NC STATE UNIVERSITY

Evaluating Precipitation Extremes from a Sparse Network: the NOAA U.S. Climate Reference Network Emma Scott¹, Ronald Leeper², and Michael Palecki³

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Background

The US Climate Reference Network (USCRN) is a new network that was designed with climate monitoring science in mind. Because precipitation datasets may differ based on their temporal, spatial, and measurement resolution, it can be difficult to get consistent data for studies of precipitation extremes. There are two goals for this project: the first is to find the extreme precipitation events for stations in the network, and the second is to analyze how well the network has captured these events. If the USCRN has sufficient spatial coverage to capture expected extreme events, it could be used as a reference network for future research.

Methods

- Precipitation extremes were compared for all USCRN sites.
- USCRN precipitation data was compared to NOAA Atlas 14 precipitation frequency estimates, in regions where NOAA Atlas 14 data were available.

Exceedances of Thresholds:

— 5 Year — 2 Year — 1 Year

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National Average Exceedances Per Year

Datasets

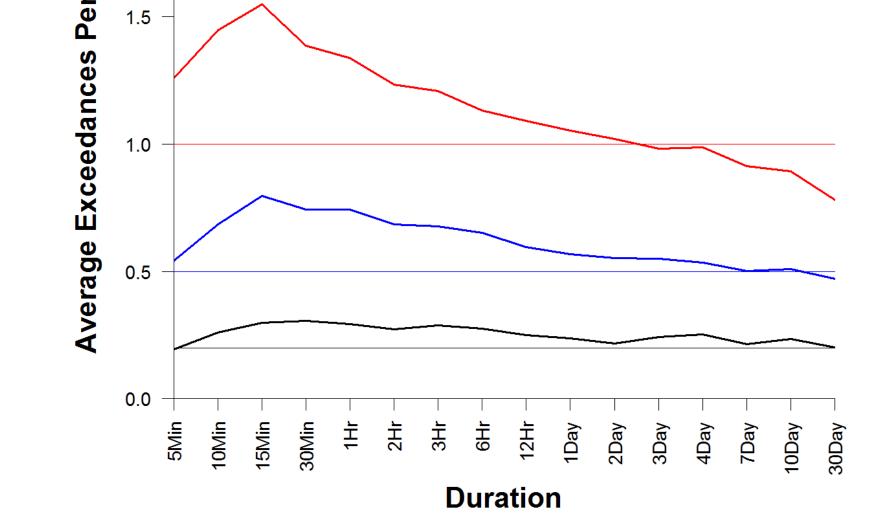
• USCRN (2006-2015):

- For each duration, rolling sums were computed based on USCRN 5-minute data
- Frequencies of exceedance of NOAA Atlas thresholds were calculated for each station.
- The frequency of exceedance was compared to the expected frequency per year. For instance, for a 5-year return interval, 0.2 counts/year would be expected.

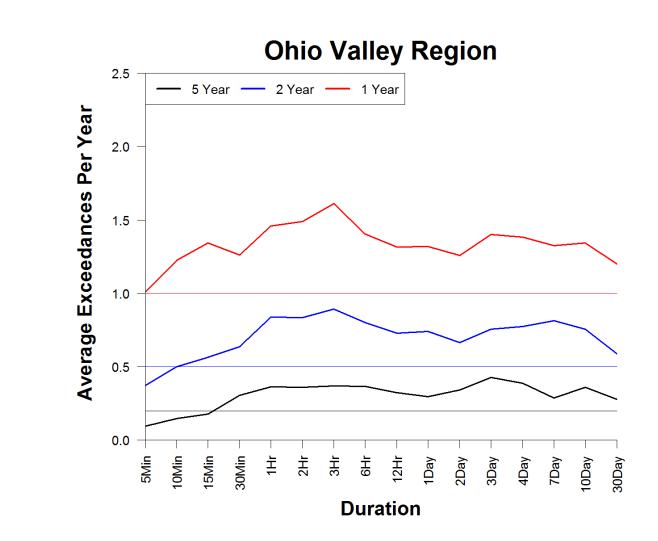
Results

Spatial/Temporal Distribution:

