

The 1/12° GLOBAL HYCOM NOWCAST/FORECAST SYSTEM

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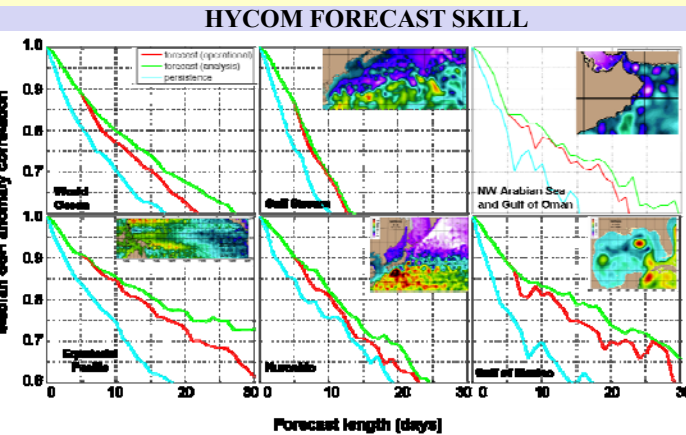
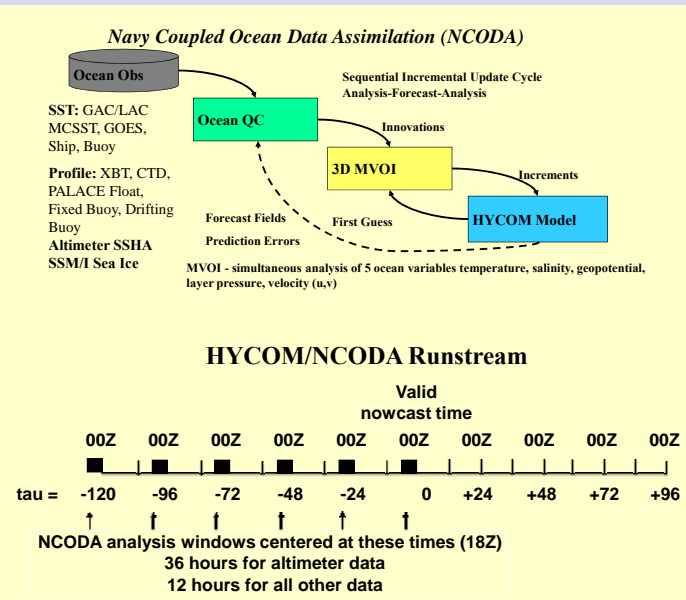
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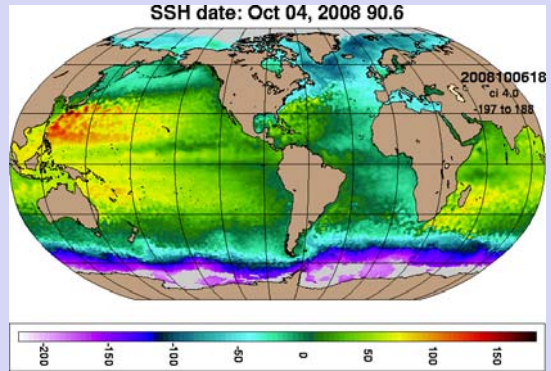
The 1/12° global Hybrid Coordinate Ocean Model (HYCOM) nowcast/forecast system has been running in near real time since 22 December 2006 and in real time since 16 February 2007. The Navy Coupled Ocean Data Assimilation (NCODA, Cummings, QJMS, 2005) system is used to assimilate available observations. NCODA is a fully three-dimensional multivariate optimal interpolation (MVOI) system. The NCODA horizontal correlations are multivariate in geopotential and velocity, thereby permitting adjustments (increments) to the mass fields to be correlated with adjustments to the flow fields. The velocity adjustments are in geostrophic balance with the geopotential increments, and the geopotential increments are in hydrostatic agreement with the temperature and salinity increments. Either the Cooper and Haines (JGR, 1996) technique or synthetic T & S profiles from the Modular Ocean Data Assimilation (MODAS), Fox et al., (JAOT, 2002), can be used for downward projection of SSH and SST. The current system is using the MODAS synthetic profile approach. NCODA assimilates remotely sensed sea surface height, sea surface temperature and ice concentration. NCODA also assimilates in situ surface and sub-surface observations from several sources, such as ships, buoys, CTD's, BT's and profiling floats. An incremental updating scheme is used to update the HYCOM forecast variables. The increments can be added over a given number of time steps, ranging from 1 (direct insertion) to the number of time steps in one day. Typically a 6 hour updating interval is used. A NCODA analysis is performed every 24 hours. The daily run consists of a 5 day hindcast and a 1 to 5 day forecast depending on available computer resources.

