Annual report on NOAA-THORPEX grant entitled

"**An Intercomparison of Bred, Perturbed Observation, and Ensemble Transform Kalman Filter Methods for Initializing Ensemble Forecasts**"

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At the request of the THORPEX grant manager, Zoltan Toth, the focus of this grant research was changed to test ensemble-based data assimilation methods. The intent of this project was to test our ensemble square-root filter (EnSRF) assimilation method against other ensemble-based assimilation methods as well as against a 3D-Var baseline. A realistic model (NCEP's Global Forecast System, or "GFS") and realistic observations (most all conventional data) were used in this test. We sought to determine (1) which ensemble method, if any, was more skillful than the others, and (2) were any of the ensemble methods as skillful or more skillful than 3D-Var using the same data?

A preliminary report was prepared for the First International THORPEX workshop, and it can be downloaded from http://tinyurl.com/dclty . Since the preparation of this preprint, two major developments have taken place. First, we now have an appropriate baseline for comparison provided by NCEP, the T62 version of their 3D-Var assimilation system using the same observations as tested in the ensemble filters. Second, we have continued development of the algorithm. While there have not been any radical changes to the basic algorithm described in the preprint, several adjustments have been made, such as adjusting the vertical covariance localization and determining which observations were likely to only provide redundant information and not assimilating them. The end result is that the EnSRF now is as good or slightly better than the GFS 3D-Var run at the same resolution assimilating the same data (see attached ppt slides).

We have not heard recently about the performance of other groups' ensemble filters. Per the request of the program manager, Zoltan Toth, we intend to participate in a conference call within a few weeks to discuss this.

We are currently writing a journal article on the performance of this ensemble filter.

It is our intent to continue the development of the filter algorithms in the coming years of this grant. It is our expectation that if it is possible to develop better model-error parameterizations, then the performance of the filter may be able to be improved dramatically. Currently the GFS system has such large biases in the boundary layer that it makes it difficult to assimilate surface and near-surface observations. Corrections for these sort of systematic errors in the model may permit the use of more data and the further improvement of analysis quality.