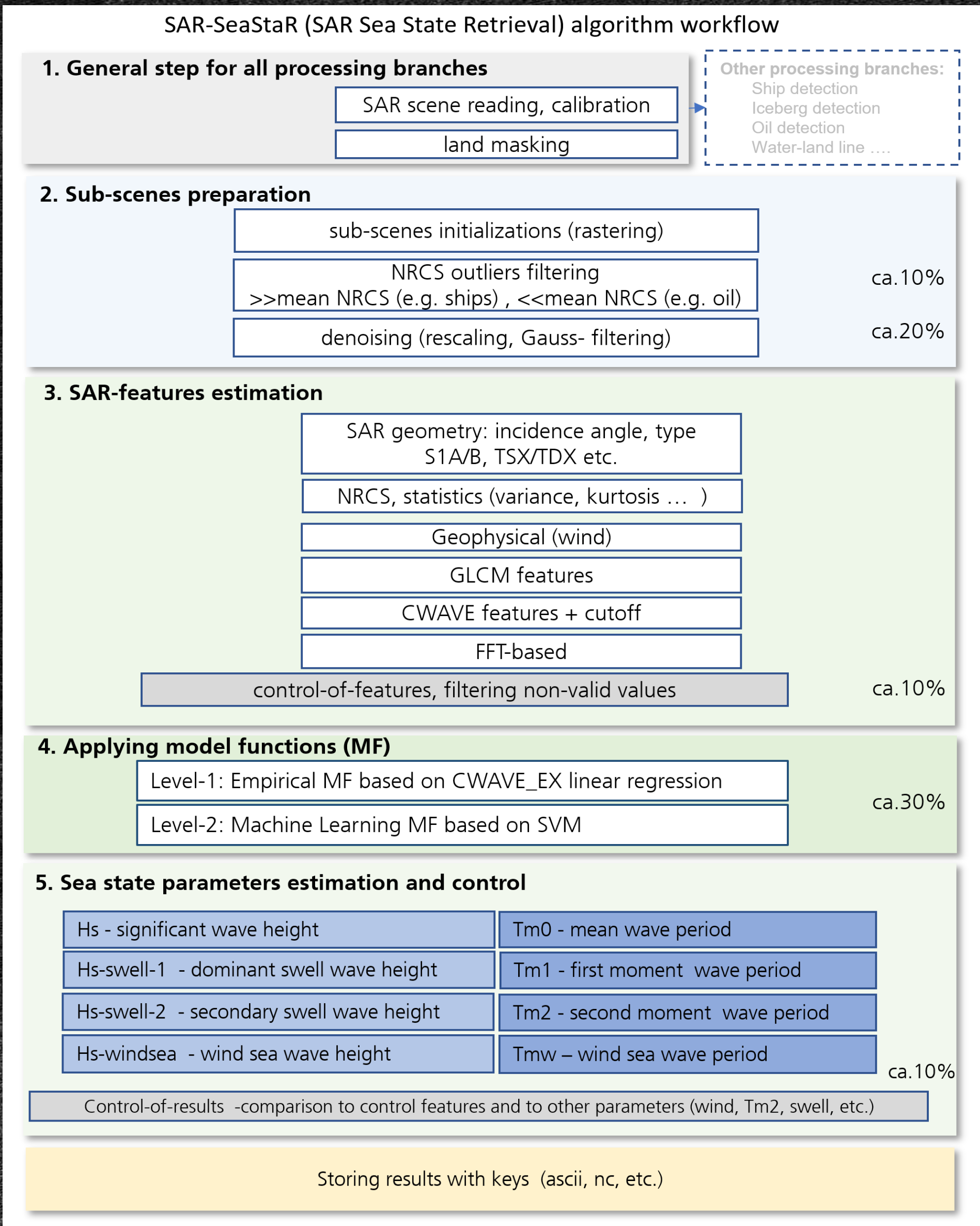


Comparison of Sea State Parameters derived from multiple SAR Missions

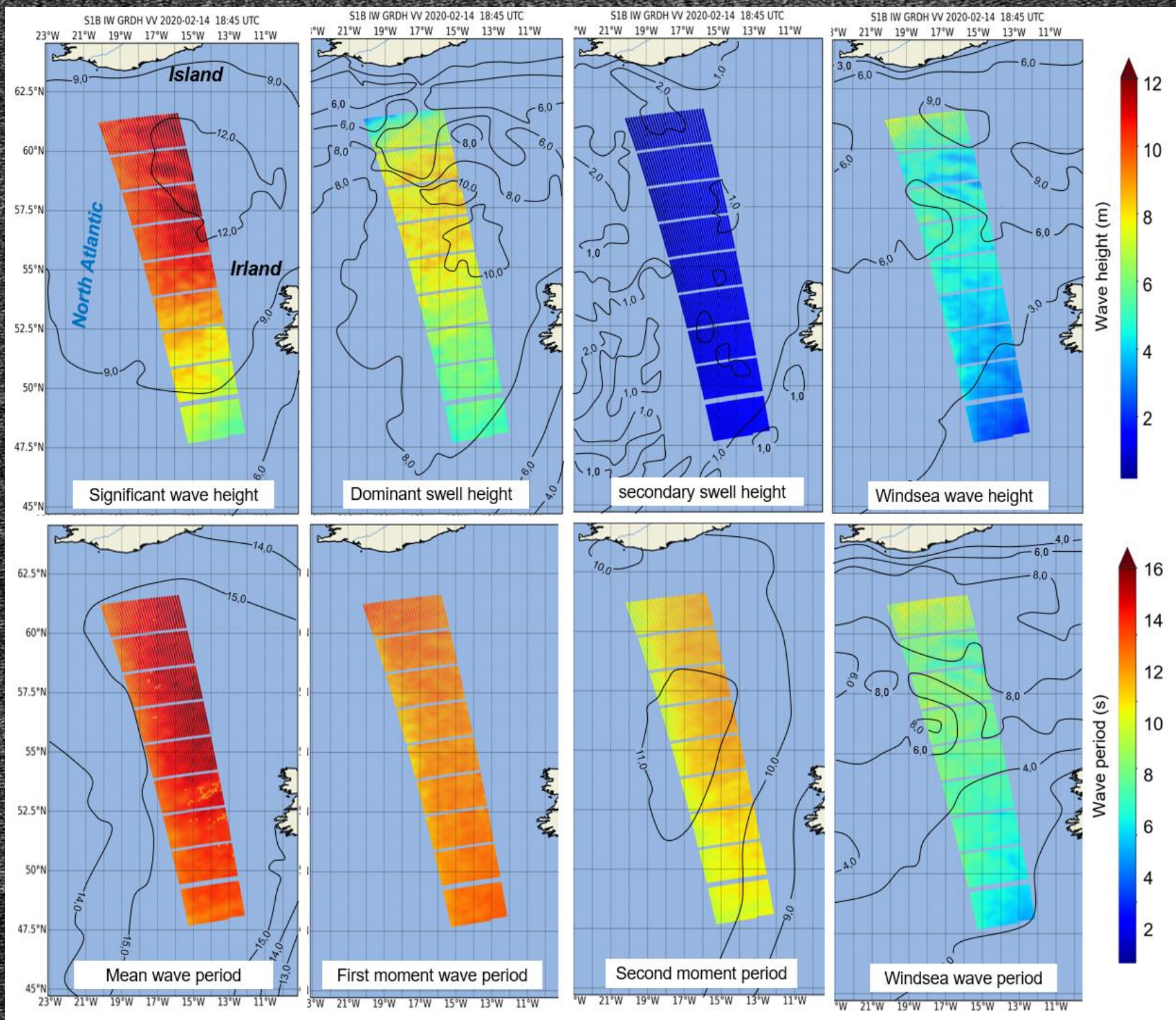
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Sentinel-1 (S1) C-band Interferometric Wide Swath Mode (IW) and TerraSAR-X (TS-X) X-band StripMap (SM) Modes were collocated for sea state analysis. The majority of all maritime data in the archives of both satellite missions in 2020 and 2021 were processed (ca. 25,000 S1 IW scenes) using the new DLR algorithm “SAR-SeaStaR” (SAR Sea State Retrieval). In term of wave height, the reached worldwide accuracies are RMSE=0.43 m for S1 IW (10 m pixel spacing) and RMSE=0.34 m for TS-X SM (1.2-3.5 m pixels) by comparison with hindcast models.

