

2019 SWOT ROSES TOSCA (Synergistic Sciences)

Coastal/estuary studies

The limitation of land contamination in conventional altimeter observations near coasts will be alleviated by the radar interferometry measurement. This improvement, plus the availability of high-resolution data (~ 50 m) in the region where the rivers meet the ocean, deltas and estuaries, will provide unprecedented opportunities to advance understanding of the complex water flow and its effect on this important environment. Understanding coastal and estuarine processes, as well as removing tidal signals, requires improved knowledge of coastal bathymetry. SWOT measurements of deviations from the vertical may be combined with specific coastal and estuarine tide models and independent bathymetric estimates for the development of better coastal tides and circulation models.

Cryospheric sciences

SWOT has the potential to be useful for observing several elements of the cryosphere, including sea ice, snow, and ice sheets. In the case of sea ice, fine-scale 250 m resolution SSH and SAR images will be available up to 78° in latitude and should enable the identification of open water and floating sea-ice. SWOT's SSH measurement may be useful to determine the freeboard of sea ice. The high-resolution observation at 250 m to 2 km everywhere, with limited patches of sea-ice data at resolution ~100 m, will allow better determination of ocean surface topography in the polar ocean in the midst of sea ice.

Additionally, it is possible that SWOT in Ka-band with a nadir altimeter in Ku band will provide useful measurements of snow surface elevation, especially during snowmelt when liquid water is present within the snowpack. Similarly, SWOT may provide some information on variations in elevation of glaciers and ice sheets, especially in low-slope regions. These measurements may provide useful information on variations in the cryosphere of importance to understanding of the terrestrial water cycle. Supraglacial rivers and lakes associated with melt processes on glaciers and ice sheets are also potentially fruitful subject of investigation.

Marine Geophysics

The SSH slope accuracy achieved by conventional altimetry is about 2 microradians, equivalent to 2 miligals in gravity anomaly. Every SWOT measurement promises to achieve 1 microradian slope accuracy at 15 km wavelength over two dimensions, as opposed to one-dimensional measurements from conventional altimetry. Over the lifetime of the mission, the precision of the measurement, as well as contamination due to mesoscale eddy slopes, will improve by an order of magnitude due to temporal averaging. Such global measurement is anticipated to result in an order of magnitude improvement in the accuracy of estimating seafloor depth at small scales. This would reveal the currently hidden abyssal hill fabric of the slow-spreading rate seafloor, as well as perhaps 10-20 thousand uncharted seamounts taller than 1000 m.