



Constrained quantile regression splines for ensemble postprocessing

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Statistical postprocessing of ensemble forecasts is widely applied to make reliable probabilistic weather forecasts. Motivated by that nature imposes few restrictions on the shape of forecast distributions, a flexible quantile regression method based on constrained spline functions (CQRS) is proposed and tested on ECWMF ENS wind speed forecasting data at 125 stations in Norway. First, it is demonstrated that constraining quantile functions to be monotone and bounded is preferable. Second, combining an ensemble quantile with the ensemble mean is shown to be a good covariate for the respective quantile. Third, CQRS only needs to be applied to about 10 equi-distant quantiles, while those between can be obtained by interpolation without loss of forecast skill. An inter-comparison of CQRS with a mixture model of truncated and log-normal distributions showed slight overall improvements in quantile score (less than 1%), reliability and to some extent also sharpness. For strong wind speed forecasts the quantile score was improved by up to 4.5% depending on lead time.