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The MVL Diagram for Fingerprinting GCMs and Ensemble Prediction Systems

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The main goal of this work is illustrating the usefulness of the MVL diagram -a recently introduced spatiotemporal analysis tool- in the field of weather prediction. We show that, as opposite to the standard temporal analysis (spatially averaged or single-point), the MVL spatiotemporal diagram accounts for the nontrivial localization of fluctuations, thus allowing disentangling the effects of the different initialization procedures (random, lagged, singular vectors) and the different model formulations. For instance, it is shown that the shared building blocks of the GCMs (atmospheric and ocean components) impose similar dynamics among different models and, thus, contribute to poorly sampling the model formulation uncertainty. This is revealed by the similar MVL fingerprint resulting for these models.

For illustrative purposes, we consider the ENSEMBLES multimodel seasonal and decadal hindcasts and focus on both initial conditions (three different perturbation procedures) and model errors.