

## Testing a calibration approach for a limited-area ensemble precipitation forecast using reforecasts

T. Diomede, C. Marsigli, A. Montani, and T. Paccagnella

ARPA-SIMC, HydroMeteorological and Climate Service of the Emilia-Romagna Regional Agency for Environmental Protection, Bologna, Italy (tdiomede@arpa.emr.it)

The calibration of the precipitation forecast at high resolution is currently a challenge for the ensemble community working with Limited Area Models, especially with respect to the improvement of the forecast skill for rare events. The potential of using reforecasts to achieve this goal has been shown in several recent studies.

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 used in this study for testing the best calibration strategy. Three calibration techniques were tested: Cumulative Distribution Function based corrections, Linear Regression and Analogs. The analog-based method was implemented in terms of the similarity of the precipitation field, as well as in terms of the similarity of upper air fields representing the synoptic pattern. The choice of these methodologies is due to the need of improving the quantitative precipitation forecasts (QPFs) provided by COSMO-LEPS, especially as an input to hydrological models, and not only of the probabilities of exceeding pre-defined thresholds. The impact of the application of these techniques to the ensemble precipitation forecasts operationally provided by COSMO-LEPS (10 km of horizontal resolution) in the years 2003-2007 was evaluated over the Emilia-Romagna Region (Northern Italy), Switzerland and Germany by computing statistical scores, for different seasons, thresholds and forecast ranges. The results revealed a beneficial impact of the calibration process for Switzerland and Germany; no significant improvements were obtained for Emilia-Romagna. The choice of the best calibration method depends on the area under investigation.

The lack of a remarkable improvement, especially over Emilia-Romagna, resulting from the application of the proposed calibration methods suggested the need of defining specific correction functions which should be able to link the model error to the meteorological situation. The stratification of the historical sample according to the forecasted flow direction and wind velocity at the level of 700 hPa provided encouraging results with respect to the improvement of the quality of the correction function.

An additional verification of the calibration process was performed by the coupling of the ensemble precipitation forecasts with an hydrological model. This test was carried out for the Reno river basin, a medium-sized catchment located in the Emilia-Romagna Region. The results of the coupling were evaluated especially with respect to the verification of warnings which would have been issued based on the discharge scenarios obtained by using the raw and calibrated QPFs.