Operational Data Assimilation using the Ensemble Kalman Filter with a Modified Cholesky decomposition

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Abstract

Numerical Weather Prediction (NWP) is of high relevance nowadays as it allows us to model the behave of the weather given physical models to produce short-term forecasts. But even the best models have uncertainty associate. To improve the quality of such, we can employ Data Assimilation techniques that allow us to manage that uncertainty, given the dynamics of the system. Since these models are computationally expensive, we require the use of High-performance computing to produce those analyses, in a reasonable amount of time (computationally speaking, as the model's parameters is in the range of O(10**8)). Given those models and meteorological information obtained by the National Oceanic and Atmospheric Administration (NOAA), we can give a better estimate using the Ensemble Kalman Filter (EnKF). We believe we can take advantage of those observations provided by the NOAA in their Reanalysis II dataset and making use of the atmospheric general circulation model SPEEDY with the Ensemble Kalman Filter formulation based on a Modified Cholesky decomposition (EnKF - MC) for inverse covariance matrix estimation. We interpolate the data from the NOAA dataset to the SPEEDY grid resolution to perform the forecasts. Results show how the use of the EnKF-MC reduces the impact of spurious correlations during the assimilation cycle.

Keywords: Data Assimilation, Ensemble Kalman Filter, Modified Cholesky decomposition

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