Geophysical Research Abstracts
Vol. 18, EGU2016-15945, 2016
EGU General Assembly 2016

Supermodeling by Synchronization of Alternative SPEEDO Models

Gregory Duane (1,2) and Frank Selten ()

(1) Geophysical Institute, University of Bergen, Norway , (2) University of Colorado, Atmospheric and Oceanic Sciences, Boulder, United States (gregory.duane@colorado.edu), (3) KNMI, Netherlands

The supermodeling approach, wherein different imperfect models of the same objective process are dynamically combined in run-time to reduce systematic error, is tested using SPEEDO – a primitive equation atmospheric model coupled to the CLIO ocean model. Three versions of SPEEDO are defined by parameters that differ in a range that arguably mimics differences among state-of-the-art climate models. A fourth model is taken to represent truth. The "true" ocean drives all three model atmospheres. The three models are also connected to one another at every level, with spatially uniform nudging coefficients that are trained so that the three models, which synchronize with one another, also synchronize with truth when data is continuously assimilated, as in weather prediction.

The SPEEDO supermodel is evaluated in weather-prediction mode, with nudging to truth. It is found that the supemodel performs better than any of the three models and marginally better than the best weighted average of the outputs of the three models run separately. To evaluate the utility for climate projection, parameters corresponding to green house gas levels are changed in truth and in the three models. The supermodel formed with inter-model connections from the present-CO_2 runs no longer give the optimal configuration for the supermodel in the doubled-CO_2 realm, but the supermodel with the previously trained connections is still useful as compared to the separate models or averages of their outputs.

In ongoing work, a training algorithm is examined that attempts to match the blocked-zonal index cycle of the SPEEDO model atmosphere to truth, rather than simply minimizing the RMS error in the various fields. Such an approach comes closer to matching the model attractor to the true attractor – the desired effect in climate projection – rather than matching instantaneous states. Gradient descent in a cost function defined over a finite temporal window can indeed be done efficiently. Preliminary results are presented for a crudely defined index cycle.