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Probabilistic precipitation forecasts based on the COSMO-DE time-lagged ensemble

Sabrina Bentzien and Petra Friederichs
Meteorological Institute, University of Bonn, Germany (bentzien@uni-bonn.de)

High-resolution limited area models such as COSMO-DE are particularly developed in order to predict high-impact weather. An important process for extreme weather on the mesoscale is deep convection, which in COSMO-DE is not parameterized but resolved by the model dynamics. Nevertheless, high-resolution model forecasts show systematic errors and ensembles are not well calibrated. Thus reliable forecasts can only be achieved through a combination of dynamical and statistical analysis methods, where a stable and significant statistical model based on a-priori physical reasonings establishes a-posterior a statistical-dynamical model for mesoscale weather prediction.

We present a statistical post-processing for the time-lagged COSMO-DE ensemble in order to obtain probabilistic precipitation forecasts. The time-lagged ensemble consist of four successively started COSMO-DE forecasts. The COSMO-DE model has a horizontal grid spacing of 2.8 km and runs operationally at Deutscher Wetterdienst (DWD). A radar composite as well as rain gauge data are used for statistical model training and forecast verification.

Precipitation is characterized by a mixed discrete-continuous distribution, which consists of the probability of the occurrence and a continuous distribution of the amount of precipitation. Latter is clearly a non-Gaussian distribution. The statistical methods employ logistic regression, generalized linear models, censored quantile regression and extreme value theory. The different approaches are compared using probabilistic verification scores such as the Brier skill score or the quantile verification skill score.