The new MeteoSwiss postprocessing scheme for medium-range surface weather forecasts: multi-model, probabilistic, seamless, and at any arbitrary location

Christoph Spirig¹, Jonas Bhend¹, Stephan Hemri², Jan Rajczak¹, Daniele Nerini¹, Regula Keller¹, Daniel Cattani¹, Mathieu Schaar¹, Lionel Moret¹, and Mark Liniger¹

¹Federal Office of Meteorology and Climatology, MeteoSwiss, Switzerland (christoph.spirig@meteoswiss.ch)
²Department of Mathematics, University of Zurich, Switzerland

MeteoSwiss has developed and is currently implementing a NWP postprocessing suite for providing automated weather forecasts at any location in Switzerland. The aim is a combined postprocessing of high resolution limited area and global model ensembles with different forecast horizons to enable seamless probabilistic forecasts over two weeks leadtime. Further, the output should be coherent in space and provide predictions at any location of interest, including sites without observations. We use the full archive of MeteoSwiss’ operational local area models (COSMO-1 and COSMO-E) over the past four years and the corresponding IFS-ENS medium range predictions of ECMWF to develop postprocessing routines for temperature, precipitation, cloud cover and wind. Here we present selected key results on the performance of various postprocessing methods we applied but also on practical aspects of their implementation into operational production.

Both ensemble model output statistics (EMOS) and machine learning (ML) approaches are able to improve the forecasts in terms of CRPS by up to 30% as compared to the direct output of the local area model. The skill increase obtained by postprocessing varies depending on the parameter, region and season, with best results for temperature and wind in areas of complex orography and only marginal improvements for precipitation during seasons with a high fraction of convective situations. Particularly for temperature, the combined postprocessing of COSMO and IFS-ENS resulted in a skill benefit over postprocessing the COSMO models alone. Locally optimized postprocessing would allow further skill improvements, but only at sites where observations are available. However, the ability of non-local postprocessing approaches to provide calibrated forecast at any point in space is a key advantage for providing automated forecasts to the general public via the internet and smartphone app. Furthermore, the computational efficiency of these non-local approaches makes them attractive for operationalization in a realtime context.