

# SAR ALTIMETER RETRACKER PERFORMANCE BOUND OVER WATER SURFACES

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## 1. ABSTRACT

The application of Synthetic Aperture Radar (SAR) techniques to conventional altimetry was first introduced by Raney (1). This technique presents an enhanced solution for water surface altimetry observations due to two major innovations: the addition of along track processing for increased resolution, and multi-look processing for improved SNR. Cryosat-2 (scheduled for launch in 2009) will be the first satellite to operate in SAR altimetry mode. Although its main focus will be on Cryospheric applications, it will also be operative over water surfaces and thus be able to test and refine its improved altimetric capabilities.

This paper defines a re-tracker for SAR altimetry observations over water surfaces using Maximum Likelihood Estimation (MLE) based on the SAR altimeter average impulse response of a rough surface, first introduced by the same author in (2). In addition, this paper provides the theoretical limit for the performance of the re-tracker for different Significant Wave Height (SWH) conditions using the Cramer-Rao Bound (CRB). CRB provides the best achievable performance for an estimation process, where the stochastic nature of the observation is described by a probability distribution function (pdf) (3).

This paper aims to contribute to the success of Cryosat-2 altimetric observations over water surfaces, also beneficial to the forthcoming Sentinel 3 mission. Sentinel 3 is devoted to the provision of operational oceanographic services and will routinely monitor ocean, coastal zones and inland water surfaces. Like its predecessor (Cryosat-2) Sentinel 3 will also have a SAR altimeter on board. Thus, it will certainly benefit from the work reported here.

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## References

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