Introduction to skewed ensemble Kalman filter

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To implement ensemble Kalman filter (EnKF) to a weather prediction system, most operational meteorology centers keep on trying to make it higher the skill of expressing error covariance using finite ensemble members. The localization and the variance inflation are the representative examples for improving the expressiveness of finite samples.

In contrast to those previous approaches, we found that there is a new approach to make the analysis of EnKF more accurate. It is to select an estimate having an error covariance to be more easily approximated by finite sample. By choosing as the background for analysis procedure a single forecast, not the mean of forecast ensemble, we can improve the skill of EnKF even though using the same number of ensemble members. This new approach is called skewed ensemble Kalman filter (SEKF).

Our presentation will show that the skewness of the background can improve the expressiveness of finite samples in approximating error covariance. The results of the numerical experiments using Lorenz 40-variable model will confirm that the ensemble covariance of SEKF better represents the forecast error covariance even though using the same number of ensemble members as used in EnKF.