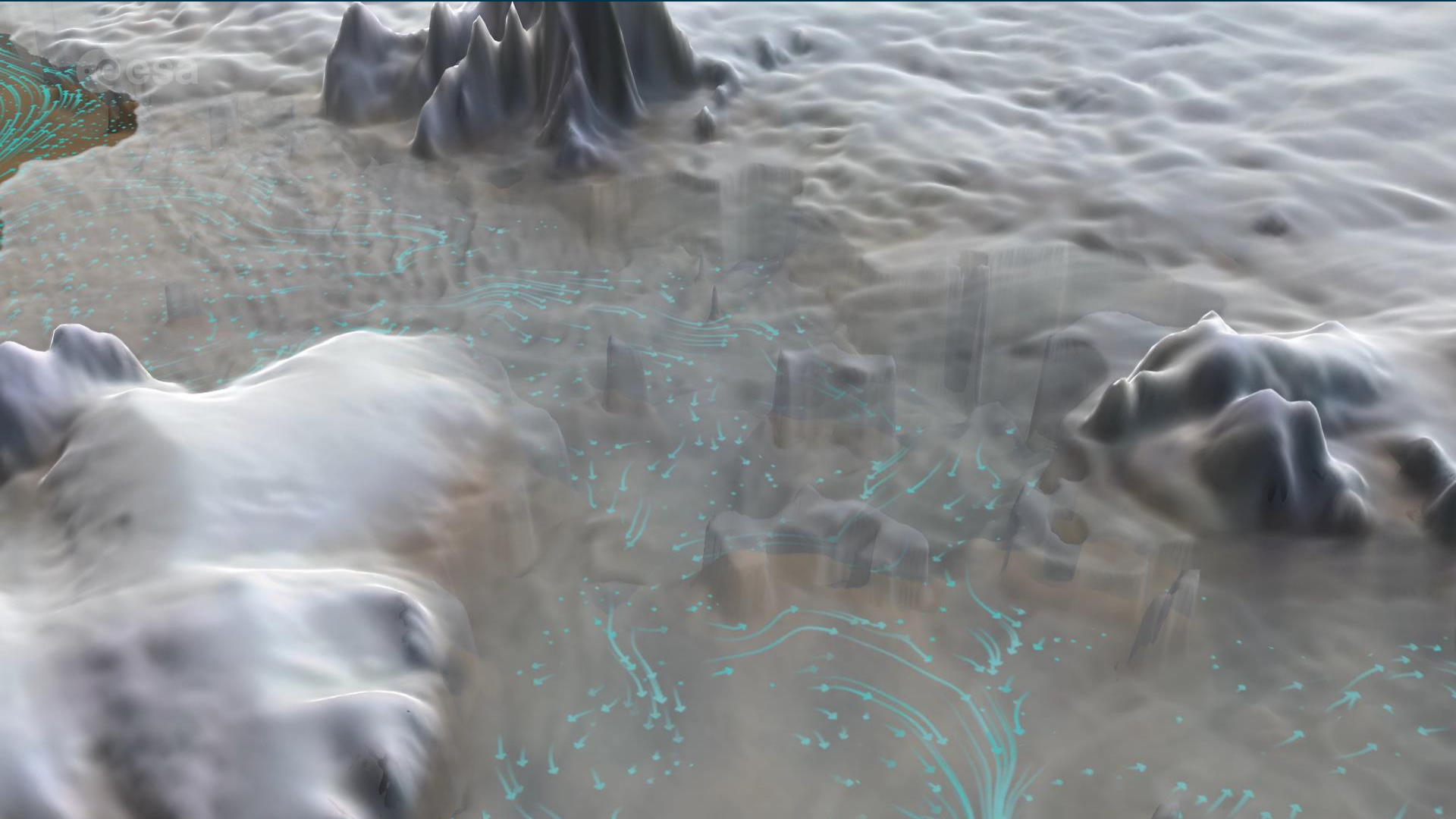
GLAMBIE

Global Glaciers mass balance inter-comparison exercise

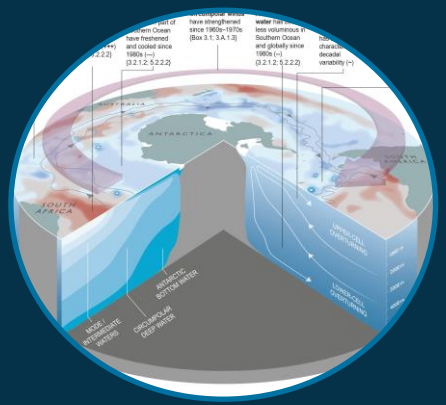


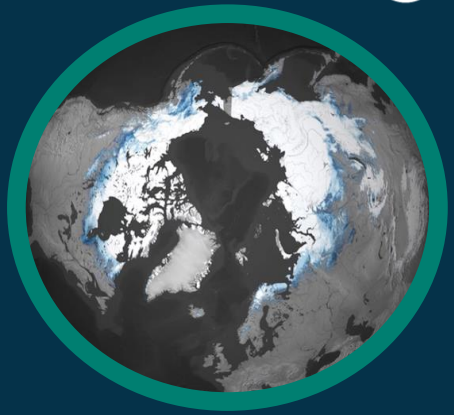
AMPAC

Arctic Methane and Permafrost Challenge



New ESA Activities and Opportunities for collaboration…





Coordinated Actions on Greenland: joint assessment of changes and impacts through EC-funded project (see call below) and ESA 4DGreenland (Dedicated Extension) and new ESA relevant Arctic activities…

