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Evaluation of eddy and front predictability in the Gulf of Mexico with the use of ensemble runs.

F. Counillon, L. Bertino

(1) Mohn-Sverdrup Center / Nansen Environmental and Remote Sensing Center, Bergen, Norway (francois@nersc.no / Fax: +47 55 20 58 01)

As oil production moves further into deeper waters, the costs related to strong current hazards are increasing accordingly, and accurate three-dimensional forecasts of currents out to two weeks are urgently needed. To be useful, models have to describe eddy fronts to an accuracy of 30 km at a nowcast stage, which is almost impossible to accomplish with the use of satellite maps of the same accuracy. Therefore, estimations of the predictability with the use of stochastic forecasting system allows us to give location dependent confidence indices of the prediction.

We use the Ensemble Optimal Interpolation (EnOI) data assimilation method and we assimilate Sea Level Anomaly (SLA) since it presents significant correlation with currents, salinity, temperature, and layer interface at all depths.

In this study, we run an ensemble forecast with 10 members of equal likelihood, which differ due to perturbation of the initial state and perturbation of the forcing field. They give the probability of finding a front in a given location.

This study concentrates on the Eddy Vortex (2005), observed from altimeters around the 2^{nd} of March, which has crossed the 28N parallel. We focus on the reliability of our stochastic Nowcast and 7 days Forecast results, with 2 runs starting respectively 1 and 2 weeks prior to the observed shedding date. We validate our results against satellite SST maps and current measurements from ADCPs.

For this study we use a high resolution (5km) Gulf of Mexico HYCOM model, which receives boundary conditions from the TOPAZ system.