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Surface characterization of oceanic (sub)mesoscale through high resolution optimal interpolation : application to the NW Mediterranean Sea

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Oceanic mesoscale and submesoscale play a key role in modulating large-scale circulation, heat fluxes transfer and primary production enhancement. Nevertheless, the high spatial and temporal variability associated with mesoscale motions makes them difficult to study with sparse in-situ observations. Alternative options rely on developing methodologies based on the combination of multi-sensor platforms in conjunction with numerical simulations.

In this context, we present here the results of a 2D surface currents mapping, merging altimetry and SST data in the Balearic Sea (NW Mediterranean Sea). In a first step, the large ($\sim$100 km) scale signals are removed by subtracting the gridded Sea Level Anomaly maps (AVISO) to improve along track data. In a second step, the residuals are submitted to an objective analysis scheme with correlation scales adjusted to smaller (sub)mesoscale dynamics. A method including bathymetric constraint has been tested to provide a pseudo-dynamical boundary condition and to increase reliability in the coastal region. SST data information from satellite sensors are also integrated in the covariance function to gain resolution. A numerical model (ROMS) implemented in our study area has been used to test the sensibility of the developed methods. The results of these methods were then compared to independent data such as drifters launched in the area, several campaigns with in-situ data and glider information, revealing an improvement in the resolution of actual small scales features.

Our approach allows us to characterize the main mesoscale features present in the Western Mediterranean Sea. Moreover, the combination with the numerical model permits to better understand the physical processes related to small-scale features.