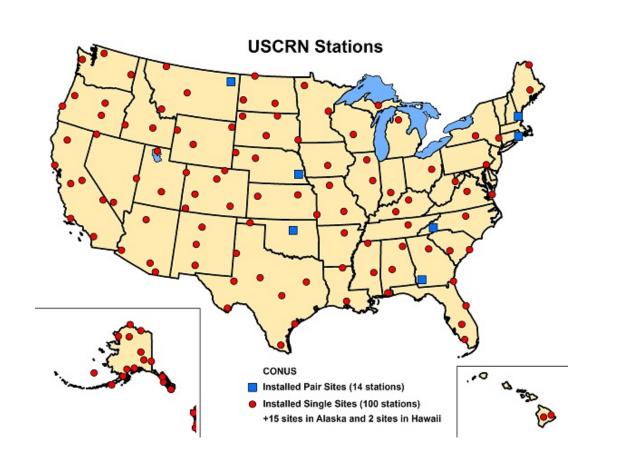
5-Min Max Value for Each Station



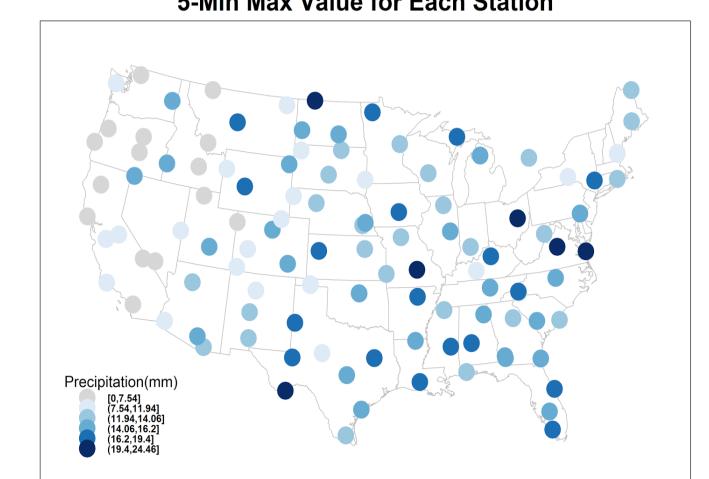
 USCRN exceeded NOAA Atlas 14 thresholds more often than expected at sub-daily durations, with the same or fewer exceedances than expected at 2day to 30-day durations



- 114 CONUS stations
- Shielded Geonor triple wire weighing gauge
- Stations report precipitation over
 0.2 mm at 5 minute resolution
- Sparsely distributed and set up as a reference network
- One of the only national networks with research quality shielding and measurements

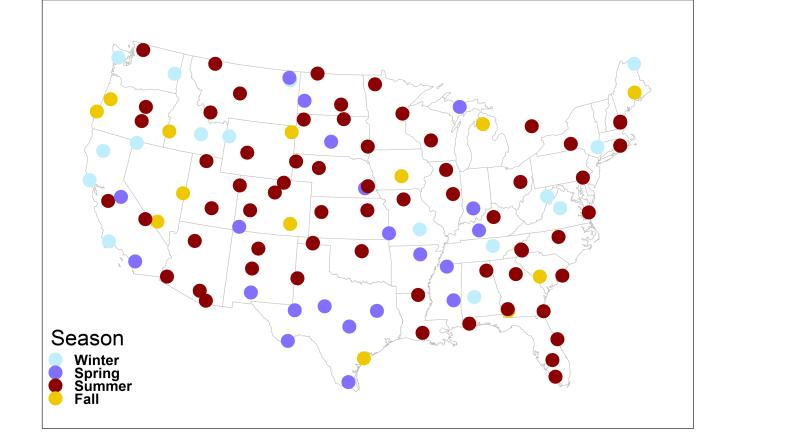


• NOAA Atlas 14 (20+ year climatology):