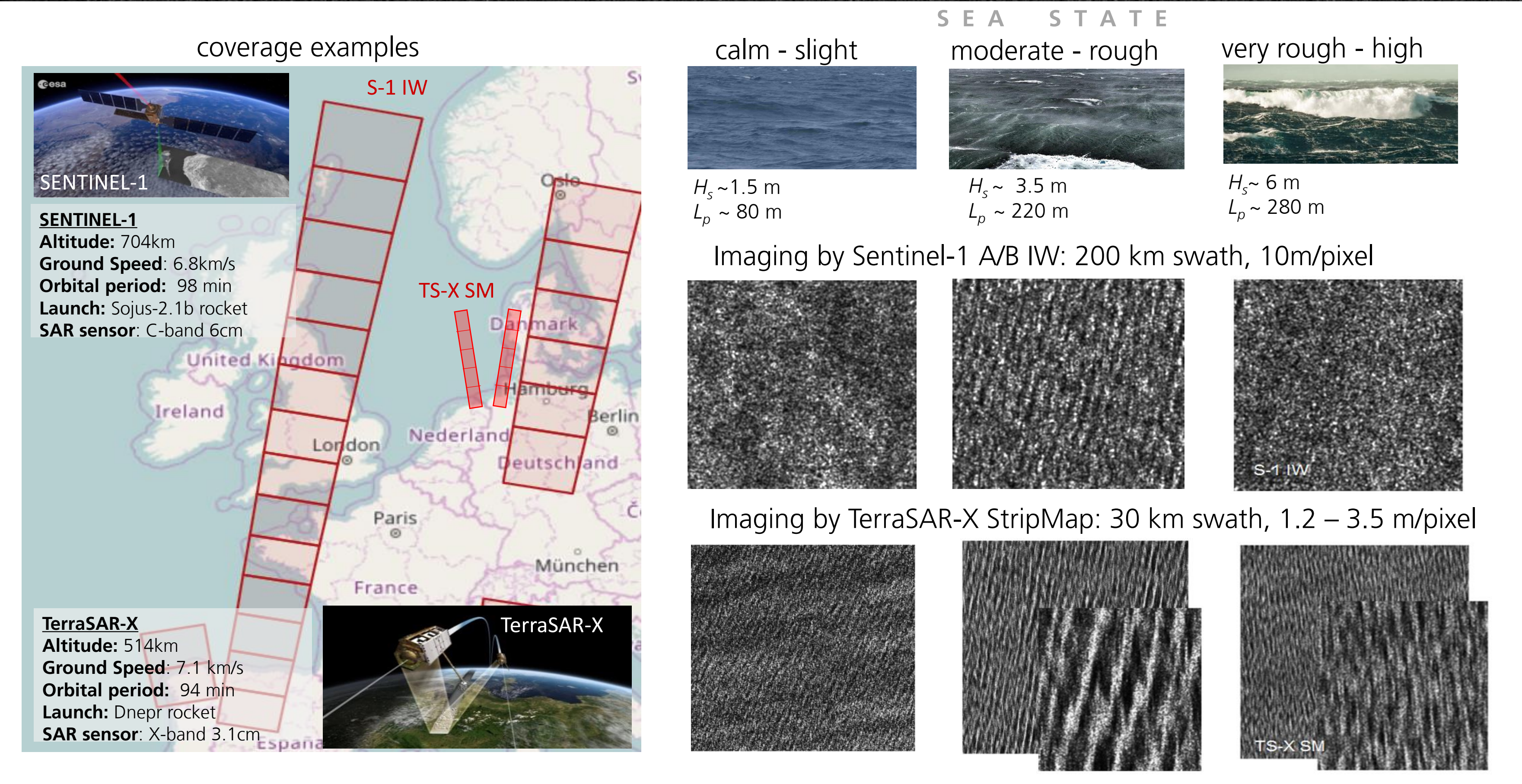


New DLR algorithm SAR-SeaStaR (SAR Sea State Retrieval) realized in Sea State Processor as part of the SAR AIS Integrated Toolbox (SAINT) package for processing meteorological information, targets and processes at sea surface from SAR imagery. The current version includes model functions for 4 satellite/modes and 8 sea state parameters. The algorithm includes a series of operations required for high accuracy. For each operation, the approximate benefit in percent on the resulting RMSE is shown on the right.

