The USCRN can be used to monitor precipitation extremes and is a useful tool for comparing between networks, so long as its own biases are considered.

Extreme Precipitation Events Observed by the U.S. Climate Reference Network and the NOAA Hourly Precipitation Dataset

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INTRO

Precipitation networks differ in their spatial, temporal, and measurement resolution, as well as in the algorithms used to quality control the data. The U.S. Climate Reference Network (USCRN) is meant to provide a highly accurate and reliable reference point for other networks to compare against, but station siting is sparse. We compare the USCRN capture of extreme precipitation events, based on NOAA Atlas thresholds, to NOAA's widely used Hourly Precipitation Dataset (HPD) to determine its suitability for precipitation extreme monitoring.

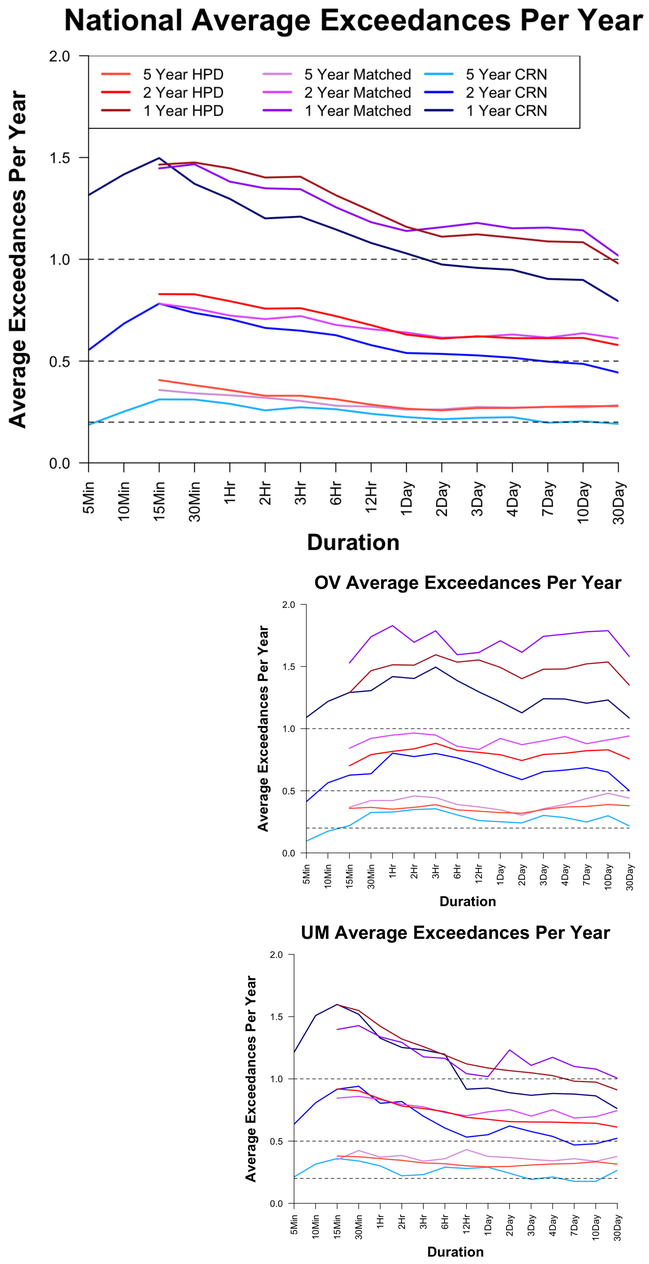
METHODS

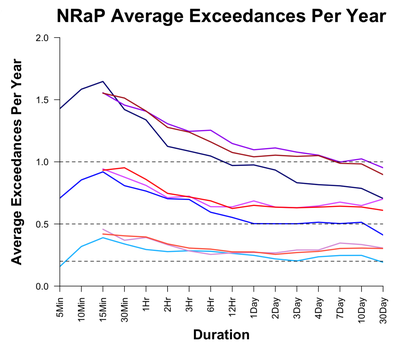
- USCRN and HPD precipitation data were compared to thresholds based on available NOAA Atlas 14 precipitation frequency estimates
- Rolling sums were computed for each duration based on 5-minute USCRN data and 15-minute HPD data
- Frequencies of exceedance of NOAA Atlas thresholds were calculated for each station and compared to the expected frequency per year based on the return interval

