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Connecting the ocean components of earth system models in order to build a supermodel

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article

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Abstract

We develop a dynamical interactive ensemble based on three earth system models. The ocean components in the system exhange information during the run, making this approach different from the multi-model ensemble approach in which model outputs are combined a-posteriori. The method, called supermodeling, is applied for the first time to three state-of-the-art earth system models (MPI-ESM, EC-Earth and Nor-ESM).
Every month, we generate an idealised observation based on the weighted output of the individual model SST and this observation is assimilated into each model using the Ensemble Optimal Interpolation (EnOI) scheme, which constructs the covariance matrix from a historical ensemble.
A supermodel constructed by weighting the different model SST equally is tested for the period 1980 to 2010 and compared to the perfomance of the three individual models. Synchronisation of the surface ocean is achieved in most places (i.e., internal ocean variability is not damped) and analysis show that the bias is reduced in some regions, for instance tropical Atlantic. There is also an improved simulation of some ENSO characteristics, like its rainfall pattern. The performance of a supermodel constructed with optimal weighting of different model SST will also be presented. We will discuss the potential skill of the supermodel for seasonal to decadal climate prediction.