A regional detection and attribution formula for historical precipitation over the United States

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Abstract

Despite the emerging influence of anthropogenic climate change on the global water cycle, at regional scales the combination of observational uncertainty, large internal variability, and modeling uncertainty undermine robust statements regarding the human influence on mean and extreme precipitation. Here, we propose a novel approach to regional detection and attribution (D&A) for precipitation, starting with the contiguous United States (CONUS) where observational uncertainty is minimized. In a single framework, we are able to simultaneously detect systematic trends in mean and extreme precipitation, attribute trends to anthropogenic forcings, compute the effects of forcings as a function of time, and map the effects of individual forcings. We use output from global climate models in a perfect-data sense to conduct an extensive set of tests that result in a parsimonious representation for characterizing seasonal mean and extreme precipitation over the CONUS for the historical record.

Keywords: extreme precipitation, natural variability, local impacts, anthropogenic aerosols, CMIP6, DAMIP

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