Supermodelling towards improved climate prediction

Climate models suffer from long-standing biases that raise uncertainty in climate projection and degrade climate prediction skills. Although some simulations are being tested at a breakthrough resolution, we are still most likely decades away from being able to perform operational climate simulations with models that can explicitly resolve the most important physical processes. We test an alternate method called supermodelling to understand and mitigate these biases using the current generation of models. A supermodel connects different models interactively so that their systematic errors compensate and achieve a model with superior performance. It differs from the standard non-interactive multi-model ensembles (NI), which combines model outputs a-posteriori. A first ocean-connected Earth System model (connecting NorESM, CESM, and MPIESM in their CMIP5 version) could for instance strongly reduce tropical SST biases, the double ITCZ. Here we test the potential of supermodelling for enhancing seasonal prediction skills for the period 1990-2020 with 4 start dates per year. Supermodelling improves Nino 3.4 prediction skill and skilfully crosses the spring predictability barrier unlike standard predictions performed with NI.

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