Representation of model error in convective scale data assimilation

Tijana Janjic, Yuefei Zeng, Alberto de Lozar, Yvonne Ruckstuhl, Ulrich Blahak, and Axel Seifert
Ludwig Maximilians University Munich, Munich, Germany (tijana.pfander@lmu.de)

Model error is one of major contributors to forecast uncertainty. In addition, statistical representations of possible model errors substantially affect the data assimilation results. We investigate variety of methods of taking into account model error in ensemble based convective scale data assimilation. This is done using the operational convection-permitting COSMO model and data assimilation system KENDA of German weather service, for a two-week convective period in May 2016 over Germany. Conventional and radar reflectivity observations are assimilated hourly by the LETKF. For example, to take into account the model error due to unresolved scales and processes, we use the additive noise with samples coming from the difference between high-resolution model run and low-resolution experiment. We compare this technique for assimilation of radar reflectivity data to other methods such as RTPS, warm bubble initialization, stochastic boundary layer perturbation and estimation of parameters. To further improve on additive noise technique, which consists of perturbing each ensemble member with a sample from a given distribution, we propose a more flexible approach in which the model error samples are treated as additional synthetic ensemble members that are used in the update step of data assimilation but are not forecasted. In this way, the rank of the model error covariance matrix can be chosen independently of the ensemble. This altered additive noise method is analyzed as well.