YEAR 1 PROGRESS REPORT

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In carrying out our research we have been closely following our research plan. In particular:

- We revised the paper Szunyogh, et al.: Assessing a Local Ensemble Kalman Filter: Perfect Model Experiments with the NCEP global model, which is now accepted for publication in Tellus. This paper presents our results on the implementation of the Local Ensemble Kalman Filter on the 2001 version of the NCEP GFS for the assimilation of simulated observations. (The paper acknowledges the support of the NOAA THORPEX Grant.)
- We successfully implemented the 2004 version of the NCEP GFS on our Linux cluster. (We received invaluable help from Jeff Whitaker in implementing and testing this version of the model).
- We coded an improved efficiency version of our Local Ensemble Kalman Filter (LEKF) data assimilation scheme. We call the new scheme Local Ensemble Transform Kalman Filter, indicating that the new scheme combines ideas from our own LEKF scheme and from the Ensemble Transform Kalman Filter of Bishop et al. (2001). This new code was successfully tested with an implementation on the 2001 version of the NCEP GFS, assimilating simulated observations. On our 40-processor Linux cluster the new LETKF scheme is about 6 times faster than the original LEKF scheme.
- We are currently in the process of testing a 3-dimensional version of the LETKF data assimilation system with real weather observations. We are still in the process of correcting coding errors in the system, thus we cannot report on results at this point.
- We developed a new scheme for the parameterization of model errors in the LEKF (LETKF) framework. This technique was successfully tested on the 40-variable Lorenz model. These results are described in the manuscript “Baek, Hunt, Szunyogh, and Ott: Local Ensemble Kalman Filtering in the Presence of Model Errors. We are currently in the process of revising the paper for Tellus A. We are planning to incorporate this bias correction technique into our data assimilation system, once the coding errors have been eliminated from the current version of the system. We are also planning to implement a 4-dimensional extension of the LETKF.
- We also continued our efforts to carry out basic predictability research: (1) we have revised and published the paper Oczkowski, Szunyogh, and Patil: Mechanisms for the development of locally low dimensional atmospheric dynamics, JAS, 65, 1135-1156 and (2) we submitted the paper Kuhl, Szunyogh et al.,: Assessing predictability with a Local Ensemble Kalman Filter to JAS. (We attached a Powerpoint slide showing the most important result of this paper: a small ensemble can provide an efficient estimation of the space of forecast uncertainties for a model of operational complexity, when an ensemble Kalman filter is applied to obtain the initial ensemble. The full manuscript, as well as our other papers, is available at http://keck2.umd.edu/weather/weather_publications.htm). These two papers also acknowledge the support of the NOAA THORPEX Grant.
- We contributed 5 presentations to the First International THORPEX Symposium and we contributed 3 papers to the WMO publication on the same meeting.
- We are aware of the extremely promising results of the NOAA CDC team, but we have no information about the progress of the other teams. We hope to be able to correct the coding errors in our data assimilation system soon and to provide some initial results for the intercomparison project by the end of the summer of 2005. In Year 2 we hope to further develop our data assimilation scheme and to contribute increasingly more accurate analyses to the intercomparison project.