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Validation of multi-mission satellite altimetry for the Baltic Sea region

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Currently, three sources of wave data are available for the research community, namely, buoys, modelling, and satellite altimetry. The buoy measurements provide high-quality time series of wave properties but they are deployed only in a few locations. Wave modelling covers large domains and provides good results for the open sea conditions. However, the limitation of modelling is that the results are dependent on wind quality and assumptions put into the model. Satellite altimetry in many occasions provides homogeneous data over large sea areas with an appreciable spatial and temporal resolution.

The use of satellite altimetry is problematic in coastal areas and partially ice-covered water bodies. These limitations can be circumvented by careful analysis of the geometry of the basin, ice conditions and spatial coverage of each altimetry snapshot.

In this poster, for the first time, we discuss a validation of 30 years of multi-mission altimetry covering the whole Baltic Sea. We analysed data from RADS database (Scharroo et al. 2013) which span from 1985 to 2015. To assess the limitations of the satellite altimeter data quality, the data were cross-matched with available wave measurements from buoys of the Swedish Meteorological and Hydrological Institute and Finnish Meteorological Institute. The altimeter-measured significant wave heights showed a very good correspondence with the wave buoys. We show that the data with backscatter coefficients more than 13.5 and high errors in significant wave heights and range should be excluded.

We also examined the effect of ice cover and distance from the land on satellite altimetry measurements. The analysis of cross-matches between the satellite altimetry data and buoys' measurements shows that the data are only corrupted in the nearshore domain within 0.2 degrees from the coast. The statistical analysis showed a significant decrease in wave heights for sea areas with ice concentration more than 30 percent. We also checked and corrected the data for biases between different missions.

This analysis provides a unique uniform database of satellite altimetry measurements over the whole Baltic Sea, which can be further used for finding biases in wave modelling and studies of wave climatology. The database is available upon request.