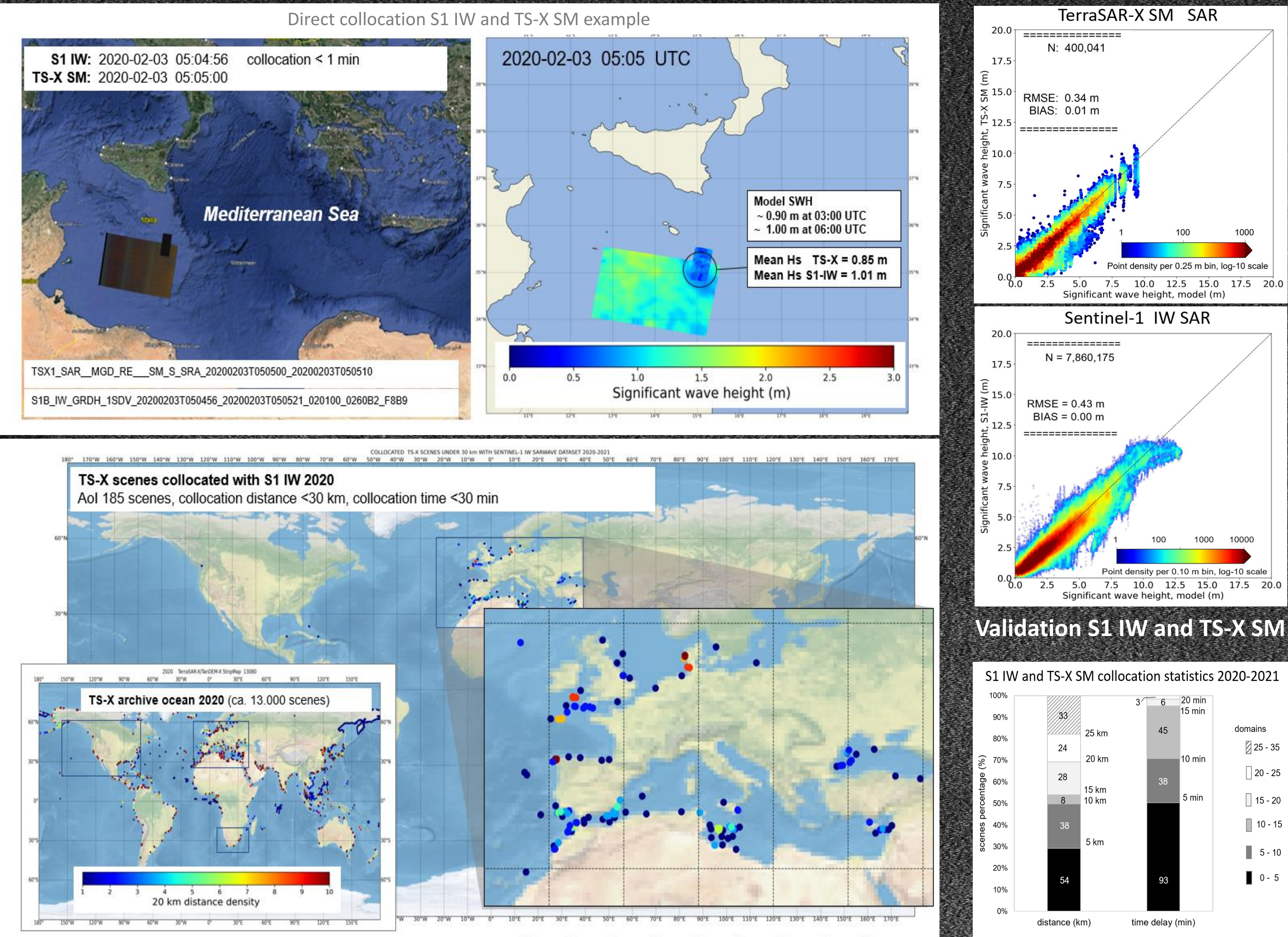


Example of sea state fields processed using SAR-SeaStaR from a S1 IW scene with ca. 1600 km × 200 km coverage acquired during a strong storm in the North Atlantic on 2020-02-14 at 18:45 UTC. Processing with 5 km raster results in ca. 1500 subscenes for each individual IW image. Isolines show the results of forecast model MFWAM at 18:00 UTC.

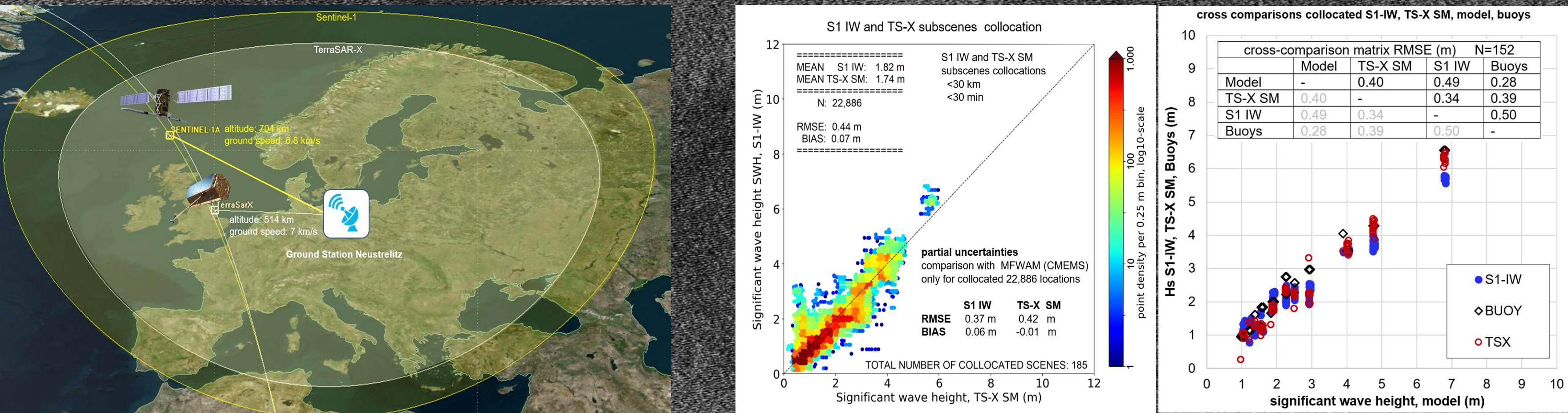
Sea state: ocean surface waves as moving targets in satellite radar imagery



Significant wave heights processed from both satellites S1 and TS-X for two years were collocated to each other, to a spectral hindcast wave model, and to buoy measurements in order to evaluate uncertainties in the sea state processing.



First row: an example of a direct collocation between S1 IW and TS-X SM. Second row: collocation TS-X SM with S1 IW for two Aol in scope of the ESA SARWAVE project covers majority of NDBC and EMODNET buoys around USA/Canada and European waters.



Collocated S1 IW and TS-X SM 2020-2021 for two Aol with ca. 25,000 scenes within 30 km and 30 min. Cross-comparison for quadruple collocations S1 IW, TS-X, buoys and model. The wave height RMSE cross-comparison matrix for all four sources. The partial RMSEs are calculated only for locations where all four sources are available.