*Forecasting the weather
- ensemble techniques
in probabilistic weather prediction*

Predicting outliers in ensemble forecasts

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An ensemble forecast is a collection of runs of a numerical dynamical model, initialized with perturbed initial conditions. In numerical weather prediction for example, ensembles are used to retrieve probabilistic information about future atmospheric conditions. In this contribution, we are concerned with ensemble forecasts of a scalar quantity (say, the temperature at a specific location). We consider the event that the verification is smaller than the smallest, or larger than the largest ensemble member. We call these events outliers. If a K-member ensemble accurately reflected the variability of the verification, outliers should occur with a base rate of $\frac{2}{K+1}$. In operational forecast ensembles though, this frequency is often found to be higher. We study the predictability of outliers and find that, exploiting information available from the ensemble, forecast probabilities for outlier events can be calculated which are more skillful than the unconditional base rate. We show this analytically for statistically consistent ensembles. The analytical results are compared to the predictability of outliers in an operational ensemble by means of model output statistics. We find the analytical and empirical results to agree both qualitatively and quantitatively.