



HYDROSPACE 2023 Workshop Short Report

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The European Space Agency (ESA), in the context of the "Earth Observations Science for Society" Programme, GEWEX, and the Centre National d'Études Spatiales (CNES, the French Space Agency), organised a sequel joint event to HydroSpace2021 and the Earth Observation for Water Cycle Science 2020 Conference (EO4Water2020). The 5th Space for Water Cycle and Hydrology Workshop, HYDROSPACE 2023, took place in Lisbon, Portugal, from 27 November to 1 December 2023.





HYDROSPACE 2023 aimed at reviewing the latest advances in the use of Earth Observation (EO) technology for water cycle science and hydrology and its applications, exploring the potential offered by the existing and coming EO satellites together with advanced modelling and novel technologies as well as the main challenges and opportunities to enhance our current capacity to observe, understand, and predict the water cycle and its impacts and feedbacks with human activities and ecosystems. One of the main goals of the event was to contribute to defining a community scientific agenda that may drive future scientific activities of ESA and other space agencies and partners to face main societal challenges of our day.

The HYDROSPACE 2023 Workshop was open to EO scientists, water researchers and students, modelers, Earth system and climate scientists, industry, operational agencies, policy makers, representatives of local communities, and other stakeholders interested in sharing their knowledge and experience and in contributing to drive the scientific agenda for advancing EO water research and future applications. Overall, the event attracted 270 registrations, from 45 countries, of which 207 participants from 22 countries could actually attend in Lisbon. We received 233 abstracts from 34 countries. The whole workshop was recorded and can be viewed online. Presentations and posters are also online at <https://www.hydrospace2023.org/photo-gallery-and-presentations>.

Given the abundance of outstanding presentations at the workshop, we can only highlight a select few. Notably, with the recent launch of the Surface Water and Ocean Topography (SWOT) mission (<https://swot.jpl.nasa.gov/>), jointly developed by the National Aeronautics and Space Administration (NASA) and Centre National d'Études Spatiales (CNES) with contributions from the Canadian and UK Space Agencies, numerous presentations focused on this wide-swath altimetry mission and showcased exciting new results and potential applications of the forthcoming data, which should become widely-available in 2024. The expectations of SWOT seem clearly to be met, if not surpassed. Among the diverse range of keynote topics including flood management, surface water storage, hydrogeodesy, results from the Italian Research Council, Research Institute for Hydrogeological Protection (CNR-IRPI) team showed notable progresses in the development of a “hydrological digital twin”. More traditional research areas such as soil moisture estimation from space using the Soil Moisture Ocean Salinity (SMOS) and Soil Moisture-Active Passive (SMAP) missions were also presented, including a new low-cost L-band radiometer that could be a follow-up to instruments on missions such as SMAP. Sentinel-3 and Sentinel-6MF water level data as well as total water storage using Gravity Recovery and Climate Experiment (GRACE) were also subjects of many presentations.

Noteworthy recommendations emerged from discussions, with a highlight being the potential for sub-daily temporal sampling facilitated by future missions, such as the proposed "SMASH Constellation of SmallSats" concept for water level.



As stated, the workshop was meant to provide a scientific overview of the progress made and a forum for discussions among the community, and to establish needs perceived by the hydrological community concerning Earth observations. A detailed report will be drafted by the 42 co-chairs of the sessions and the Organising Committee, the "SUMMARY AND RECOMMENDATIONS FROM THE HYDROSPACE 2023 WORKSHOP" document; it will be published by ESA with a DOI on the HYDROSPACE-2023 website (<https://hydrospace2023.org/>) and may be the basis for a peer-reviewed publication.

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OBJECTIVES OF THE WORKSHOP

- Reviewing the latest advances and results in the use of EO technology to monitor and characterise the different components of the water cycle (terrestrial hydrology, ground water, atmosphere, oceans, mountain ranges and glaciers), hydrological processes and its interactions with human activities and ecosystems.
- Reviewing the progress in understanding the water cycle cycle as well as its variability and sensitivity to climate change including hydro-climatic extremes with related compound and cascade events.
- Reviewing the progress of novel EO-based high-resolution data, methods, and approaches for modeling the water cycle at basin scales targeting spatial and temporal scales compatible with decision making.
- Exploring the status of future EO missions under preparation by space agencies and industry and latest advances in novel EO technologies, future mission concepts and new mission ideas for water cycle research and hydrology.
- Exploring opportunities offered by the effective integration of latest EO data, AI, advanced models, information technology and communication, cloud computing and high-performance computing capabilities for developing Digital Twins, fostering open science and developing novel applications serving policies and society.
- Fostering networking and collaborative research in water sciences, bringing together different expertise, data and resources in a synergistic manner ensuring that the final result may be bigger than the sum of the parts.

Identifying the major scientific challenges, observation gaps and research needs for the coming years and advancing towards the definition of major scientific priorities in water cycle research that may drive scientific activities of ESA and other partners in the coming years.

DEADLINES

Abstract Submission closing	17 July 2023
Notification of Acceptance	4 August 2023
Issue of Preliminary Programme	4 August 2023
Registration (free) deadline	29 October 2023

ORGANISING COMMITTEE

Co-chairs
 Jérôme Benveniste, European Space Agency
 Jean-François Crétaux, CNES/LEGOS

Members
 Panagiotis Balabanis, European Commission DG-RTD | Diego Fernandez, European Space Agency | Peter van Oevelen, GEWEX | Nicolas Picot, CNES | Aurelie Strzepek, CNES | Isabel Trigo, Instituto Português do Mar e da Atmosfera (IPMA) | Espen Volden, European Space Agency