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AN OVERVIEW OF THE PROPOSED SURFACE WATER AND OCEAN TOPOGRAPHY MISSION

Abstract

Satellite altimetry has revolutionized the study of the global oceans for the past two decades. Precision altimetry missions like TOPEX/Poseidon, Jason-1, and OSTM/Jason-2, complemented by other missions like ERS 1 and 2, ENVISAT, and GFO, have provided unprecedented observations of the ocean surface topography at scales larger than about 200 km and made significant advances in our understanding of global ocean circulation and sea level change. However, current generation of nadir pointing, or profile altimeters prevent resolving scales shorter than 100 km, the submesoscales that are important for understanding the dynamics of the ocean kinetic energy and the vertical transfer processes in the ocean.

Altimetry measurements have also been applied to the study of the water levels of rivers and lakes, but the coarse resolution of the data has severely limited its ability in addressing key hydrological questions on the storage of water on land and its discharge. These are important questions on the distribution of fresh water on land that is being seriously affected by global climate change.

By using swath interferometry, rather than profile altimetry methods, the proposed SWOT mission would allow mapping of surface water extent and stage of inland waters at spatial scales as fine as 100 m, and perhaps better, and would resolve ocean and near coastal eddies to scales of around 10 to 15 km. To enable this challenging measurement performance, the SWOT mission concept is designed to overcome several challenges, such as very high raw data rate (320 Mbps), large on-board data volumes, high power demand, stringent pointing and stability requirements, and on board and ground data processing systems.

The primary objectives of the proposed SWOT mission are:

For oceanography: - Characterize the ocean mesoscale and sub-mesoscale circulation at spatial resolutions of 10 km and greater;

For hydrology - Provide a global inventory of all terrestrial water bodies whose surface area exceeds (250m2) (lakes, reservoirs, wetlands), and rivers whose width exceeds 100 m (requirement) (50 m goal);

- Measure the global storage change in fresh water bodies at sub-monthly, seasonal, and annual time scales, and to estimate the global change in river discharge at submonthly, seasonal, and annual time scales.