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Modeling Surface Currents in the Eastern Levantine Mediterranean

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We consider the problem of reconstructing the meso-scale features of the currents in the Eastern Levantine Mediterranean from combining in-situ and satellite altimetry data. Mathematically, this is an inverse problem where the objective is to invert Lagrangian trajectories, which are positions of drifters launched at sea, in order to improve the coarse Eulerian velocity, provided by the altimetric satellite measurements. We shall use a variational assimilation approach, whereby the eulerian velocity correction is obtained by minimizing the distance between the simulated position from a velocity background and actual observations. One important property of our approach is that it is model free, so that it is inexpensive and can be easily cast into real-time oceanic operational products.
Our method is first validated with twin experiments, where we conduct sensitivity analysis to parameters such as number of drifters, assimilation time window and spatial filter length.
The approach is next validated with past and present data from the Levantine Mediterranean by correcting velocity fields derived from altimetry by assimilating drifters' data. The drifters' data used here were collected in the context of the MedSVP program and more recently by the National Lebanese Marine Center (CNSM) in September 2013. The CNSM with its boat CANA has developed an important activity of data collection along the Lebanese coast so far and this activity will permit it to extend its collaborations further by integrating the modeling and data assimilation methods for reconstructing the surface currents.