Geophysical Research Abstracts
Vol. 16, EGU2014-10950-1, 2014
EGU General Assembly 2014
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Impact of ensemble perturbations provided by convective-scale ensemble data assimilation

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How to derive proper initial conditions for convective-scale ensemble prediction systems (EPS) is still an open question. One common approach is to generate initial condition perturbations through dynamical downscaling of information from lower resolution models. This approach is attractive due to its simplicity and has been showing overall good results. However, by using lower resolution model information, it is not possible to represent the full spectrum of uncertainty in the initial state of the convective-scale EPS.

An alternative approach to derive proper high-resolution initial ensemble perturbations, is to apply a convective-scale ensemble data assimilation system which provides a full analysis ensemble in addition to a deterministic analysis. The derived analysis ensemble, which gives an estimate of the current theoretical analysis uncertainty, can be used as initial conditions for subsequent ensemble forecasts.

A kilometer scale ensemble data assimilation (KENDA) system for the Consortium for Small-scale Modeling (COSMO) model is currently under development at Deutscher Wetterdienst (DWD). In this study, we investigate the potential benefits of KENDA initial conditions for ensemble forecasting. A comparison of COSMO ensemble forecasts for the German domain (DE) using initial ensemble perturbations provided by KENDA and generated by the downscaling approach, highlights the improved representation of uncertainty in ensemble forecasts from the KENDA initial conditions. Further, different inflation methods of KENDA ensemble perturbations are tested to account for unrepresented error sources.