Comparison of Multivariate Ensemble Post-processing Methods

Mária Lakatos

Faculty of Informatics, University of Debrecen

Nowadays most operational weather centres provide predictions in the form of forecast ensembles obtained from multiple runs of numerical weather prediction models with varying initial conditions or model parameterizations. However, ensemble forecasts are often subject to systematic errors, hence may result in uncalibrated and/or biased predictions. State-of-the-art post-processing techniques (e.g. ensemble model output statistics (EMOS), or Bayesian model averaging) map each ensemble forecast for a specific location and time point with a given lead time to a calibrated predictive distribution, thus ignoring the prevailing correlation structures among different dimensions. The main idea behind the application of multivariate post-processing methods is to reinstall the possibly lost spatial and/or temporal dependencies between these calibrated marginals.

We compare the forecast skill of various multivariate post-processing approaches using global temperature, wind speed and precipitation accumulation forecasts of the European Centre for Medium-Range Weather Forecasts for the period 2002 – 2014. Based on the results of independent EMOS calibration of the different weather quantities we apply various versions of ensemble copula coupling to create either spatially or temporally consistent multivariate predictions. In general, compared with the raw and independent forecasts, multivariate post-processing substantially improves the forecast skill; however, there is no unique winner, the best performing approach depends on the weather variable at hand and on the type of forecast error.