

Combining Dynamical and Statistical Ensembles

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Abstract

A prediction accompanied by quantitative estimates of the likely forecast accuracy is inherently superior to a single “best guess” forecast. Such estimates can be obtained by “dressing” a single forecast using historical error statistics. Dressing ensemble forecasts is more complicated, as one wishes to avoid double counting forecast errors due, for example, to uncertainty in the initial condition when that uncertainty is explicitly accounted for by the ensemble (which has been generated with multiple initial conditions). The economic value of dressed forecasts has been demonstrated by previous studies. This paper presents a method for dressing ensembles of any size, thus enabling valid comparisons to be made between them. The method involves identifying the “best member” of an ensemble in a multidimensional forecast space. The statistics of the errors of these best members are used to dress individual forecasts in an ensemble. The method is demonstrated using ECMWF ensemble forecasts, which are compared with the ECMWF high-resolution best guess forecasts. It is shown that the dressed ECMWF ensembles have skill relative to the dressed ECMWF best guess, even at the maximum lead time of the ECMWF forecasts (10 days). The approach should be applicable to general ensemble forecasts (initial condition, multi-model, stochastic model etc.), allowing better informed decisions on forecast acquisition and forecast system development.

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