Geophysical Research Abstracts
Vol. 19, EGU2017-7393, 2017
EGU General Assembly 2017

A flexible additive inflation scheme for treating model error in ensemble Kalman Filters

Matthias Sommer (1) and Tijana Janjic (2)

(1) Hans Ertel Centre for Weather Research, LMU, Munich, Germany, (2) Hans Ertel Centre for Weather Research, German Weather Service, Offenbach am Main, Germany (Tijana.Janjic-Pfander@dwd.de)

Data assimilation algorithms require an accurate estimate of the uncertainty of the prior, background, field. However, the background error covariance derived from the ensemble of numerical model simulations does not adequately represent the uncertainty of it. This is partially due to the sampling error that arises from the use of a small number of ensemble members to represent the background error covariance. It is also partially a consequence of the fact that the model does not represent its own error. Several mechanisms have been introduced so far aiming at alleviating the detrimental effects of misrepresented ensemble covariances, allowing for the successful implementation of ensemble data assimilation techniques for atmospheric dynamics. One of the established approaches in ensemble data assimilation is additive inflation which perturbs each ensemble member with a sample from a given distribution. This results in a fixed rank of the model error covariance matrix.

Here, a more flexible approach is suggested where the model error samples are treated as additional synthetic ensemble members which are used in the update step of data assimilation but are not forecast. In this way, the rank of the model error covariance matrix can be chosen independently of the ensemble. The effect of this altered additive inflation method on the performance of the filter is analyzed here in an idealised experiment. It is shown that the additional synthetic ensemble members can make it feasible to achieve convergence in an otherwise divergent setting of data assimilation. The use of this method also allows for a less stringent localization radius.