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Assessment of Observational Uncertainty in Extreme Precipitation Events over the Continental United States

Presentation Summary

Extreme precipitation events are associated with numerous societal and environmental impacts. Furthermore, anthropogenic climate change is projected to alter precipitation intensity across portions of the Continental United States. Therefore, a spatial understanding and intuitive means of monitoring extreme precipitation over time is critical. Towards this end, and as part of a NASA effort to build new climate indicators in support of the sustained assessment activities of the US National Climate Assessment, we apply an event-based categorization scheme, which assigns categories to extreme precipitation events based on 3-day storm totals as the basis for a dataset intercomparison. To assess observational uncertainty across a wide range of historical precipitation measurement approaches, we intercompare in situ station data from the Global Historical Climatology Network (GHCN), satellite-derived precipitation data from NASA's Tropical Rainfall Measuring Mission (TRMM), gridded in situ station data from the Parameter-Elevation Regressions on Independent Slopes Model (PRISM), global reanalysis from NASA's Modern-Era Retrospective Analysis for Research and Application, version 2 (MERRA-2), and regional reanalysis with gauge data assimilation from NCEP's North American Regional Reanalysis (NARR). While all datasets capture the principal spatial patterns of extreme precipitation event climatology, results show considerable variability across the five-dataset suite in the frequency, spatial extent, and magnitude of events. Higher resolution datasets, PRISM and TRMM, most closely resemble GHCN-D and capture a greater frequency of high-end extreme events relative to lower resolution products, NARR and MERRA-2. When all datasets are rescaled to a common, coarser grid, differences persist with datasets originally constructed at high resolution maintaining the highest frequency and magnitude of events. In addition to a fixed threshold P-Cat scheme, we introduce a flexible set of P-Cat thresholds customizable to a given dataset. This percentile-based P-Cat scheme further accounts for a product's uncertainties and the influence of spatial resolution and is well-designed to evaluate climate models and assess projected change.