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Global Ocean Prediction with the Hybrid Coordinate Ocean Model

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The next generation global ocean prediction system is currently undergoing testing in an operational environment at the Naval Oceanographic Office. The circulation model within the system is based on the Hybrid Coordinate Ocean Model (HYCOM) with 1/12 equatorial (∼7 km mid-latitude) resolution and 32 layers. HYCOM is a generalized (hybrid isopycnal/s/z) coordinate ocean model. It is isopycnal in the stratified ocean, but reverts to a terrain-following (s) coordinate in shallow depths, and to pressure (∼z-level) coordinates in the surface mixed layer. The vertical coordinate is dynamic in space and time via the layered continuity equation, which allows a dynamical transition between the coordinate types. The atmospheric forcing was from the Fleet Numerical Oceanography and Meteorology Center (FNMOC) Navy Operational Global Atmospheric Prediction System (NOGAPS) (on the 0.5° computational grid). The data assimilation methodology is based on multi-variate optimum interpolation (MVOI) within the Navy Coupled Ocean Data Assimilation (NCODA) system. Several observational data types can be assimilated, but those routinely assimilated include sea surface height (SSH) from satellite altimeters, sea surface temperature (SST) and temperature (T)/salinity (S) profiles. In this presentation the details of the system are presented, as well as verification results from forecast fields. Specifically, verification of 30-day forecasts of SSH are performed by comparing to unassimilated tide-gauge data using 20 forecast periods initialized during 2004 and 2005 when data from three nadir-beam altimeters were assimilated by the hindcasts. Verifications are performed using operational atmospheric forcing that gradually reverts toward climatology after 5 days as well as analysis-quality atmospheric forcing for the duration. Correlations between the forecasts and observations are examined relative to both open ocean and coastal tide gauge stations.