



## **Added value of a new high-resolution ensemble nudging reanalysis system**

Lilo Bach (1), Christoph Schraff (2), Jan Keller (2,3), and Andreas Hense (1)

(1) University of Bonn, Germany (libach@uni-bonn.de), (2) Deutscher Wetterdienst, Offenbach, Germany, (3) Hans-Ertel-Centre for Weather Research, Climate Monitoring Branch

The FP-7 funded European project UERRA produces probabilistic high-resolution regional reanalyses to provide centres like the newly-installed Copernicus Climate Change Service with high quality data sets including uncertainty estimates.

We propose a new ensemble nudging data assimilation system for producing such regional reanalyses. Ensemble nudging is derived from deterministic nudging which performs a continuous relaxation of the prognostic variables of a numerical weather prediction model towards observations during the forward integration of the model. For ensemble nudging, different realizations are generated through perturbing the observations with perturbations reflecting the observation errors. Thereby, we obtain an estimate of the reanalysis' uncertainty given the observation errors. Deterministic nudging has proven to be useful for producing high quality regional reanalyses. Further, with respect to the ensemble approach, the method's computational cheapness (e.g. compared to ensembles of 4dvar) allows for a reasonable number of ensemble numbers while retaining a high horizontal resolution.

In principle, the DA system can easily be extended to incorporate model errors by perturbing the model physics and to represent uncertainties in the lateral boundary conditions, e.g. by providing different lateral boundary conditions from global ensemble reanalyses.

In our presentation, we focus on the evaluation of short-period ensemble reanalysis experiments with the limited-area model COSMO on the European CORDEX domain at  $0.11^\circ$  horizontal grid spacing. We show deterministic and probabilistic verification results, e.g. for precipitation and 2m-temperature as parameters of particular interest to users. We also provide comparisons to ERA-Interim to show the added value of the ensemble nudging reanalysis system. Thereby, we address the impact of latent heat nudging and soil moisture perturbations on both the reanalysis skill and the uncertainty estimation.