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# Testing data assimilation methods on convective scale dynamics

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Determining appropriate methods for convective-scale data assimilation is a major focus of the Data Assimilation Branch of the Hans-Ertel-Centre for Weather Research. These scales are characterized by highly nonlinear dynamics and non-Gaussian error statistics. For example, the assimilation of high-resolution radar observations is complicated due to the rapid evolution of convection.

The problem of complex convective fields has been explored using a hierarchy of simplified models. The models range from a 1-D stochastic cloud model, to a modified shallow water model and the full nonhydrostatic, km-scale numerical model COSMO with idealized initial and boundary conditions. Data assimilation methods that have been evaluated on these models are the Ensemble Transform Kalman Filter (ETKF) and two variants of particle filters (SIR and the efficient particle filter that combines the particle filter with the nudging technique). Having in mind the application to high-dimensional systems, ETKF and SIR are used with and without localization and observational averaging techniques.

Application of the LETKF to the above models shows that the filter is efficient in locating correct cloud locations, but poor in removing spurious cells. Results with the efficient particle filter on a stochastic cloud model show that the number of particles required can be reduced compared to the SIR, especially if correct non-Gaussian error statistics are used in the experiment. These results are further generalised to a modified shallow water model.