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EnVAR Quality Control and Observation Aggregation for ICON-LAM

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The German Weather Service (DWD) operationally runs an LETKF (Localized Ensemble Kalman Filter) assimilation scheme for the regional weather forecasts with the ICON-LAM (ICON Limited Area Mode) Numerical Weather Prediction model. We investigate the potential of using an EnVAR (Ensemble Variational data assimilation) using the kilometre-scale Ensemble Data Assimilation (KENDA) ensemble. Quality Control (QC) and Observation Aggregation (OA) are essential parts of a data assimilation system. The former ensures that the assimilated observations are likely to be "acceptable", in the sense of technical, physical and statistical properties. The latter reduces the amount of data and computations under the aspect of efficiency, and helps handling redundant or correlated observations.

We show results of assimilation experiments for KENDA and EnVAR using a similar selection of conventional observations after QC and OA, while using a fully dynamic B matrix and no variational QC. The difference of the results of the two algorithms does not only depend on the partially differing implementation of QC and OA, but also due to partially different implementations of the observation operators or even the supported observation types. Important differences to the operational global EnVAR code are e.g. the choice of suitable observation types and the interpolation specification of the first guess to the locations of the observations.

As we use the same code for the EnVAR as in the DWD's global data assimilation scheme, we can potentially assimilate many other observations systems beyond conventional observations. This includes, after some adaptations, a wide range of spaceborne observations. Additionally, it is possible to run a regional EnVAR assimilation and a deterministic forecast with a coarse resolution first guess ensemble. Re-using existing ensembles for the ensemble B matrix might be a computationally efficient way to use a variational algorithm for deterministic forecasts.