The prediction system provides boundary conditions for higher resolution coastal models. An accurate representation of the oceanographic fields at the open boundaries of a coastal model is important for a successful coastal ocean prediction system. Results from the global system can be found on the HYCOM Consortium web page <http://www.hycom.org>. The data can also be accessed through this web page.

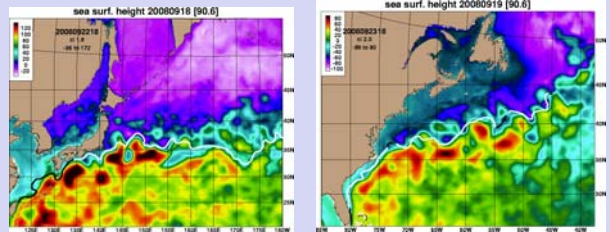


Green line: Analysis quality atmospheric forcing throughout the forecast period
Red line: Atmospheric forecast for first 5 days, then gradually reverting toward climatology

- HYCOM long term goals for operational prediction**
- .08 fully global ocean prediction system in the process of being transitioned to NAVOCEANO
 - ~7 km mid-latitude resolution
 - Include shallow water, minimum depth 10m
 - Bi-polar (PanAm) grid for the Arctic
 - Increase to .04 resolution globally and transition to Naval Oceanographic Office by 2013
 - ~3.5 km mid-latitude resolution
 - Good resolution for coastal model boundary conditions globally
 - "Baseline" resolution for shelf regions globally

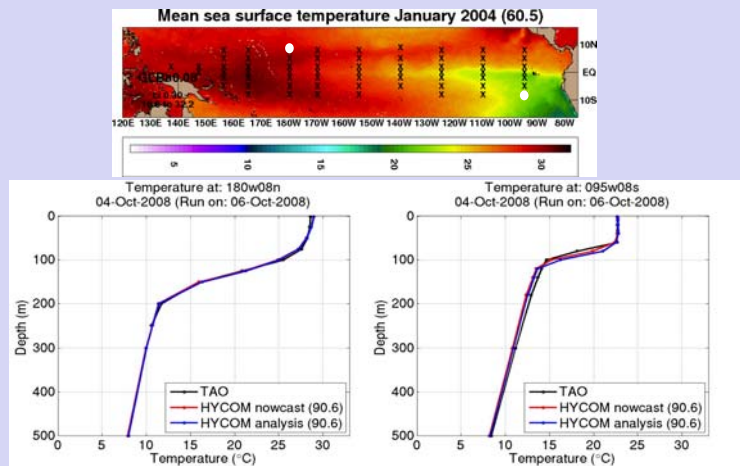


Gulf Stream and Kuroshio SSH with SST-based frontal analysis

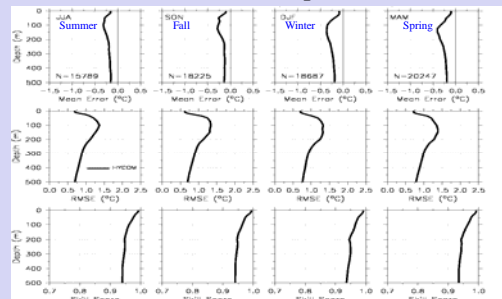


Frontal analysis < 4 days old = white, analysis ≥ 4 days old = black
The frontal analysis is performed at the Naval Oceanographic Office

Comparison to temperature profile observations in real time



Temperature vs. depth error analysis from a one year hindcast using unassimilated profiles



References:

Cooper, M. and Haines, K. A. Altimetric assimilation with water property conservation. *J. Geophys. Res.*, 1996, 24, 1059-1077

Cummings, J.A. Operational multivariate ocean data assimilation. *Quart. J. Royal Met. Soc.*, 2005, 131, 3583-3604

Fox, D. N., Teague, W. J., Barron, C. N., Carnes, M. R. and Lee, C. M: The modular ocean data assimilation system. *J. Atmos. Ocean. Technol.*, 2002, 19, 240-252