Benefit of the 5Hz SWIM nadir data in regional wave model for the French coastal areas

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Résumé

Classical 1 Hz altimeter significant wave heights (Cryosat-2, Saral, Jason 3, Sentinel-3, CFOSAT) are commonly used in the assimilation of operational wave model MFWAM at Météo-France for many years. This contributes to a significant improvement of the sea state prediction in early hours in the period of forecast. Recently better sampling of altimeter data along track at 5 Hz are provided in the Level 2 wave products of CFOSAT mission. The goal of this work consists in assessing the impact of using such better sampled data in comparison with conventional 1 Hz altimetry data by performing assimilation experiments in coastal wave model.
Firstly, we set a configuration of the model MFWAM with 5 km grid resolution for Western Europe (Iberian-Biscay-Ireland). Assimilation runs of 1 Hz data from CFOSAT and Sentinel-3A and 3B have been performed for 2019. The results from this run have been compared to the assimilation of high frequency data of these two satellites. The validation is performed with independent altimeters and buoys data during the year of 2019 and particular attention is dedicated to storm events near the european coasts. The results showed that high frequency data are better skilled to spread the correction induced by the assimilation from open ocean to the coastal areas.

In other respects, the impact of 5 Hz significant wave height from SWIM has been examined in a finer model configuration of 2.5 km centered on France. In order to analyze the capacity of 5 Hz data to describe small scale features, the assimilation runs are compared to model run forced by surface currents provided by CMEMS regional Monitoring Forecasting Centers. We also used wave products from high resolution coastal wave model with unstructured grid (1 km) including tidal currents. The correlation of wave parameters from runs with assimilation of SWIM 5Hz data and models forced by surface currents are examined.
Indeed, the interest of assimilating 5 Hz data would be to better represent the variability of sea state, which is known depending on wave-currents interactions at this spatial scale.

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