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# Past and future trends of extreme precipitation over the central United States in an ensemble of regional climate simulations

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The central United States is one of the world's most productive agricultural regions, so that climate change in this region can have impacts that extend throughout the globe. One of the most prominent changes over the central United States during the late 20th and early 21st centuries has been an increase in the incidence of extreme precipitation (daily rates exceeding 102 mm) despite only a modest increase in mean precipitation. Here we evaluate the ability of regional climate models (RCMs) to reproduce these observed trends and use these results to interpret projected future changes by the same models. In support of the CORDEX-North America and DOE FACETS projects we have performed a suite of dynamically downscaled simulations over North America using two RCMs (WRF-ARW and RegCM4), each run using three grid spacings (50 km, 25 km, and 12 km), and each driven by three global models (HadGEM2-ES, MPI-ESM-LR, and GFDL-ESM2M). This systematic matrix of simulations in a three-dimensional parameter space (RCM by resolution by GCM) allows clearer identification of influences on RCM results compared to the typical ensemble of opportunity. Simulated historical trends in extreme precipitation are qualitatively similar to observed trends; in fact, it appears that trends in extreme precipitation are more reliably reproduced than trends in mean precipitation. These trends are projected to continue through the end of the 21st century. There are systematic differences between the RCMs, including a tendency for RegCM4 to produce too much precipitation at low daily amounts. These results are tempered by complex interactions among resolution, choice of RCM, and the driving GCM.

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