Advanced Data Assimilation into a High Resolution Global Ocean Model using an Ensemble Kalman Filter

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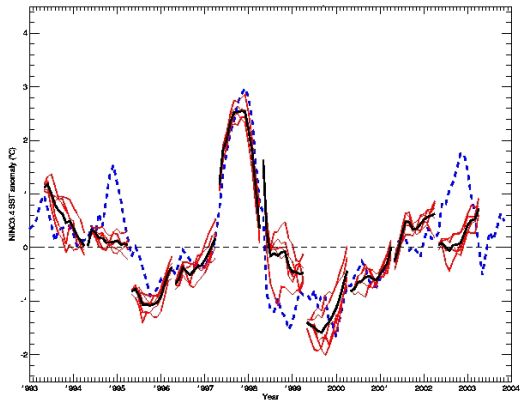
Objectives

Improve ocean state estimation by employing ensembles of ocean simulations to estimate the time-varying error statistics required to assimilate ocean observations and update the multi-variate ocean states using an Ensemble Kalman Filter (EnKF).

Use the memory and compute speed of Columbia to increase the ensemble size (from 16 6o 64) to improve the reliability and spread of the statistics

The focus is on the initialization of the equatorial ocean basins in support of coupled seasonal predictions.



Time series of Niño-3.4 SST-anomaly hindcasts.made with ensembles of the GMAO CGCM with the ocean-model initialized with the EnKF system using temperature and altimeter data. Red: individual ensemble members; Black: the ensemble mean; Dotted line: observed SSTs.

Technical Elements

The GMAO ocean data assimilation system employs an Ensemble Kalman filter with the Poseidon quasi-isopycnal OGCM. An online bias correction scheme is used in the assimilation of surface height anomalies from satellite altimetry.

Resolution:
OGCM: 1/3 x 5/8 x 34L
EnKF: 64 ensemble members

Simulation: 12-year assimilation using satellite altimeter data with in situ measurements of temperature and salinity profiles

Significance

The increase in the ensemble size will allow better representation of the relationships between the surface and subsurface ocean and between the different model fields, leading to a more effective use of the surface altimeter data.

The outcomes will be i) a 12-year improved time series of the ocean state, with estimates of uncertainty, and ii) a set of ensemble ocean initial conditions to be used to evaluate the impact of ocean altimeter data on coupled forecast skill.