

Analysis of Cryosat-2 altimeter waveforms for the detection and characterization of ship targets

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Abstract:

The detection of non-ocean scatterers over the sea surface by using pulse-limited satellite altimeters involves a series of challenging targets, such as icebergs, lighthouses and ships, which have been investigated in the literature. In particular, past works focused on the hyperbolic features observed in the thermal noise area of the received waveforms, in order to detect the presence of such non-ocean targets.

In this work, we exploit the capabilities of Cryosat-2 SIRAL instrument (operating in SAR mode) for the detection and characterization of ships. In particular, we propose a suitable metric for the discrimination of ships and investigate the possibility to estimate some geometric features of the detected vessels from the echoes returned by the altimeter.

Thus, the possibility to extract further information, in addition to the mere presence of eventual ship targets, is discussed in this work. The presented approach offers the opportunity to: i) study the compatibility between the detected target(s) and the known ship traffic, by using the Automatic Identification System (AIS) data; ii) resolve ambiguities among multiple targets, by investigating their compatibility with the estimated geometry.

Ship traffic statistics, as introduced by the recent literature, may take benefit from the method described in this work, providing a contribution to improve the overall precision of such statistics. In particular the next Sentinel-3 mission, which will be soon in operation, will provide a constellation with global SAR coverage and free accessibility to the data, with a potential enhancement to the estimation of the number and characteristics of the ships with respect to past literature approaches.

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