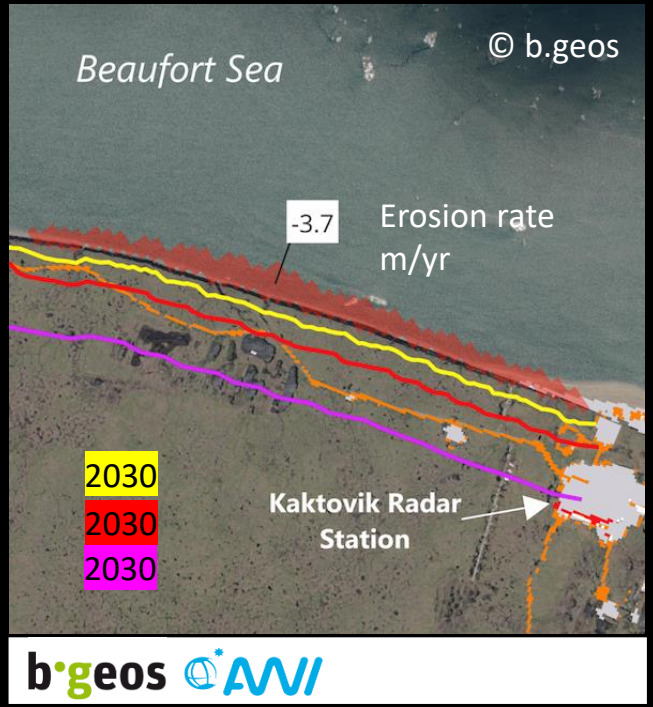
Coordinated Action on Antarctica/SO: ESA new 5DAntarctica and SO-SIMBA projects, also as an ESA contribution to Antarctic Insync….

Coordinated Action on the Artic: ESA new set of Arctic projects (e.g., Artic Carbon, AMOC, Extremes, fresh-water impacts on biology…)

In coordination with existing EC funded projects and the resulting teams from HE call:

