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Joint analysis of coastal altimetry and HF radar data: insight to the shelf slope seasonal and mesoscale dynamics within the Bay of Biscay

Ivan Manso (1), Ainhoa Caballero (1), Anna Rubio (1), Claire Dufau (2), and Florence Birol (3)

(1) AZTI, Marine Research, Pasaia, Spain (imanso@azti.es), (2) CLS Space Oceanography Division, 8-10 Rue Hermès, 31526 Ramonville St. Agne, France, (3) LEGOS, 14 Ave. E. Belin, 31400 Toulouse, France

Coastal HF radar systems provide operational measurements of coastal surface currents with high spatial (∼1-5 km) and temporal (∼hourly) sampling resolution while the near continuous altimetry missions afford, from 1993 to nowadays, information of geostrophic currents in the global ocean with typical along-track and temporal sampling resolutions of >7 km and >9 days, respectively. During the last years, the altimetry community has made a step forward in improving these data in the coastal area, where the data present lower quality than in the open ocean due to technological limitations (e.g. land effect in large footprint, data processing, environmental corrections). The combination of HF radar and altimetry measurements arises as a promising strategy to improve the continuous monitoring of the coastal area (e.g. by expanding the measurements made by HF radars to adjacent areas covered by the altimetry, or by validating/confirming improvements brought by specific coastal algorithms or new altimeter missions). A first step towards this combination is the comparison of both datasets in the overlapping areas.

In this study, we compare measurements from HF radar and altimetry within the southeastern Bay of Biscay. In this area of complex hydrodynamics, a 4.5 MHz HF radar system provides current measurements since 2009. HF radar and two Jason-2 satellite altimetry products with different processing (CTOH and CMEMS) are compared over the period 2009-2015. The results provide an evaluation of the performance of different coastal altimetry datasets within the study area and a better understanding of the ocean variability contained in both data sets.

The variability of the radar and altimetry measurements are higher near the coast, and both observing systems detect the Iberian Poleward Current and the eddies, which are the main mesoscale processes within the area. The highest correlations between radar and altimetry take place in the slope, where the Iberian Poleward Current affords a great part of the mesoscale variability. Although there is a not yet explained disagreement, adding Ekman currents to the altimetry-derived geostrophic currents increases the agreement between both data sets (increasing the correlation in around 10%).