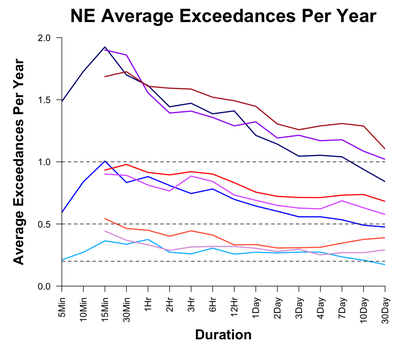
DISCUSSION

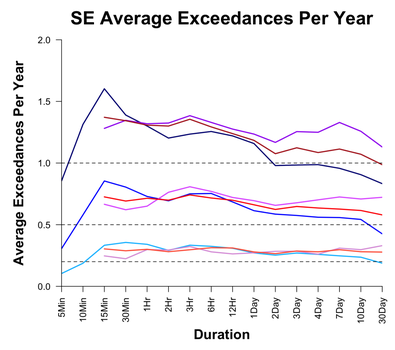
- Both networks had a higher-than-expected number of observed events, particularly for durations of less than one day, signaling that non-stationarity in extreme precipitation due to climate change has occurred since NOAA Atlas 14's creation. NOAA Atlas 15, currently in production, should address this issue by accounting for both current changes and future climate change.
- The USCRN network slightly underperforms the HPD network generally but outperforms it for the shortest events.
- While there are certainly regional differences, regions with good spatial coverage had relatively similar results between USCRN and HPD.

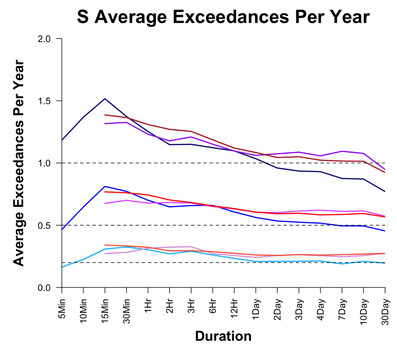
USCRN captures more extreme events than expected based on **Atlas 14**, but **fewer** events than the **HPD network.**

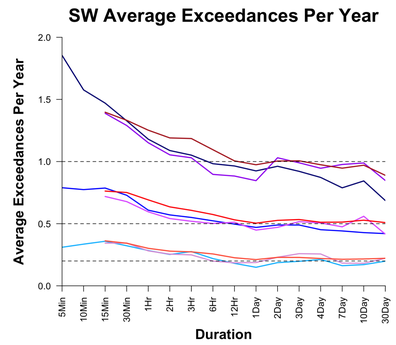


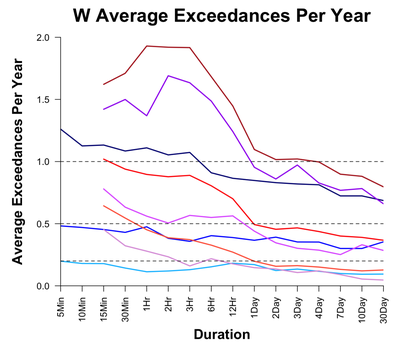










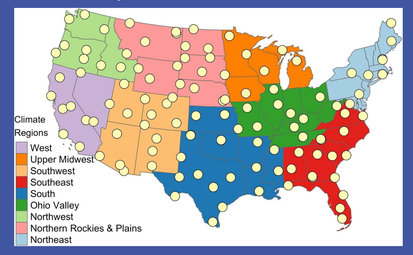


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Datasets

USCRN:

- 2006-2022, 114 CONUS stations



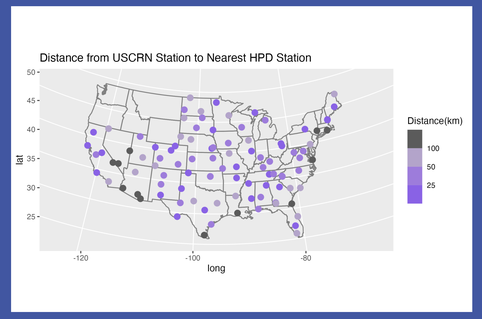
- Triple-wire weighing gauge reports precipitation at 5-minute resolution
- Sparsely distributed, reference network

HPD:

- 2006-2022, 1219 CONUS stations
- weighing gauge reports precipitation at 15-minute resolution
- Densely distributed network
- HPD had some known periods of faulty data where extremes were over-reported. For each station, any year with more than 10 1-year RI/15-minute duration extremes was removed from analysis.

Region	Total Station Years	Station Years with <5 Exceedances	Station Years with <11 Exceedances
Northern Rockies and Plains	1342	1291 (51 removed)	1342
Ohio Valley	3655	3561 (94 removed)	3650 (5 removed)
Upper Midwest	2769	2647 (122 removed)	2767 (2 removed)
Northeast	822	775 (47 removed)	817 (5 removed)
Southeast	1643	1579 (64 removed)	1640 (3 removed)
South	6906	6653 (253 removed)	6894 (12 removed)
Southwest	2057	1970 (87 removed)	2054 (3 removed)
West	1790	1657 (133 removed)	1777 (13 removed)
Total % Available	**100%**	**95.9%**	**99.8%**

To better compare networks of different site densities, USCRN sites were matched with their closest HPD site within <100 km to create a matched dataset. Sites with no close match were discarded.



NOAA Atlas 14:

- PFEs used as comparison point
- Conglomerate of many station networks, with more contributing stations for longer durations (~10X jump from 15-minute to hourly to daily observations)
- The Western region was not available at the time of analysis

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