Blending ensembles from multiple models

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Initial condition seasonal simulations from multiple models can be combined in a variety of ways to produce forecasts. General questions of forecast skill constructed by combining ensemble members, both with each other and with climatology, are explored in the context of seasonal forecasting (Hagedorn et al, 2005; Doblas-Reyes et al, 2005) with the DEMETER data set (http://data.ecmwf.int/data/d/demeter_mnth/1950/hindcasts/). A blending methodology is suggested using weights for individual model's ensemble members determined by the probabilistic skill score of forecasts based upon individual models. Methods for blending ensemble members from multiple models are demonstrated in the context of low dimensional chaotic systems where there are no limitations on the size of the forecast-observation archive. In particular, the importance of not using uniform weights is illustrated using multiple imperfect models of the Moran Ricker Map; the actual Moran Ricker Map providing the verification. In general, the optimised weighted blend is found to be more skillful than the equal weight approach. It is noted, however, that when either the archive is small or the variation in model quality is large, there is a tendency to place almost all weight on a single model. Approaches to avoid over-fitting the blend weights given only a small forecast archive are discussed.

Hagedorn, R., F.J. Doblas-Reyes and T.N. Palmer, 2005: The rationale behind the success of multi-model ensembles in seasonal forecasting. Part I: Basic concept. Tellus A, 57(3), 219-233.

Doblas-Reyes, F.J., R. Hagedorn and T.N. Palmer, 2005: The rationale behind the success of multi-model ensembles in seasonal forecasting. Part II: Calibration and combination. Tellus A, 57(3), 234-252