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Investigating Future Changes in the Spatial Characteristics of Precipitation Extremes over the United States

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An intensification of hydroclimate extremes in response to increase in radiative forcing has the potential to cause severe and widespread socioeconomic damages. Therefore, a comprehensive evaluation of projected changes in the characteristics of these extremes in a warming climate is necessary for emergency preparedness and planning. While the intensity and frequency of these extremes have been thoroughly investigated, the efforts on understanding their spatial characteristics are still limited. To this end, we use an ensemble of high-resolution regional climate simulations to investigate the spatial characteristics of daily-scale precipitation events across the United States, in addition to other features. The simulations cover 1966–2005 in the historical period and 2011–2050 in the future period under Representative Concentration Pathway 8.5 (RCP 8.5) scenario. The simulated ensemble compares well with observations in the historical period, and project further intensification of widespread extremes in the near future. Further, our results demonstrate that the projected changes in the characteristics of precipitation events are associated with more frequent occurrences of extreme years where contributions from intense and widespread events to the annual precipitation is unprecedentedly high. These findings highlight the need for more rigorous investigations of changes in the spatial characteristics of extremes to prepare for potential future changes and associated risks.