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MMM SEMINAR *NCAR*

Hierarchical Bayes Ensemble Variational Data Assimilation

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Advanced data assimilation techniques in common use rely on the assumption that the error statistics of the data (both background forecast and observations) are perfectly known. In reality, this is never the case. Especially, background-error covariance matrix B derived from a (small) ensemble is largely uncertain. Static B used in variational schemes often also poorly represent flow-dependent background-error statistics. State-of-the-art ensemble-variational hybrids are designed to improve both static and ensemble covariances by combining them in some, usually ad hoc, way. We propose to optimize this combination by explicitly acknowledging that the B matrix is uncertain and random, introducing its prior (matrix-variate) probability distribution, and updating it in the analysis along with the state. In this update, ensemble members are assimilated as generalized observations together with ordinary observations.

The ensemble analysis is obtained by drawing pseudo-random samples from the posterior distribution. The deterministic analysis (best point estimate of the atmospheric state) can be computed using different techniques, among them posterior mode and importance sampling. For toy problems, numerical experiments with synthetic truth show that the new technique outperforms the existing variational, ensemble Kalman filter, and traditional ensemble-variational analyses.

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Thursday, 16 October 2014, 3:30 PM
Refreshments 3:15 PM
NCAR-Foothills Laboratory
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