



What can we learn from single model initial-condition large ensembles (SMILEs)? A Comparison of Multiple SMILEs for Precipitation

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Identifying anthropogenic influences on climate amidst the “noise” of internal climate variability is a central challenge for the climate research community. In recent years, several modeling groups have produced single-model initial-condition large ensembles (SMILE) to analyze the interplay of the forced climate change and internal climate variability under current and future climate conditions. These simulations help to improve our understanding of climate variability, including extreme events, and can be employed as test-beds for statistical approaches to separate forced and internal components of climate variability.

So far, most studies have focused on either an individual or a limited number of SMILEs. In this work we compare seven large ensembles to disentangle the influence of internal variability and model response uncertainty for multiple precipitation indices (e.g. wettest day of the year, precipitation with a return period of 20 years). What can we learn from intercomparison of SMILEs, how similar are they in terms of spatial patterns and forced response, and what if they aren't? How does the forced response of an ensemble of SMILEs compare to the CMIP5 multi-model ensemble? By assessing multiple SMILEs we can identify robust signals for regional and global precipitation properties and revealing anthropogenic responses that are inherent to our current representations of the Earth system.