



Parsimonious Modeling of UK Daily Rainfall for Density Forecasting

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Rainfall forecasts are needed to estimate flood and drought risk, to price insurance premiums and other financial products and contracts based on precipitation. Due to the specific meteorology of the UK, daily rainfall patterns have significant spatial correlation but little autocorrelation. Thus models of precipitation are required that can take into account these spatial correlations. In this paper we investigate the sources of correlation structure in UK daily rainfall over the Thames Valley, and use this information to construct a parsimonious model of rainfall over this catchment. We demonstrate the effectiveness of the forecasts produced by this model in comparison with several simple benchmark forecasts, and against state-of-the-art ensemble numerical weather forecasts from the National Centers for Environmental Prediction (NCEP), USA. The new model is capable of outperforming all the other models in terms of point forecasting mean absolute error, and in terms of density forecasts is no worse than the NCEP ensemble numerical forecasts. We conclude that, for localized forecasts, relatively simple statistical models can be constructed that can perform as well as ensemble supercomputing numerical methods, and that therefore these models can be of value in quantifying risk for a wide range of applications.