Potential Predictability and Impacts of Subseasonal Extreme Precipitation Events in the United States

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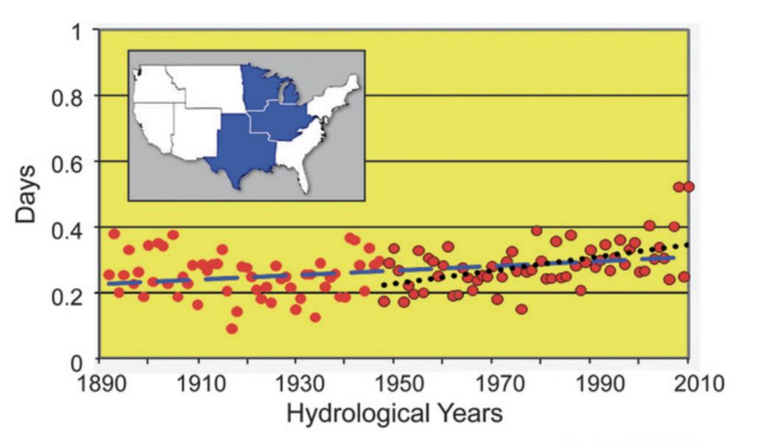
Motivation

- S2S prediction of climate extremes is needed for disaster mitigation.
- Flooding is costliest of all natural disasters (Miller et al. 2008)
- Most studies focus on precipitation on the <u>daily</u> timescale and show increasing daily precipitation.
    - (Karl & Knight, 1998; Kunkel et al., 1999; Groisman et al., 2012 seen to right).
- Yet, planning for these events would ideally happen at a longer timeframe than current daily forecasts.



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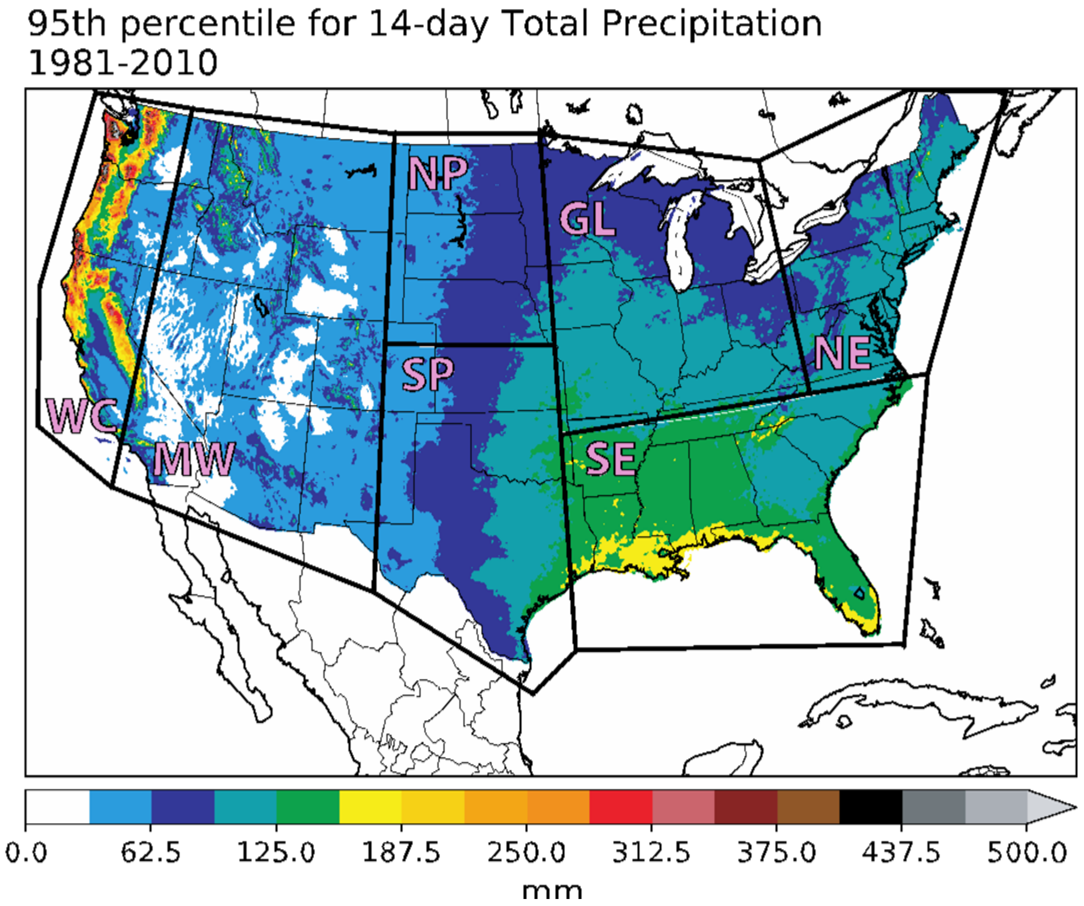
Defining our extreme events

Using a 14 day sliding window from Jan 1, 1981 to Dec 31, 2018:

1. Total area of rainfall exceeding PRISM 95th percentile of 14 day precipitation must be above the area threshold
2. Area-averaged precipitation must exceed 10 mm/day for 5 (or 3 for MW) of the total 14 day sliding window
3. The heaviest rainfall day and the surrounding two days must not exceed 50% of the event precipitation
4. If events are overlapping, the event with the higher rainfall totals is chosen as the event

	WC	MW	NP	SP	SE	GL	NE
Area Threshold (km^2)	200,000	200,000	200,000	200,000	300,000	300,000	200,000
Event Count	51	50	17	57	46	54	38



Jennrich, G. C., J. C. Furtado, J. B. Basara, and E. R. Martin, 2020: Synoptic Characteristics of 14-Day Extreme Precipitation Events across the United States. Journal of Climate,33 (15), 6423–6440, doi:10.1175/JCLI-D-19-0563.1.

