EMS Annual Meeting Abstracts
Vol. 10, EMS2013-183, 2013
13th EMS / 11th ECAM

A comparison of ensemble post-processing methods for extreme events

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Ensemble post-processing methods are used in operational weather forecasting to produce probability distributions that represent forecast uncertainty. Several methods have been proposed in the literature, including logistic regression, ensemble dressing, Bayesian model averaging and nonhomogeneous Gaussian regression. We present the results of Williams et. al. (2013), a comparison study of these methods using the Lorenz 1996 system as a surrogate for the atmosphere, with a focus on probabilistic forecasting of extreme, or rare events. We extend the original specifications of the post-processing methods given in the literature, by using functions of ensemble statistics such as the ensemble mean and variance to specify the mean and variance of the forecast distributions. We show that these new models improve considerably on the skill of the original methods, particularly for extreme forecasts. We find that ensemble dressing, Bayesian model averaging and nonhomogeneous Gaussian regression perform similarly, but that logistic regression is less skilful, particularly for forecasting extreme events.