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The Performance of the Supermodeling Approach In the Real Imperfect Model Scenario

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The novelty of the supermodeling (SUMO) approach is that it is an *interconnected* ensemble of existing imperfect models of a real, observable system. The connections between the models can be learned from observational data using methods from machine learning. The supermodel outperforms the individual models in simulating the behaviour of the real system since it has learned to combine the strengths of the individual models. The concept of supermodeling is based on a new combination of insights from climate science, nonlinear dynamical systems, and machine learning.

This SUMO framework provides a possible new approach to forecasting in the imperfect model scenario (IPMS). Numerical investigations found that coupling several imperfect models resulted in better forecasting skill than that of the uncoupled models or their averaged outputs. In the initial SUMO studies - essentially showing a proof of concept - a very limited type of model error had been investigated. Here we present our recent studies which include an extension of the types of model error that were previously investigated within the SUMO framework. In addition, we introduce a new measure based on the separation time of the different models aimed at validating the super models. All of this will shed new light and yield further understanding of the SUMO setup and assist in quantifying its performance.