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Spatial post-processing for forecasts of temperature

Kira Feldmann (1), Mikyoung Jun (2), Tilmann Gneiting (1,3)

(1) Heidelberger Institut für Theoretische Studien, Heidelberg, Germany (kira.feldmann@h-its.org), (2) Texas A&M University, College Station, USA, (3) Karlsruher Institut für Technologie, Karlsruhe, Germany

Statistical post-processing addresses systematic shortcomings in ensemble predictions systems, which typically show biases and are uncalibrated. Various methods have been proposed for doing this, with Bayesian model averaging and heterogeneous regression being state of the art approaches. However, these techniques focus on forecasts at single locations, ignoring spatial correlation between different observational sites. When forecasting composite quantities, such temperature minima or maxima over a region, spatial dependence structures are of great importance. For this task we use heterogenous regression in concert with ensemble copula coupling as a reference standard. In a more sophisticated approach, we utilize Gaussian random fields to represent the forecast error fields, where we fit covariance functions on the globe that account for land-water differentials in predictive ability and correlation length. In a case study, we apply these methods to temperature forecasts with the TIGGE multi-model ensemble and demonstrate improvements in forecast skill.