Geophysical Research Abstracts
Vol. 12, EGU2010-8296, 2010
EGU General Assembly 2010

Assimilation of track SLA in a tidal-driven model and eddy-resolving of the South China Sea with the EnOI

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The upper ocean circulation in the South China Sea (SCS) is driven by the Asian monsoon, the Kuroshio intrusion through the Luzon Strait, strong tidal currents, and a very complex coastline. Here, we demonstrate the benefit of assimilating track altimeter data into a nested configuration of the HYbrid Coordinate Ocean Model (HYCOM) that includes tides, for the representation of the surface circulation. This is done by a cost-effective Ensemble Optimal interpolation (EnOI), which uses a static ensemble for 3D and multivariate updates. Some new features to the method are proposed: a simple filtering of the tidal signal from the model output, a running selection of members from the static ensemble to handle the strong seasonal variability and a more advanced aging of asynchronous observations, dependent on space and time.

The data assimilative system is tested for the two years 1994 and 1995 when the availability of validation data is largest. Data assimilation reduces the monthly RMSE of Sea Level Anomalies (SLA) from 9 cm to 7 cm, and reproduces documented mesoscale features for the same period of study: i.e. a dipole structure related with the jet off the coast of Vietnam in July-August 1994, and several eddies in the central SCS in May 1995. The comparison of the model currents against drifter data indicates that surface currents have also been improved near the coast with largest improvement in the northern SCS and east of Vietnam. We therefore recommend the method for assimilation into global high-resolution models including tides.