

## Impacts of Period of Record on the Uncertainty of Estimates of Precipitation Extremes

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Multiple US agencies are currently working towards improving and updating estimates of extreme precipitation and its hydrologic impacts at a variety of spatial and temporal scales. Many of these efforts will include estimates of the frequency and potential magnitude of extreme precipitation in modeled future climates. Increases in extreme precipitation have been observed with a warming climate, with sub-daily precipitation extremes increasing at a faster rate than extreme precipitation at longer durations.

The reliability of modeled future extreme precipitation characteristics can be estimated by evaluating the ability of a model to represent the statistics of extreme precipitation during the current climate. Because of the rarity of extreme precipitation, long period of record reference datasets are needed to adequately capture the tails of the precipitation distribution. Gauge datasets such as GHCN provide in situ estimates of precipitation with some records extending back to the mid-1900s. However, gauge data is spatially discontinuous, difficult to quality control, particularly for sub-daily precipitation, and many locations have much shorter periods of record. Gridded precipitation datasets provide spatially continuous precipitation estimates with high temporal resolution, but often have limited periods of record or inconsistent inputs through time.

We hypothesize that, for some regions or datasets, a shorter period of record may be sufficient to estimate the characteristics of precipitation, including extremes, with reasonably low uncertainty. This would increase confidence in evaluations of gridded QPE from gauge locations with shorter periods of record, and potentially enable the use of high resolution radar-based datasets to evaluate modeled precipitation characteristics.

In this study we quality control the GHCN-hourly gauge precipitation dataset over the CONUS and select stations with at least 40 years of data. We then calculate extreme precipitation statistics using subsets of the data to represent shorter periods of record at each site, using bootstrapping with replacement to estimate the confidence intervals of the calculated statistics, examining how the uncertainty changes with increasing years of available data. We then compare the calculated statistics and confidence intervals to those from several regional gridded precipitation datasets with varying periods of record ranging from 8 to 46 years, including Analysis of Record for Calibration (AORC), CONUS404, Stage IV, and Multi-Radar Multi-Sensor (MRMS) to identify regions where the gridded datasets adequately represent the statistical characteristics of precipitation compared to the gauges and thus, where spatially continuous gridded datasets with a short period of record could potentially be used to evaluate model output.