

Operational Global Ocean Assimilation and Modeling with the Navy Coastal Ocean Model

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A global implementation of the Navy Coastal Ocean Model (NCOM) has recently become operational at the Naval Oceanographic Office (NAVO). Global NCOM provides global ocean nowcasts and forecasts for U.S. Navy applications including providing standalone data where sufficient, a quick overview of local circulation where refined products are operationally unavailable, and boundary conditions for regional or relocatable models that may be more specialized for a particular task or domain. Assimilation of global ocean observations available on short operational time scales is implemented through relatively simple, low-cost techniques. Extensive validation of this global modeling system provides a baseline for considerations of cost and benefit of more sophisticated approaches.

Satellite altimetry and satellite sea surface temperature (SST) provide the primary sources of global ocean observations for global NCOM. These data are assimilated by the operational Navy Layered Ocean Model (NLOM). While NCOM is fully global to depths of 5-m, global NLOM excludes polar latitudes and depths shallower than 200m. However, global NLOM has twice the horizontal resolution of global NCOM, giving it improved skill in dynamically interpolating sea surface height (SSH) measurements along altimeter tracks into forecasts of deep-water front and eddy location. The Modular Ocean Data Assimilation System (MODAS) combines steric SSH anomalies from NLOM with fully global SST fields interpolated from satellite and in-situ observations to produce 3-D temperature and salinity fields for assimilation into global NCOM.

Validation of global NCOM using unassimilated observations or climatologies provides a basis for estimating the accuracy of its nowcasts and forecast products and indicates directions for further model refinement and development. Representative results selected from evaluations performed during the model development and operational test phases include eddy kinetic energy, transports, vertical sections of temperature and velocity, sea surface temperature, mixed-layer depth, sea-surface height and event comparisons. These results are used to assess present operational capabilities and indicate directions for future research and development.