Sequential Aggregation of Probabilistic Forecasts - Application to Wind Speed Ensemble Forecasts

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Sequential aggregation is a theoretically-grounded means to combine several forecasts of a quantity to achieve better forecast performance as evaluated by a loss function. This theory has been mainly applied to point forecasts with a scalar forecast quantity, but rarely to forecasts expressed in a probabilistic form. In this work, we show how this theory can be readily adapted to forecasts expressed as step-wise cumulative distribution function (CDF), with the continuous ranked probabilistic score (CRPS) as performance measure.

Ensemble weather forecasts estimate the outcome of future observed quantities in a way that can be interpreted as step-wise CDF. Since those forecast CDFs are biased, statistical postprocessing methods are used to improve their statistical coherency with the observed quantity. Since many ensembles and many postprocessing methods exist, one can combine raw and post-processed ensembles in order to get even better forecast performance. To illustrate this point and the advantages of blending CDFs, sequential aggregation is applied to wind-speed ensemble weather forecasts with the CRPS as a performance measure alongside the Jolliffe-Primo test to assess the reliability of the various (raw, post-processed or aggregated) forecasts.