NOAA THORPEX: UNDERSTANDING AND IMPROVING THE ENSEMBLE TRANSFORMA KALMAN FILTER TARGETING STRATEGY

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The primary goal of this project is to evaluate and further develop the Ensemble Transform Kalman Filter (ETKF) adaptive observing strategy, which is presently in use in National Weather Service Winter Storm Reconnaissance programs. The main focus is to assess the ability of the ETKF to perform out to 3-7 days, in spite of its shortcomings.

Summary of work to date

The original goal in the first year of research was to design a quasi-geostrophic model OSSE to answer these questions in a fundamental manner. However, in concert with the reviewers' and panel's comments, it was decided that more emphasis be placed on using the operational NCEP Global Forecasting System (GFS) model system in this project.

Hence, we have so far achieved considerably more with the NCEP GFS model than had originally been written in the proposal. Three parallel runs of the GFS at T126 resolution have been conducted every day since November 2004: (i) from operational SSI analyses, (ii) from SSI analyses produced with eastern Asian rawinsonde data denied, (iii) from SSI analyses produced with east North American rawinsonde data denied. The parallel runs will continue through February 2005, to give a 3-month dataset. Some interesting observations include the very rapid eastward speed of propagation by the influence of rawinsondes, by as much as 160^{o} in 3 days.

In parallel, the current version of the ETKF code is being tested for the corresponding cases, to predict the evolution of "signal variance", which gives the variance field of the influence of the rawinsonde observations on forecasts out to 6 days.

Quantitative analyses of the influence of the rawinsonde data on 3-7 day forecasts will take place in the next 6 months, together with the ETKF's ability to predict this. The evolution of NCEP GFS signals and ETKF signal variance will be studied using diagnostics such as the eddy kinetic energy equation, and measures of non-linearity in the flow as estimated from ensemble forecasts. Results are updated daily on the website http://orca.rsmas.miami.edu/~majumdar/thorpex/

This work has been presented at the following conferences:
1. First International THORPEX Science Symposium, Montreal, Canada. 6-10 Dec 2004.
2. The AMS Ed Lorenz Symposium, San Diego, CA. 13 Jan 2005.