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Inferring geostrophic currents from HF radar measurements: assessment from two regional simulations

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The main aim of the COMBAT Project (CMEMS Service Evolution 2) is computing an improved local solution of the Mean Dynamic Topography for the southeastern Bay of Biscay, by including in its computation the existing long time-series of high-quality HF radar velocity measurements. The prerequisites for the computation of this new Mean Dynamic Topography is to remove the non-geostrophic signal from the HF radar measured velocities and to identify the scales resolved by the altimetry in the study area. The latter is characterized by the presence of a narrow shelf in the south and east and a deeper area gently sloping from east to west (the so-called 'Plateau des Landes').

In order to remove the ageostrophic part of the current from the HF radar data, different methods can be applied. For assessing their performance in the study area, we have first applied them to two different regional model simulations. This way, we can assess the methodology by comparing the results with the geostrophy computed from the simulated Sea Surface Height. The first simulation is the Reanalysis over the Irish-Biscay-Iberian domain, provided by the CMEMS, with around 8.3 km resolution. The second model is Symphonie in a Bay of Biscay configuration, with variable horizontal resolution (about 800 m in the study area). Daily surface data from 2011 to 2012 have been analysed.

First, simulated surface currents have been compared with the HF radar measurements at daily time scales. We find that both models tend to overestimate the slope current in winter, while the time variability is consistent with the data. The comparison between the two simulations evidences differences on the mesoscale patterns. These patterns are more energetic in the higher resolution model, showing characteristics consistent with those reported in the literature. Then, we estimate the geostrophic component from the total current using two different approaches and compare the results when applied to the two simulations. At last, we conclude on recommendations on the use of the HF radar measurements for the MDT calculation.