Patterns of projected extreme precipitation indices and associated trends over the Contiguous U.S.

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Changes in the past, present and future state of the Earth's climate have the potential to have irreversible consequences, such as large-scale melting of the Arctic ice sheet surpassing the tipping threshold. The Coupled Model Intercomparison Project Phase 6 (CMIP6) represents cutting-edge climate studies and is a critical asset to understanding the planet's current and future climate. This study uses Community Earth System Model Version 2 large ensemble (CESM2-LE) simulations of CMIP6 to examine the extreme precipitation over the United States (CONUS) in the 21st century. Particularly, the study quantifies the extreme precipitation variability of different quantiles (i.e., 25^{th}, 50^{th}, 75^{th}, and 95^{th}) using the quantile regression technique and finds which quantiles are expected to drive the precipitation regime at the regional scale. A set of indices is used to define the characteristics of extremes under medium-to-high range emission scenarios, SSP3-7.0, which includes maximum seasonal precipitation at daily scale, seasonal total, maximum consecutive dry days, and simple precipitation intensity. According to preliminary results, the expected median daily annual maximum precipitation trend magnitudes show substantial increases in the northeastern and southeastern CONUS. Summer in the southeast and winter in the northwest have the most significant increasing trend magnitudes in the highest precipitation values (i.e., 95th percentile). Further investigation into the change of the seasonal distribution in the top 5% extremes on a regional scale reveals that fall extremes dominate the southeast over two horizons, namely the near future (2020-2040) and distant future (2080-2100). Furthermore, northeastern, and southeastern regions are expected to have increased top 5% precipitation magnitudes. Future investigation will incorporate looking into the spatial features of climate indices using principal component analysis projected to define the climate features at a regional scale. To conclude, quantifying quantitative measures of projected precipitation, such as examining the change of different quantiles in precipitation indices, provides new insights to understand the projected variabilities to dominate precipitation regimes at the regional scale.

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