Copernicus Sentinel-6: measuring sea level rise and more

Sea level rise, which threatens the nearly 900 million people living in low-lying coastal areas, is accelerating. In their Sixth Assessment Report, the United Nations' Intergovernmental Panel on Climate Change warns that the sea level will remain elevated for millennia. This underscores how essential it is to monitor global sea surface height.

The main goal of the Copernicus Sentinel-6 series of satellites is to do just this. Consisting of three satellites – Sentinel-6 Michael Freilich, launched in 2020; Sentinel-6B, to be launched in 2025; and Sentinel-6C, scheduled for launch in 2030 – Sentinel-6 will make crucial ocean observations for years to come.

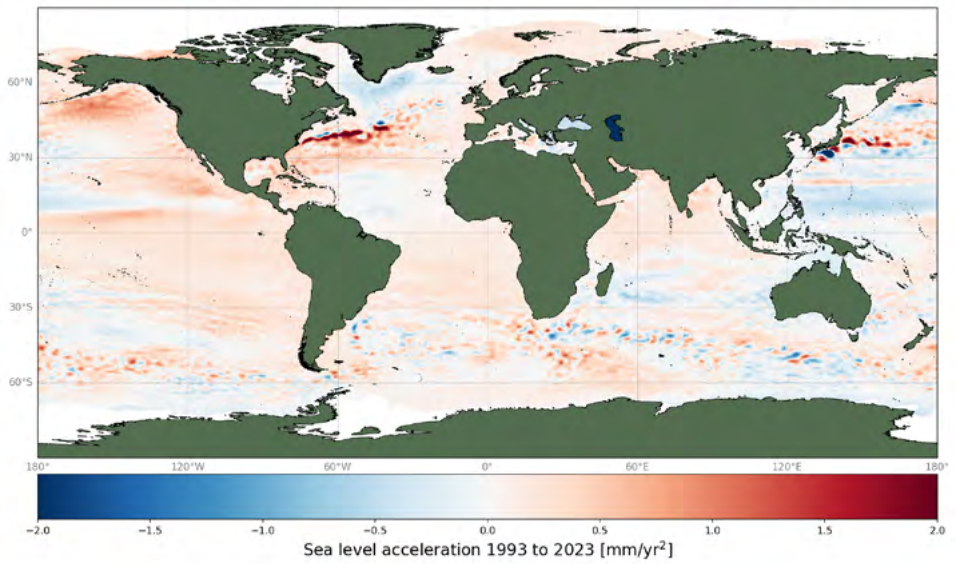
Copernicus Sentinel-6 carries one main instrument, an altimeter that is used to derive sea surface height, wave height, and wind speed near the sea surface, together with a suite of supporting instruments.

Sentinel-6 is able to provide highly accurate observations thanks to its path (or orbital inclination) and altitude. These are optimal for providing a wide view of the Earth's oceans every 10 days while minimising the forces that interfere with the precise determination of the satellite's altitude.

Copernicus Sentinel-6's high precision makes this mission unique as the reference mission against which other satellite altimetry missions are calibrated.

Its observations are also important for a number of other applications including:

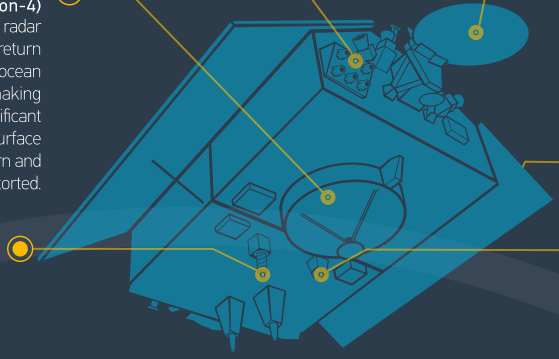
- short-range forecasting of high impact marine weather;
- medium-range forecasting of hurricanes, cyclones, and marine heatwaves;
- extended-range forecasting of El Niño episodes, droughts, active cyclone seasons, and severe winters;
- monitoring of climate and ocean currents;
- planning for ship routing, commercial fishing, and response to environmental hazards;
- inland water resource management: river discharge and lake water level monitoring.



The mission is a cooperative effort between Europe and the United States. This partnership began with TOPEX-Poseidon, the first long-lasting satellite mission dedicated to ocean monitoring, launched in 1992. These ocean observations then continued with the Jason satellites – Jason-1, Jason-2, and Jason-3. Now, the Copernicus Sentinel-6 mission will ensure that they continue into the 2030s.

In January 2020, the name of the first satellite in the Copernicus Sentinel-6 mission was changed from Copernicus Sentinel-6A to Copernicus Sentinel-6 Michael Freilich in honour of the former Director of NASA's Earth Science Division.

Copernicus Sentinel-6



Global Navigation Satellite System Radio Occultation (GNSS-RO)
These instruments support the altimeter by providing data to correct for atmospheric effects and determining the precise position of the satellite.

Poseidon dual frequency altimeter (Poseidon-4)
This high-precision radar altimeter releases radar pulses that bounce off the ocean surface and return to the altimeter. Different features of the ocean impact these radar pulses in different ways making it possible to derive sea surface height, significant wave height, and wind speed near the sea surface from the time it takes the radar pulses to return and how they have been distorted.

Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS)

Advanced Microwave Radiometer (AMR-C)
This instrument helps to ensure that the observations taken by the Poseidon-4 altimeter are as precise as possible. Because water vapour in the atmosphere can interfere with the time it takes for a radar pulse to travel between the altimeter and the sea surface, this radiometer quantifies the impact of atmospheric water vapour, making it possible to correct for its effects.

Global Navigation Satellite System Precise Orbit Determination Receiver (GNSS PODRIX)

Laser Retroreflector Array (LRA)

Dimensions

Length: 2.80m
Height: 2.30m
Width: 5.20m
(in orbit configuration)

Payload

Six instruments

Mass

Including fuel: 1,200kg

Power

891W (average consumption)

Design lifetime

5.5 years

Orbit

Type: Non-sun-synchronous repeat cycle

Distance: 1,336km altitude
66° inclination

Repeat cycle: 10 days (127 orbits)

A productive partnership

The European Commission, EUMETSAT, the European Space Agency (ESA), and the French Space Agency (CNES) work together with the United States' National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA) to make this mission a success.
EUMETSAT, ESA, NASA, and NOAA are the implementing agencies.

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