Assimilating radar volume data into the COSMO model using an LETKF approach

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The prediction of a convective event is still very challenging nowadays because of its nonlinear and uncertain processes in the atmosphere. It is assumed that assimilation of high resolution data is a key to improve numerical weather prediction. Weather radars are regarded as an ideal data source because they provide unique 3-dimensional information about dynamical and microphysical characteristics of precipitating clouds. However, the observed quantities are not directly comparable to variables of the numerical model. Hence, an Efficient Modular RADar SCanning forward OPErator (EMRADSCOPE) has been recently developed at the Karlsruhe Institute of Technology (KIT) and the German Weather Service (DWD). In the assimilation framework, the operator simulates the measurement process of radar observables from the model variables and allows for direct comparison the observation space. Then, Ensemble Kalman Filters can be used to exploit information from this comparison and transfer the information back onto the model states.

One important task of the DWD ongoing project KENDA (Km-scale Ensemble-based data assimilation, COSMO priority project) is to assimilate radar data, using the new Local Ensemble Transform Kalman Filter (LETKF). Currently, experiments are performed using volume data from the new weather radar network of DWD which comprises 17 C-Band Doppler radars, evenly distributed throughout Germany, and data from Emilia-Romagna (Italy) radar network made of 2 C-Band Doppler radars. Assimilation of reflectivity and radial velocity are under investigation, and the aim of this work is to assess the impacts of the use of radar data into this assimilation framework. By that we mean to clarify essential issues such as localization, maintaining of ensemble spread and superobbing. Preliminary results of the running experimets will be presented.