Potential Predictability

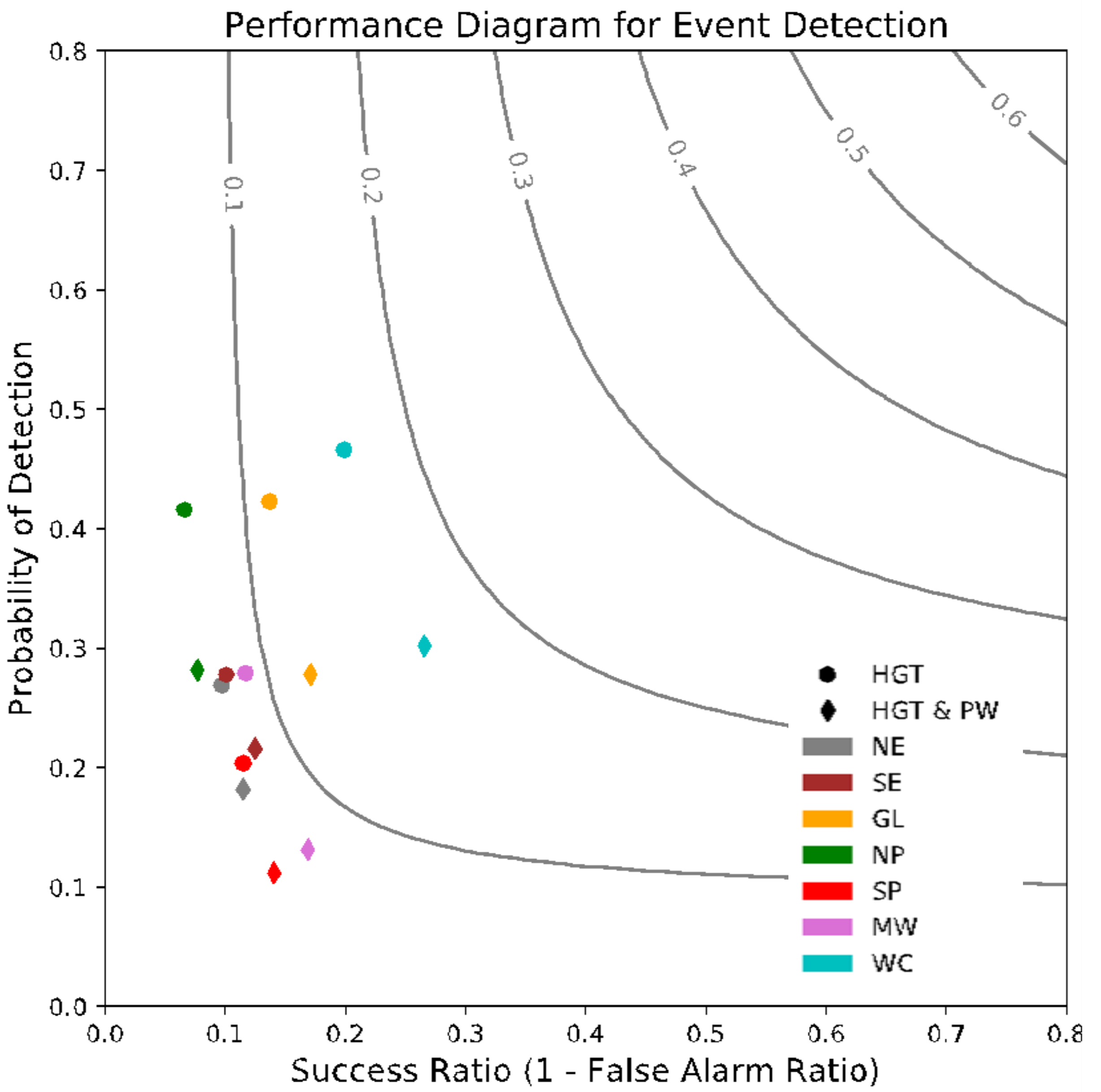
- Congruence Coefficient

$$r_c = \frac{\sum XY}{\sqrt{\sum X^2 \sum Y^2}}$$

  X ➞ Composite of all event days

  Y ➞ Composite of 14 day sliding window from 1981-2018

- Found hits/false alarms from a Congruence Coefficient threshold of 0.35
- Used Composites of geopotential heights (circles) and the combination of geopotential heights and precipitable water (diamonds)



Summary of Regional NCEI Storm Reports

	Common Storm Report Types	Significantly more reports than 1000 random non-events		
		Flash Flood	Flood	Heavy Rain
NE	Tropical Storm, Winter Reports, Convective Reports	*	*	
SE	Tropical Storm, Convective Reports	*	*	*
GL	Convective Reports	*	*	*
NP	Convective Reports	*	*	*
SP	Convective Reports, Drought	*	*	*
MW	Winter Reports, Convective Reports, Drought		*	
WC	Winter Reports	*	*	*

Conclusions

- Impacts are related to seasonality of the regions.
- Significantly more flooding was seen during our 14 day events for all regions.
- Our event's geopotential and precipitable water composites are not unique to event periods.
- Highest skill is seen for the West Coast and Great Lakes.

Future Work

- Many other factors that could be considered
- Use new database of extreme events that does not utilize regional boundaries (Dickinson et al. 2021).
- Utilize seasonal models to look at predictability of events.

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