

# SWOT: Surface Water and Ocean Topography satellite

Image credit: NASA

SWOT, launched in 2022, is providing 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 offers

Scientists, specialist consultancies and professional users of datasets are already using SWOT's high resolution sea surface height maps and data for research, including:

- Flood warning and forecasting
- Water resources monitoring and management
- Improved understanding of the dynamics of estuaries, floodplains and wetlands
- Understanding movement of heat around oceans and its impact on atmospheric temperature.
- Global studies of water resources, including rivers that cross international borders, lake and reservoir storage and river dynamics, identifying hotspots of decline or growth.

Very large datasets are available via NASA and CNES and will be revised as the mission progresses.

These data include:

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

Access the data here by creating a log-in:  
[CNES AVISO+](#) or [NASA podaac](#)

## 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, validated 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](#), have been working with the [Ocean University of China](#) on identifying and tracking 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

Initial Level 1 datasets became publicly available.

#### Oct 2023

Initial datasets from the KaRIn instrument became available.

#### Dec 2023

Release of validated early Level 1 data products from all instruments except KaRIn.

#### Apr 2024 onwards

Releases of validated Level 1 KaRIn data product and Level 2 data products via NASA and CNES data portals. Revised datasets will continue to be issued.

### Instrumentation

- KaRIn, the pioneering Ka-band Radar Interferometer, supplies images of water on Earth with an increase in resolution of up to 10 times that previously available. It uses 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 is covered twice every 21 days.
- The Positioning Ocean Solid Earth Ice Dynamics Orbiting Navigator (POSEIDON-3C) is a Jason-class Altimeter. It measures sea surface height between the two KaRIn swaths.
- The two-beam Microwave Radiometer (AMR-S) allows measurements of water vapour.
- SWOT also carries the DORIS-NG Antenna to receive radio signals, a GPS receiver, and a Laser Retroreflector Array to help track the spacecraft from the ground.



### Further Information

- 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](#)
- Fu et al. 2024: doi: [10.1029/2023GL107652](#)
- 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](#).

- NOC's validation project page <https://projects.noc.ac.uk/swot-uk/>

"The UK has a growing industry interested in using SWOT's data to push the boundaries of knowledge. It is a catalyst for science in the UK with spin-offs we don't even realise yet – the data is wonderful! "

– Dr Paul Bell, Lead Scientist for SWOT UK at the National Oceanography Centre (NOC) where he is a Principal Research Scientist.



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