ASSESSING THE ALTIMETRIC PRECISION OF DELAY DOPPLER ALTIMETRY OVER THE OCEAN WITH NUMERICAL SIMULATIONS FROM THE CRYOSAT MISSION PERFORMANCE SIMULATOR

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The launch of the ESA Cryosat-2 mission in March 2009 will be the first example of a Delay Doppler altimeter flown in space. With a ten-fold increase in pulse repetition frequency, Delay-Doppler altimeters, also known as SAR altimeters, will be characterised by pulse-to-pulse coherence to enable Doppler cell selection within the radar antenna footprint. The Delay Doppler Altimeter (DDA) concept was first proposed by Raney (1998) and promises improved altimetric precision and higher along-track resolution compared to conventional pulse-limited altimeters.

In this paper, we present the results of numerical simulations performed in the context of the ESA SAMOSA project "Development of SAR Altimetry Studies and Applications over Ocean, Coastal zones and Inland waters". The prime objective of the SAMOSA project is to determine the improvement in altimetric precision achievable with DDA over water surfaces, compared to conventional low-resolution altimeters. Our approach is based on output from the Cryosat Mission Performance Simulator (CRYMPS), a software simulator capable of producing official CRYOSAT-2 products in both SAR and Low Resolution mode for explicit three-dimensional descriptions of Earth surfaces.

CRYMPS was developed by University College London/MSSL in collaboration with ESA/ESTEC and was originally designed for cryospheric applications. Here, the CRYMPS simulator is applied to explicit descriptions of ocean surfaces with realistic ocean waves obtained from the theoretical Elfouhaily et al (1997) ocean wave spectrum. LRM and SAR Cryosat-2 products are obtained for ocean scenarios with a range of significant wave height values, averaged then retracked with an appropriate theoretical retracker. In the case of LRM, this consists of a conventional Brown ocean altimeter waveform retracker. In the case of SAR, a new DDA waveform retracker was implemented, based on the recent theoretical DDA waveform model by Martin-Puig et al. (2009, this conference). The altimetric precision on the retrieved range is estimated for both LRM and SAR data over same ocean surfaces for a range of significant wave height, for comparison with earlier results by Jensen & Raney (1998), who reported a two-fold improvement in altimetry precision with SAR altimetry.

References:

Raney, R.K., ”The Delay/Doppler Radar Altimeter”, IEEE Trans. Geosci. Rem. Sens., 36, 1578-1588, 1998.

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