Spatial ensemble calibration using station-specific predictors

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Ensemble forecasts aim to provide realistic information of forecast uncertainty. However, ensemble forecasts may be biased and have typically too narrow spread compared to forecast errors over the first few days. To make the ensemble forecasts useful for weather related decision making, they need to be calibrated with statistical methods. Finnish meteorological institute (FMI) is starting to use operational calibration for European Centre for Medium-Range Weather Forecasts (ECMWF) ensemble prediction system (ENS) temperature and wind speed forecasts.

In this study, we use non-homogeneous Gaussian regression method for temperature calibration and a Box-Cox t distribution method for wind calibration. Instead of making the calibration for each station individually, we calculate joint calibration coefficients for all European stations simultaneously. Stations-specific characteristic were accounted for by using elevation, latitude and land-sea mask value of the weather model as predictors in the calibration. Spatial calibration saves computational resources and time, which is essential in operational weather forecasting. Using spatial calibration also means that forecasts will not have regional discontinuities, and the calibration can be made for locations where observations are not available. We investigate how the size of the training area affects calibration results locally, because our main goal is to improve ensemble forecasts over Finland. The calibration and verification tools applied in this study were originally developed jointly within the Hirlam-Aladin consortium.

Verification results indicate that calibration improves ensemble forecasts on the average over the calibrated area but locally there might be areas where calibration reduces the forecast skill. The improvement is also different depending on the verification month. Results of spatially calibrated temperature and wind speed forecasts with different station-specific characteristic and different training domains will be shown.