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NRT Vessel detectability on TerraSAR-X and Sentinel-1

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Public and private users request for Maritime Situation Awareness (MSA) to gain the ability to support maritime safety and security in worldwide oceans and coastal waters. One important part of MSA is the observation of ship traffic. Today observation is mainly done using the Automatic Identification System (AIS), which is almost continuously globally available. However, considering AIS as data source to support maritime safety and security has some drawbacks, because it shows coverage gaps in high traffic areas, is not broadcast by all ships and only provides limited information content. Thus, MSA needs support by more trustworthy earth observation data. In this paper we concentrate on SAR data from the TerraSAR-X and Sentinel 1 missions.

In detail, the detectability of ship and ship wake signatures using TerraSAR-X data acquired under different environmental conditions is analyzed. Ship detectability analyses for SAR data are commonly based on models relating the ship size to RCS (Vachon et al., 1997). Especially on high resolution images this relation shows worse correlation. After multiple years of acquiring TerraSAR-X data and collecting a large AIS database as ground truth, we present a detectability analysis based on measurements and compare it to Vachon's detectability model.

As the application of ship detection on multiple satellites increase the spatial and temporal coverage, we additionally provide a comparison to Sentinel-1.