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THE CO-POLARIZED PHASE DIFFERENCE OVER SEA SURFACE: THE INFLUENCE OF SAR ACQUISITION PARAMETERS AND ENVIRONMENTAL CONDITIONS

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Abstract

The exploitation of microwave remote sensing for marine and maritime applications is a hot topic in the scientific community. The almost all-weather capability of acquired large-scale information on the oceans independently of illumination conditions is a key benefit ensured by microwave remote sensing. Among the several microwave remote sensing tools, it was demonstrated that polarimetric synthetic aperture radar (SAR) can provide valuable information on the oceans once proper modeling is available.

Actually, there is a wide set of marine and marine applications that takes full benefits of the polarimetric information, including ship detection, sea oil pollution monitoring, sea iceberg detection and coastline extraction [1-4]. Most of the polarimetric SAR-based algorithms that aim at detecting the target of interest needs to enhance the target-to-clutter ratio as much as possible in order to improve the detection accuracy. Nevertheless, the properties of sea surface polarimetric backscattering are strongly affected by both SAR imaging configuration (frequency, polarization, noise floor, incidence angle) and environmental conditions (sea state) [5-8].

In this study, one of the most widely and successfully used polarimetric features in the field of marine and maritime applications, namely the co-polarized phased difference, is considered [9-10]. A sensitivity analysis is undertaken on a large set of polarimetric SAR measurements collected, under different frequency, incidence angle and noise floor, over sea surface characterized by different sea state conditions, that aim at assessing the influence of SAR acquisition parameters and environmental conditions on the CPD distribution. The polarimetric SAR dataset includes high-quality wide swath full-polarimetric airborne UAVSAR scenes, full-polarimetric satellite Alos-PalSAR 1 scenes, full-polarimetric satellite Radarsat-2 scenes and dual-polarimetric coherent HH+VV satellite TerraSAR-X scenes. This analysis could be of potential support in the design and development of SAR architectures/algorithms whose goal is to identify sea targets of interest.

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