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Test of calibration techniques based on reforecasts for limited-area ensemble precipitation forecasts

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The project CONSENS (CONSolidation of COSMO ENSemble), developed within the framework of COSMO (COnsortium for Small-scale MOdeling), aims at consolidating the COSMO ensemble forecasting systems for the mesoscale. One of the purposes of this project is the implementation of a calibration technique to the ensemble precipitation forecasts.
Recent studies have recognised that a calibration for 24-h precipitation would be desirable to improve the forecast skill, especially for rare events, and have shown the potential of using reforecast to achieve this goal. Unfortunately, most of these works deal with lower resolution forecasting systems (based on global models), therefore, calibration of the precipitation forecasted at higher resolutions, as is typical of Limited Area Models, is still a challenge for the ensemble community. Hence, within the framework of CONSENS, a calibration strategy should be developed and tested, and then applied to the ensemble output.
The calibration of ensemble forecasts has been widely applied in recent years, introducing the use of reforecasts, namely dataset of prior forecast from the same model run operationally. In this study, thirty years of reforecast of one member of COSMO-LEPS (the Limited-area Ensemble Prediction System based on the non-hydrostatic limited-area model COSMO) were run by MeteoSwiss and have been used for testing the calibration strategy.
Three calibration techniques, which enable a calibration of the quantitative precipitation forecasts (QPFs), are considered: cumulative distribution function based corrections, linear regression and analogues (based on the similarity of forecast precipitation fields). This choice is due to the need to improve COSMO-LEPS QPFs especially as an input to hydrological models.
The impact of the application of these techniques to the ensemble precipitation forecasts operationally provided in the years 2003-2007 is here verified over the Emilia-Romagna Region (Northern Italy).
Preliminary results are found by means of statistical scores, comparing the performance of the three calibration methodologies for different seasons, sub-areas, thresholds and forecast ranges. Tests have been carried out taking into account the sample stratification according to the synoptic pattern.
The dependence of the results on the spatial aggregation of model grid points over sub-areas has also been addressed.