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An open ocean retracker for Sentinel-3 and Cryosat altimeter waveforms

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The nadir-pointing altimeters onboard the ESA Cryosat-2 satellite and the GMES Sentinel-3 Surface Topography Mission (STM) have the capability of operating in a high-PRF coherent SAR mode as well as the conventional low-rate pulse-limited mode (LRM). Over water surfaces, the new SAR mode should lead to significantly improved altimetric precision and finer along-track spatial resolution of the order of 300 meters. In the case of Sentinel-3 STM, the mission aims to use SAR mode to deliver high-resolution high-accuracy sea level and ocean wave measurements in regions of high mesoscale variability and coastal areas.

However, SAR ocean waveforms are much peakier than those from pulse-limited altimeters, and the conventional method of retrieving geophysical information by fitting the waveforms with the Brown ocean model does not apply. In this paper, we assess the performance of a new theoretical ocean retracker developed for SAR ocean waveforms in the ESA SAMOSA project “Development of SAR Altimetry Studies and Applications over Ocean, Coastal zones and Inland waters”. The SAMOSA SAR retracker will form the basis of the operational SAR ocean retracker to be implemented for Sentinel-3 STM. The prototype SAMOSA SAR retracker is applied to L1B 20Hz SAR waveforms over water surfaces obtained from numerical simulations with the CRYOSAT Mission Performance Simulator (CRYMPS) and from the CRYOSAT2 satellite. We compare the range retrieval accuracy in LRM and SAR mode in different wave height conditions, and compare our finding with earlier results by Jensen & Raney (1998).

References:

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