A global EMOS postprocessing for temperature and precipitation forecasts for any location in Switzerland

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MeteoSwiss is developing and implementing a post-processing suite of multi-model ensemble forecasts to produce seamless probabilistic calibrated forecasts at arbitrary locations in Switzerland (i.e. also for un-observed locations). With the complex topography of Switzerland, the raw output of the numerical model is subject to particular strong biases and conditional errors. Here, we present results for hourly temperature and precipitation predictions.

We apply a global ensemble model output statistics (gEMOS) framework. It extends the classical EMOS approach by incorporating static predictor variables describing relevant topographical features and it is trained for all stations together using a 4-year multi model numerical weather prediction (NWP) archive. As NWP sources, we combine data from the COSMO model suites (1.1 and 2.2 km horizontal grid-spacing) and from the ECMWF IFS medium-range forecasting system. Note that the three NWP suites have different forecast horizons.

We show that gEMOS is able to improve forecasts for both variables. Depending on selection of predictors, lead-time, hour-of-day and season we find improvements up to 30% in terms of CRPS for both variables with most pronounced improvements in mountainous regions. Particularly for temperature, the multi-model combination further increases the forecast skill compared to postprocessing using high-resolution simulations of COSMO only.

While locally optimized approaches show better performance in terms of skill at the observing sites, the advantage of gEMOS lies in the ability to generate calibrated predictions for arbitrary locations in a consistent way. Its computational efficiency makes it a particularly attractive method for operationalization in a realtime context.