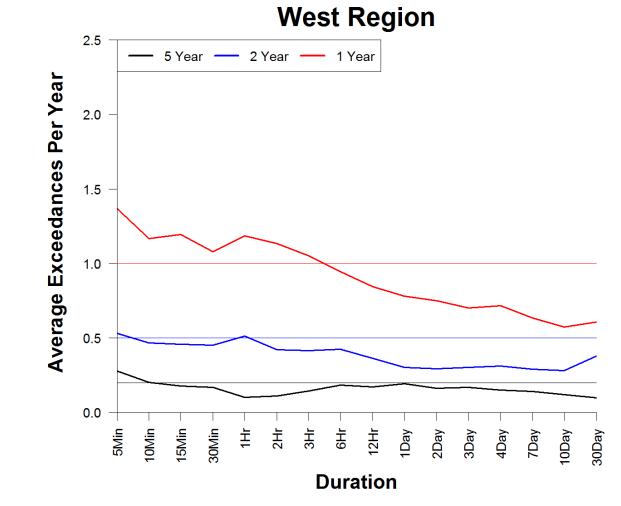


 The spatial distribution of the 5-minute maximum shows limited regional influence. USCRN's highest 5-minute maximum (24.2 mm) occurred at Cape Charles, VA on 7/24/2014

Season of 5-Min Max for Each Station



Above: Ohio Valley exceedances by duration Below: West region exceedances by duration

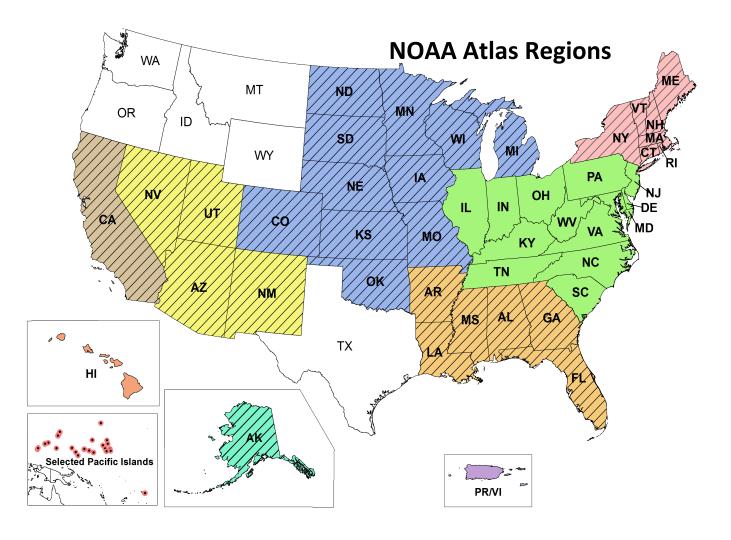


The frequency of exceedance varied by region

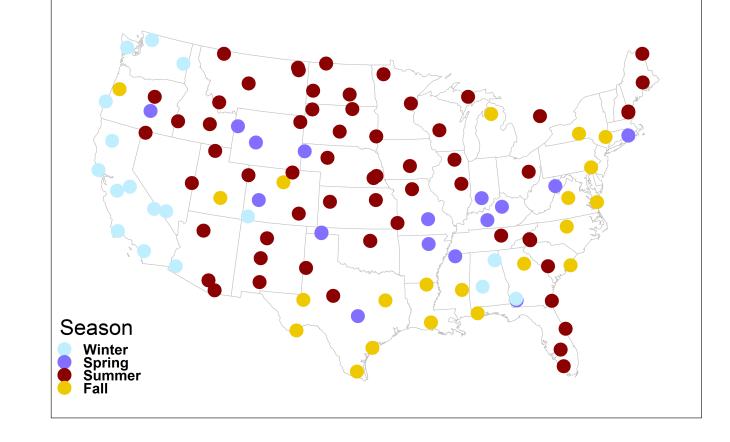
Conclusions

 USCRN exceedance of NOAA Atlas thresholds was sensitive to duration,

- ~1500 daily, 500 hourly, and 50 15minute stations per region
- Sub-hourly to 60-day extremes arranged by return interval and duration of event



Above: Maximum 5-minute precipitation Below: Maximum 30-day precipitation Season of 30-Day Max for Each Station



• Spatial patterns emerge at higher time durations.

return interval, and region.

- This was due to a combination of factors including equipment, climate, and spatial resolution
- Future work will compare other networks over USCRN's period of record to isolate the climate and spatial effects on frequency of exceedance

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