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MVL representation of ensembles as a tool for a dynamics-based model comparison

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We present a novel approach to characterize and graphically represent the spatiotemporal evolution of ensembles using a simple diagram. To this aim we introduce the MVL (Mean-Variance of Logarithms) diagram to intuitively represent the interplay and evolution of the mean and variance of the logperturbations, which describe the temporal and spatial growth of the ensemble initial perturbations, respectively. We show that this diagram uncovers useful information about the spatiotemporal dynamics of the ensemble. Some universal features of the diagram are presented and illustrated using both toy models and numerical weather prediction systems.

The MVL representation is applied to the multi-model ensemble produced in the EU-funded project DEMETER. This simple diagram shows dynamical and initialization procedure differences in the participating models. The shared atmospheric and ocean components among different models provide similar dynamics and contribute poorly to sample the model formulation uncertainty.