The NRL relocatable ocean/acoustic ensemble forecast system

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A globally relocatable regional ocean nowcast/forecast system has been developed to support rapid implementation of new regional forecast domains. The system is in operational use at the Naval Oceanographic Office for a growing number of regional and coastal implementations. The new system is the basis for an ocean acoustic ensemble forecast and adaptive sampling capability. We present an overview of the forecast system and the ocean ensemble and adaptive sampling methods.

The forecast system consists of core ocean data analysis and forecast modules, software for domain configuration, surface and boundary condition forcing processing, and job control, and global databases for ocean climatology, bathymetry, tides, and river locations and transports. The analysis component is the Navy Coupled Ocean Data Assimilation (NCODA) system, a 3D multivariate optimum interpolation system that produces simultaneous analyses of temperature, salinity, geopotential, and vector velocity using remotely-sensed SST, SSH, and sea ice concentration, plus in situ observations of temperature, salinity, and currents from ships, buoys, XBTs, CTDs, profiling floats, and autonomous gliders. The forecast component is the Navy Coastal Ocean Model (NCOM). The system supports one-way nesting and multiple assimilation methods.

The ensemble system uses the ensemble transform technique with error variance estimates from the NCODA analysis to represent initial condition error. Perturbed surface forcing or an atmospheric ensemble is used to represent errors in surface forcing. The ensemble transform Kalman filter is used to assess the impact of adaptive observations on future analysis and forecast uncertainty for both ocean and acoustic properties.