Comparison of detectability of ship wakes between C-Band and X-Band SAR

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In recent publications we presented a newly developed method for modelling the detectability of ship wakes based on machine learning techniques. Multiple detectability models were trained for datasets consisting of either TerraSAR-X (TS-X), Sentinel-1 (S-1) or RADARSAT-2 (RS-2) acquisitions. Using these models, statistics about the detectability of ship wakes in dependency to various influence factors can be derived. These influence factors are on the one hand image acquisition parameters, such as incidence angle and relative beam looking direction, and on the other hand ship properties, like ship length and velocity. Moreover environmental conditions, like wind speed and significant wave height have an impact on the detectability. In the past, statements about the detectability of ship wakes were based on physical contemplations using single SAR images or simulated data generated by CFD models or SAR simulators. Currently, our newly developed models are the only ones published, which use real world data as basis. The derived statistics show good alignment with statements concluded by previous researchers.

However, it was recognized that the detectability of wakes is slightly higher on TS-X than on S-1 and RS-2 imagery, where comparable pixel resolutions were selected from the various acquisition modes available for TS-X and RS-2. Two major differences between those three missions exist, which could be responsible for the difference in detectability: TS-X has a lower orbit altitude and operates a X-Band SAR, while S-1 and R-2 operate C-Band SARs. In order to separate the SAR band impact on the difference in detectability, contemporaneous and collocated data are acquired from the S-1, RS-2 and CosmoSkymed X-Band SAR constellation missions, of which all missions operate on similar orbit altitudes. The results of the comparison will be presented at the TS-X science team meeting.