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# Supermodel - Interactive Ensemble of Low-dimensional Models

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The accuracy of numerical weather prediction is steadily increasing due to the advances in different scientific disciplines. One of them aims at understanding the physics that underlies the atmospheric dynamics. Although the basic laws are well known there is large room for improvement in modeling various small scale processes. Currently they are generally parametrized and thus we are facing dozens of atmospheric models that are used in different meteorological centers around the world. The models are based on the same fluid dynamics laws, but generally differ in spatial resolution, parametrisation of the unresolved processes and also in the corresponding parameter values.

Another key factor that contributes to the prediction improvement is the increase of the available computational power. As one consequence the grid resolution is getting smaller. As another, the contemporary numerical weather prediction schemes consider combinations of the outputs of the ensembles of models – different perturbations of the same model or even different models.

Considering interactive ensembles- with dynamical exchange of information between models that run simultaneously-is a novel approach toward improving the weather forecast or climate projection. Although flux exchange between different ocean and atmospheric models has some history, coupling different atmospheric models is rather new. The coupling schemes can be different and the first approaches are those that combine corresponding dynamical variables or tendency components. In this work we present an example with an artificial toy model- the Lorenz 96 model-that shares some properties with the atmosphere. As reality (the atmosphere) we consider one Lorenz 96 class III system, while as its imperfect models are taken three class II systems that have different forcing terms. The interactive ensemble has tendencies that are weighted combinations of the individual models' tendencies. The weights are obtained with statistical techniques based on past observations targeted toward minimizing the mismatch between the truth's and interactive ensemble's tendencies. It is numerically verified that this ensemble has a longer range of forecast than the individual models by means of anomaly correlation.