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A probabilistic forecast approach for (extreme) daily precipitation totals applied to GFS 6h forecasts

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We present a probabilistic postprocessor for weather forecast models that provides calibrated quantile forecasts of precipitation on the local scale. The forecasts are validated using a new validation score for quantile forecasts (Friederichs and Hense 2007, Gneiting and Raftery 2006), namely the quantile verification skill score (QVSS). The approach accounts for the mixed discrete-continuous character of daily precipitation totals.

In order to provide reliable forecasts of the occurrence of extreme weather events, model forecasts, here from the NCEP High Resolution Global Forecast System (GFS), have to be calibrated towards local conditions. In general, a model output statistics system is employed to calibrate a model forecast. In this study, quantile regression (Koenker, 2005) is used to formulate a postprocessor that provides calibrated forecasts in terms of conditional quantiles.Censored quantile regression provides a tool to estimate forecast quantiles for mixed discrete-continuous variables. The QVSS enables to validate a forecast with respect to a reference forecast.

The forecast approach is as follows. First, the statistical quantile model between the large scale circulation and the local precipitation quantile is derived using NCEP and ERA40 reanalysis data. Then, the statistical quantile model is applied to 6h forecasts provided by the GFS forecast system. The precipitation forecast consists of conditional quantiles of daily precipitation totals at German weather stations.