LETKF Perturbations by Ensemble Transform in a Cloud Resolving Model

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Abstract

In ensemble data assimilation, the forecast error is estimated by perturbations of the ensemble forecast, while characteristics of the ensemble forecast strongly depend on how the initial ensemble was generated. The ensemble transform (ET) is widely used as the initial ensemble perturbation generator, however, in the previous studies for the mesoscale ensemble system (Saito et al. 2011, 2012; Duc et al. 2015), perturbations from LETKF were not necessarily better than other methods as the initial perturbations. Non-diagonal components in the transform matrix likely contaminate the synoptic scale structure of the bred vectors in the ensemble forecast in the assimilation window.

Recently, Duc et al. (2018) presented the mathematical basis of the diagonally predominance property of the ensemble transform matrix and reported that initial perturbations obtained from a diagonal matrix produce better ensemble forecasts than the ones obtained from the conventional ET in experiments using real observations. In this paper, we show detailed structures of perturbations by LETKF and by diagonal transform matrix, and compare their evolution in a cloud resolving model with deep convection.

References:

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