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Towards a new generation of regional reanalyses for Europe

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Regional reanalysis data sets are becoming more used and requested for a broad spectrum of users, from climate adaptation and mitigation, to agricultural and economical applications (e.g. energy meteorology). While the development of a reanalysis system mainly relies on an existing numerical weather prediction (NWP) model and corresponding data assimilation scheme, it involves a large amount of testing from both a computational and technical perspective.

The talk will present preliminary results of the development for a new pan-European regional reanalysis at the Deutscher Wetterdienst (DWD). The framework involves the ICON NWP model in its global configuration with a two-way coupled nest over Europe and its operational data assimilation method run at 3-hours intervals, namely EnVar for the deterministic run at 13 km global resolution (6.5 km over Europe) and Localized Ensemble Transform Kalman Filter (LETKF) for the 20 ensemble members at 40 km global resolution (20 km over Europe).

The reanalyses cover the 2010-2022 period, extended to current, and it is run split in 3 streams (June 2009, January 2015, and January 2018) with forward overlap. The first stream start date includes a 6-months initial spin-up, that in the other two streams is dealt through the forward overlap. The spin-up phase is necessary for the soil to reach the equilibrium, and in our case is shorter than what usually seen in free-running simulations because our system performs a surface analysis for soil-moisture every day at 00UTC.

First of all, we present that the number of active observations has a similar magnitude to what shown for ERA5. Then we proceed showing the evolution of the profiles averaged over Europe of first-guess and analyses departures w.r.t. observations.

Preliminary results of the first year of the 2018 stream are evaluated in observation space on a 6-day average over the European domain. First we see that first-guess bias for the radiosondes and dropsondes (TEMP) temperature of at most -0.12K below 500 hPa and +0.3 K above it. The bias magnitude is reduced by at least half when the analysis is used. The SYNOP biases for the 2-meter temperature and relative humidity are on average zero, with spatial variability maxima of 0.2 K/0.01 (first guess) and 0.1 K/0.005 (analysis).