

Interactive comment on “Improving weather and climate predictions by training of supermodels” by Francine Schevenhoven et al.

Anonymous Referee #2

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General:

In the present paper the authors demonstrate the construction and training of a so called supermodel by means of a climate model of reduced complexity. Two training methods are applied and compared: Cross Pollination in Time (CPT), and synchronization based learning (synch rule). Both methods show their ability to construct a supermodel, which outperforms the individual (imperfect) models.

The combination of models to a supermodel appear to have significant potential to improve the skill of model predictions and projections. As discussed by the authors, supermodels may also be superior to commonly used multi model ensembles. Thus, a detailed description of the general idea, the methodology, and open questions is a very useful contribution. In my view, with this paper the authors succeed to give such

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a demonstration. I very much like this paper, as it very clearly written and structured, and present more than enough new and valuable results to deserve publication. I have only two minor points mostly out of curiosity.

Minor:

1) Eq. 6c, synch role: it seems that the derivative of the model (f) with respect to a certain parameter (q) is needed for sync role. I may have overlooked it, but how is this derivative obtained. It somehow looked like one may have to use an adjoint (or at least linear) version of the model.

2) Coupling to the same ocean/land: I'm wondering how much the use of the same (perfect) ocean/land component for all models affect the training/behavior of the supermodel, as, in my view, it may constrain the variability on long time scales to be similar in all models. In addition, the coupling to land/ocean may act similar (though more complex) to the nudging term ($K(as-a_0)$). Perhaps, the authors have tried to build a supermodel from a set of totally independent SPEEDOs, and can comment on this.

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