NEW THEORETICAL MODEL OF SAR ALTIMETER SIGNAL OVER WATER SURFACES

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The application of Synthetic Aperture Radar (SAR) techniques to classical radar altimetry offers a potential solution to significantly enhance Earth surface mapping. With a launch schedule in 2009, Cryosat-2 will be the first satellite to provide such data. In addition to Cryospheric applications, these data would be of great interest to the Hydrosphere and Oceanographic communities since they would allow quantitative assessment of expected enhanced altimetric capabilities in coastal monitoring, ocean floor topography, gravity field and inland water monitoring.

SAR altimetry was first described as Delay/Doppler Radar Altimeter by Raney [1]. Its key innovation is the addition of along track processing for increased resolution and multi-look processing. This technique requires echo delay compensation, analogous to range cell migration correction in conventional SAR [2]. Due to this innovation, spatial resolution is increased in the along-track dimension. In turn, this allows for accumulation of more statistically independent looks for each scattering area, leading to better speckle reduction, hence finer precision of altimetric measurements.

To define a new re-tracking method for water surfaces that accounts for SAR altimeter observations there is a need to define a waveform model, in the same spirit set by conventional altimeters [3, 4]. This new waveform model needs to consider the different average flat surface impulse response of DDA. Moreover, the effects of the non-circular ground resolution cell of DDA and the different means and consequences of multiple looks at each cell need to be taken into consideration.

This paper will provide a brief overview of the objectives and methodology in the SAMOSA project, and will present its latest results. The key content will be the detail of the development of this new theoretical SAR altimeter wave model over ocean surfaces will be detailed.

Under the framework of the ESA project SAMOSA: *"Development of SAR Altimetry Studies and Applications over Ocean, Coastal zones and Inland waters"* the improvement of SAR altimetry (aka Delay Doppler Radar Altimeter [1], DDA) to conventional altimetry over water surfaces will be quantified. SAMOSA kicked off in September 2007, and its expected duration is fifteen months. The project, whose lead is at Satellite Observing Systems (SOS,UK), is composed of four additional scientific partners of great experience in oceanography: The Danish National Space Centre (NDSC, Denmark), De Montfort University (DMU,UK), The National Oceanography Centre (NOCS, UK) and Starlab Barcelona S.L: (STARLAB, Spain). This consortium, with the external participation of Dr. Raney (Johns Hopkins University), will analyze the potentialities of advanced SAR Altimetry over water surfaces.

2. REFERENCES

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