The Inclusion of Velocity Observations in an Ocean Prediction System

The Navy Coupled Ocean 3D Variational Data Assimilation (NCODA-VAR) system is one of the primary tools that the Navy uses operationally to ingest, process, quality and control, and assimilate ocean observations in near-real time in order to regularly update and improve the forecast skill of several different operational ocean prediction systems. At the Naval Research Laboratory, we have upgraded NCODA-VAR to include the assimilation of ocean surface velocity observations inferred from drifters. In this presentation, we will overview the mechanics that were added to the assimilation system to accommodate velocity observations. This primarily includes the addition of a new multivariate covariance operator to cross-correlate velocity observation with temperature and salinity within the analysis. Results from high-resolution (1km) validation experiments performed in both the Gulf of Mexico and a Western Atlantic domain will also be presented. Experiments with and without velocity data assimilation were conducted to test this new velocity assimilation capability. The Gulf of Mexico experiment occurred from September 1 to December 31, 2020, and the Western Atlantic experiment occurred from February 1 to May 31, 2022. These time periods correspond with large drifter deployments as part of DARPA's Ocean of Things project. These experiments were conducted within the cycling Coupled Ocean Atmosphere Mesoscale Prediction System (COAMPS) producing daily 48-hour forecasts. Comparisons will be presented showing the vast improvement including velocity observations has on the prediction of the ocean state.

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