

SWOT: Surface Water and Ocean Topography satellite

Image credit: NASA

Launched in late 2022, and currently in the calibration and validation phase, SWOT will provide images of Earth's oceans, lakes, rivers and wetlands in higher resolution than ever before, revolutionising global assessments of water resources on land.

Opportunities the SWOT mission will offer

The high resolution sea surface height maps and data provided by SWOT will provide new opportunities for scientific investigation and commercial innovation, including:

- Flood warning and forecasting
- Water resources monitoring and management
- Improved understanding of the dynamics of floodplains and wetlands
- Global studies of water resources, including rivers which cross international borders, lake and reservoir storage and river dynamics.

Data from the SWOT mission will be available in 2023/24 (see mission timeline on page 2).

These data will include:

- Maps of sea surface height and digital elevation maps of flood plains
- Wave height and wind speed
- Wet troposphere and water vapour content

The full list of datasets can be found on the [Physical Oceanography Distributed Active Archive Center website](#).

Mission Partners

- [National Aeronautics and Space Administration \(NASA\)](#)
- [Centre National D'Etudes Spatiales \(CNES\)](#)
- [Canadian Space Agency \(CSA\)](#)
- [UK Space Agency](#)

UK Expertise

[Honeywell UK](#) developed the Duplexer, a high-power switching system that is part of the radio-frequency unit. This was funded by the UK Space Agency which contributed £12.22million.

The [SWOT-UK project](#), funded by [the National Environment Research Council \(NERC\)](#) and the UK Space Agency, is validating SWOT data with ground truth data from the Bristol Channel and River Severn region. Leading scientists are: [Dr Paul Bell](#) and [Prof Christine Gommenginger](#) of the Southampton based [National Oceanography Centre](#); [Prof Paul Bates](#) of [Bristol University](#); and [Prof Simon Neill](#) of [Bangor University](#).

Researchers at the [Plymouth Marine Laboratory](#), led by [Dr Graham Quartly](#), will work with the [Ocean University of China](#) to [identify and track eddies in the South Atlantic](#), using SWOT data.

"I'm so proud of the UK expertise enabling SWOT to be built and calibrated. It is a major new climate mission giving unprecedented data across the globe." – Beth Greenaway, Chair of Space4Climate and the UK Space Agency's Head of Earth Observation and Climate.



Mission Timeline

Dec 2022

SWOT launched from Vandenberg Space Force Base in California on a SpaceX Falcon 9 rocket.

Jul 2023

First few initial level 1 datasets expected to become publicly available.

Oct 2023

Initial datasets from the KaRIn instrument are expected to become publicly available.

Dec 2023

Expected release of validated level 1 data products from all instruments except KaRIn.

Apr 2024

Expected release of validated level 1 KaRIn data product and level 2 data products.

Instrumentation

- KaRIn, the Ka-band Radar Interferometer, will increase the resolution of images of water on Earth by up to 10 times ([see NASA 2023](#)) using two side antenna for a wider swath than previous satellites, totalling 75 miles, or 120km ([Morrow et al. 2019](#), [Fjørtoft et al. 2014](#), [Fu and Ubelmann 2014](#)). Each major water resource on land will be covered twice every 21 days.
- The Positioning Ocean Solid Earth Ice Dynamics Orbiting Navigator (POSIDEON-3C) is a Jason-class Altimeter which will measure sea surface height between the two KaRIn swaths.
- Finally, the Two-Beam Microwave Radiometer (AMR-S) will allow measurements of water vapour.
- SWOT also carries the DORIS-NG Antenna to receive radio signals, a GPS receiver, and a Laser Retroreflector Assembly to help track the spacecraft from the ground.



Further Information

- Chen et al., 2018: [JPLD-75724 SWOT Calibration / Validation plan](#)
- CNES, accessed April 2023: [SWOT](#).
- CSA, accessed April 2023: [SWOT](#).
- Fjørtoft et al., 2014: doi: [10.1109/TGRS.2013.2258402](#)
- Fu and Ubelmann, 2014: doi: [10.1175/JTECH-D-13-00109.1](#)
- Morrow et al., 2019: doi: [10.3389/fmars.2019.00232](#)
- NASA, accessed April 2023: [SWOT](#)
- NASA, 2023: [Joint NASA, CNES Water-Tracking Satellite Reveals First Stunning Views](#).

“I encourage Space4Climate members to be ready to analyse and develop the data on Earth’s oceans and inland water for innovative climate services and climate action.” – *Beth Greenaway, Chair of Space4Climate and the UK Space Agency’s Head of Earth Observation and Climate.*



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