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Similarity-based semi-local estimation of EMOS models

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Weather forecasts are typically given in the form of forecast ensembles obtained from multiple runs of numerical weather prediction models with varying initial conditions and physics parameterizations. Such ensemble predictions tend to be biased and underdispersive and thus require statistical postprocessing. In the ensemble model output statistics (EMOS) approach, a probabilistic forecast is given by a single parametric distribution with parameters depending on the ensemble members.
This article proposes two semi-local methods for estimating the EMOS coefficients where the training data for a specific observation station are augmented with corresponding forecast cases from stations with similar characteristics. Similarities between stations are determined using either distance functions or clustering based on various features of the climatology, forecast errors, ensemble predictions and locations of the observation stations.
In a case study on wind speed over Europe with forecasts from the Grand Limited Area Model Ensemble Prediction System, the proposed similarity-based semi-local models show significant improvement in predictive performance compared to standard regional and local estimation methods. They further allow for estimating complex models without numerical stability issues and are computationally more efficient than local parameter estimation.