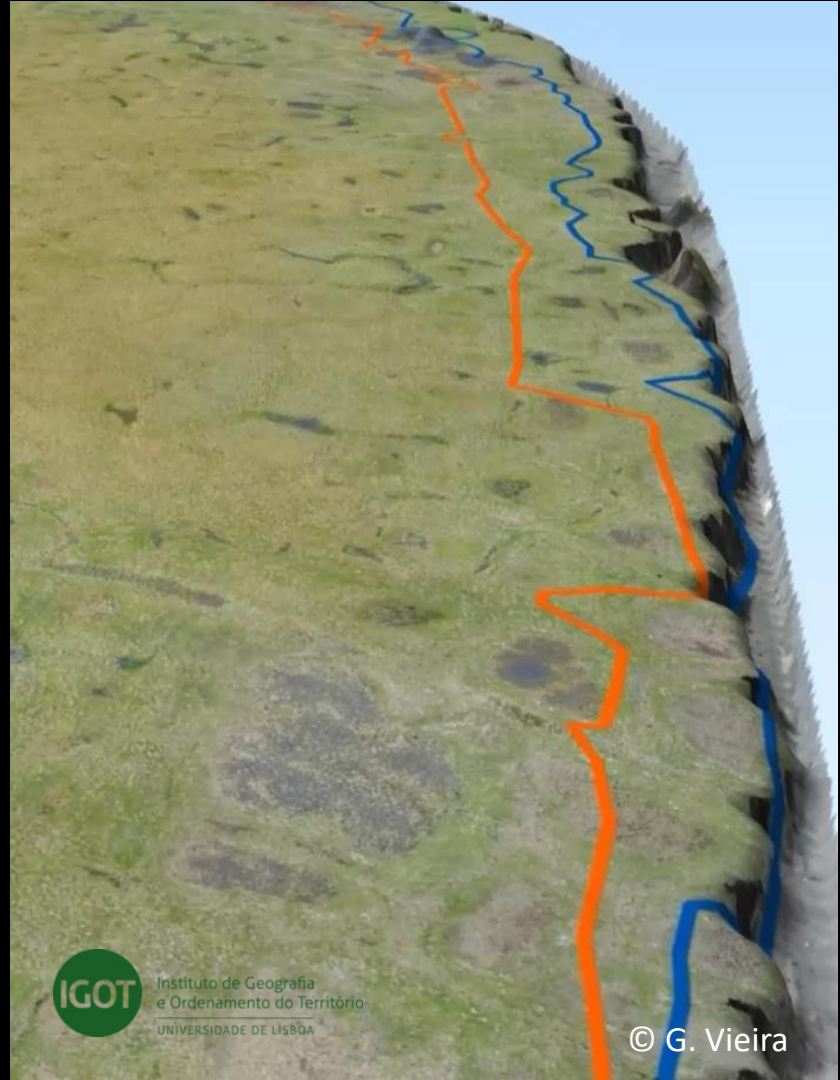
HORIZON-CL5-2024-D1-01-02 Inland ice, including snow cover, glaciers, ice sheets and permafrost, and their interaction with climate change

EO4PAC small contribution to EU Nunataryuk

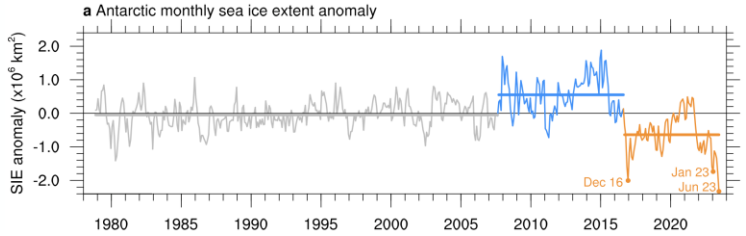


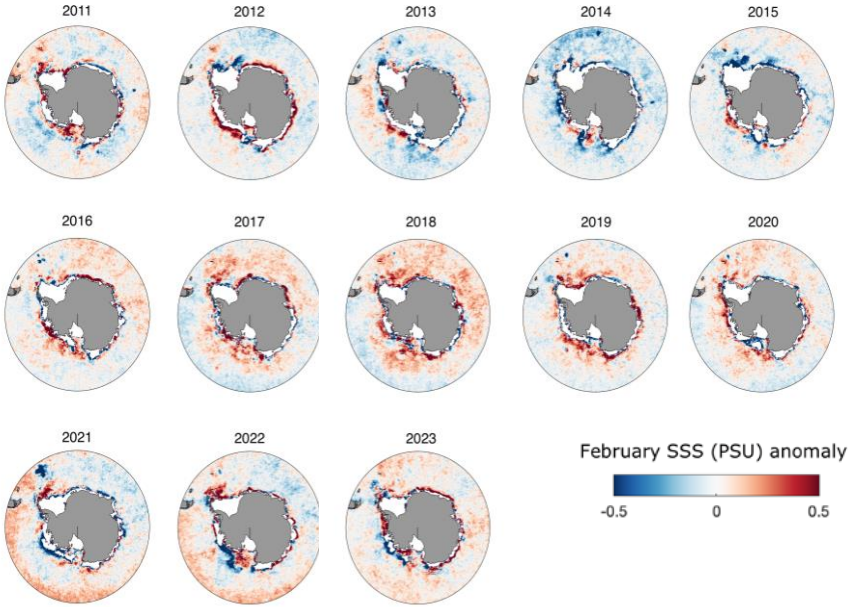
Erosion rates are high along permafrost coastlines and are expected to increase with climate change, the prolongation of the open water season

Satellite data allow us to determine the rates of erosion as well as accretion. This also allows future predictions of the coastline using rates of the last 20 years.



