Assimilation of Cloud Information at the Convective Scale with the Ensemble Kalman Filter

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Convective scale data assimilation is an area of active research. Ensemble Kalman filters have several properties which are advantageous for this purpose. They are comparatively easy to implement and parallelize, no adjoint or linearized models are needed. In principle any quantity can be assimilated, also variables which are not state variables of the model, as in the analysis step the analysis ensemble is obtained by weighting the background perturbations such that they fit the observations in an optimal sense.

We will present an approach to assimilate cloud information into a convection-permitting numerical weather prediction model with the ensemble Kalman filter. The cloud observations are obtained from satellite cloud products based on Meteosat SEVIRI data. To assure data quality and for obtaining an observation error estimate, the satellite cloud products are merged with radiosonde-derived cloud top information where available.
Cloud top height and relative humidity at the cloud top height are assimilated for cloudy pixels; the information zero cloud cover is assimilated for low, medium and high clouds for cloud-free pixels, respectively. Thus, both, "cloud" as well as "no cloud" observations are assimilated. An objective is to improve the simulation of low stratus clouds in synoptically stable high pressure systems in fall and winter.

Single observation experiments have been carried out to investigate the effect of the data on the analysis in detail. More sophisticated experiments are under way to find an optimal setting with respect to data density, localization etc.