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Local calibration of probabilistic quantitative precipitation forecasts using geostatistical model averaging

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The current way to represent uncertainty in numerical weather predictions is to use ensembles of numerical weather predictions. Unfortunately, these ensembles are uncalibrated and biased, and methods for postprocessing these ensembles statistically are needed. One popular method for postprocessing is Bayesian Model Averaging(BMA), where the BMA predictive probability density function (PDF) is a weighted average of the individual ensemble PDFs, centered on each corresponding bias-corrected forecast. The weights represent the predictive skill of the forecasts over a training period.

In BMA, all verification data from different locations are pooled before postprocessing, leading to constant BMA parameters over the forecast domain, and thus global calibration of the predictive distributions. However, precipitation is a meteorological variable that is dependent on local terrain and wind features. By postprosessing precipitation using BMA, it is not ensured that the predictive distributions are calibrated at the different locations. We will here use a new method called geostatistical model averaging (GMA) developed by Kleiber, Raftery and Gneiting, that uses locally varying BMA parameters, and do a case study comparing the predictive PDFs of BMA and GMA for a region in Western Norway.

One restriction of using BMA or GMA is that it only applies to one single lead time, whereas in operational use, there is a demand for multiple lead times. Our approach is therefore to investigate possible methods to extend the model to include multiple lead times. One place to start is to model the error of the mean of the predictive distribution for different lead times as either an autoregressive process, or as a Gaussian copula model with dependence between lead times.