



Ocean state and uncertainty forecasts using HYCOM with Local Ensemble Transfer Kalman Filter (LETKF)

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An ensemble forecast system based on the US Navy's operational HYCOM using Local Ensemble Transfer Kalman Filter (LETKF) technology has been developed for ocean state and uncertainty forecasts. One of the advantages is that the best possible initial analysis states for the HYCOM forecasts are provided by the LETKF which assimilates the operational observations using ensemble method. The background covariance during this assimilation process is supplied with the ensemble, thus it avoids the difficulty of developing tangent linear and adjoint models for 4D-VAR from the complicated hybrid isopycnal vertical coordinate in HYCOM.

Another advantage is that the ensemble system provides the valuable uncertainty estimate corresponding to every state forecast from HYCOM. Uncertainty forecasts have been proven to be critical for the downstream users and managers to make more scientifically sound decisions in numerical prediction community. In addition, ensemble mean is generally more accurate and skilful than the single traditional deterministic forecast with the same resolution. We will introduce the ensemble system design and setup, present some results from 30-member ensemble experiment, and discuss scientific, technical and computational issues and challenges, such as covariance localization, inflation, model related uncertainties and sensitivity to the ensemble size.