SO-Fresh – SO-CHIC science case study at the ESA Science Hub





EC SO-CHIC

Southern Ocean Carbon and Heat Impact on Climate

SO-CHIC

November 2019 -2023
16 partners

ESA SO-FRESH

ESA SO-ICE

Southern Ocean Ice-Ocean Interactions
SO-ICE

NORCE

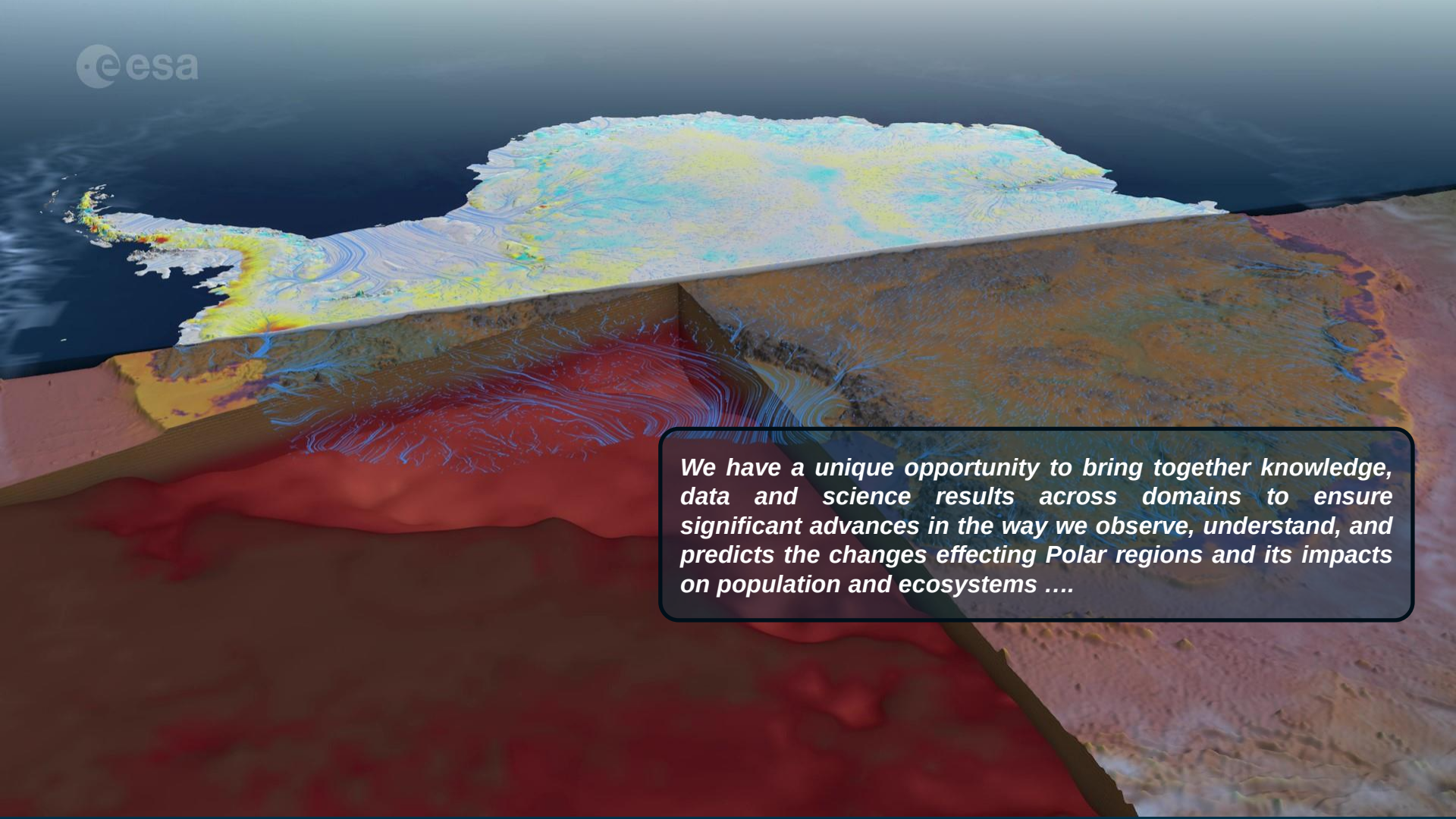
SORBONNE UNIVERSITÉ UNIVERSITY OF LEEDS

Sept 2021 -2023
6 partners

A. Silvano
U. of Southampton

ESA Science Hub Visiting Scientist

March/August 2024


We have a unique opportunity to bring together knowledge, data and science results across domains to ensure significant advances in the way we observe, understand, and predicts the changes effecting Polar regions and its impacts on population and ecosystems ….