Updates on NOAA's Rapid Attribution Capability: The July 2024 California Heat Wave

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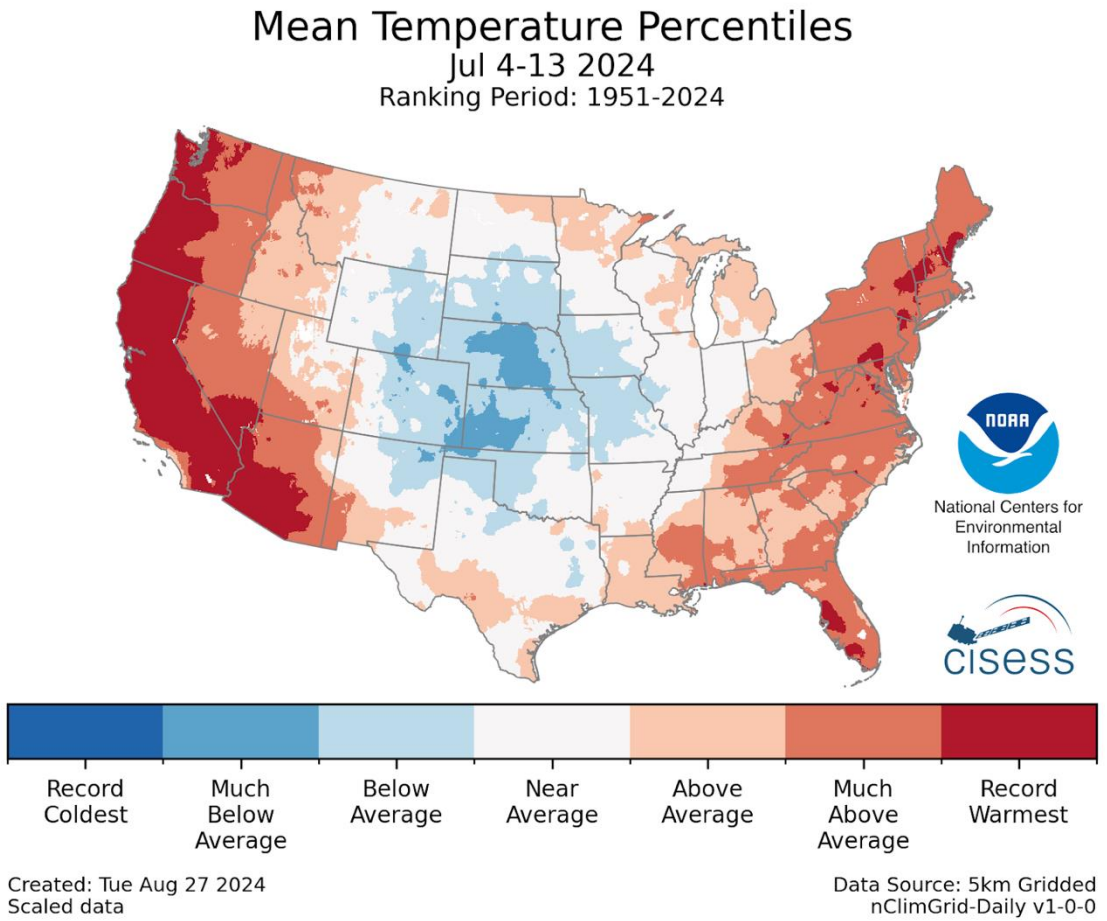

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ENVIRONMENTAL RESEARCH
CLIMATE

PAPER

A rapid response process for evaluating causes of extreme temperature events in the United States: The 2023 Texas/Louisiana heat wave as a prototype

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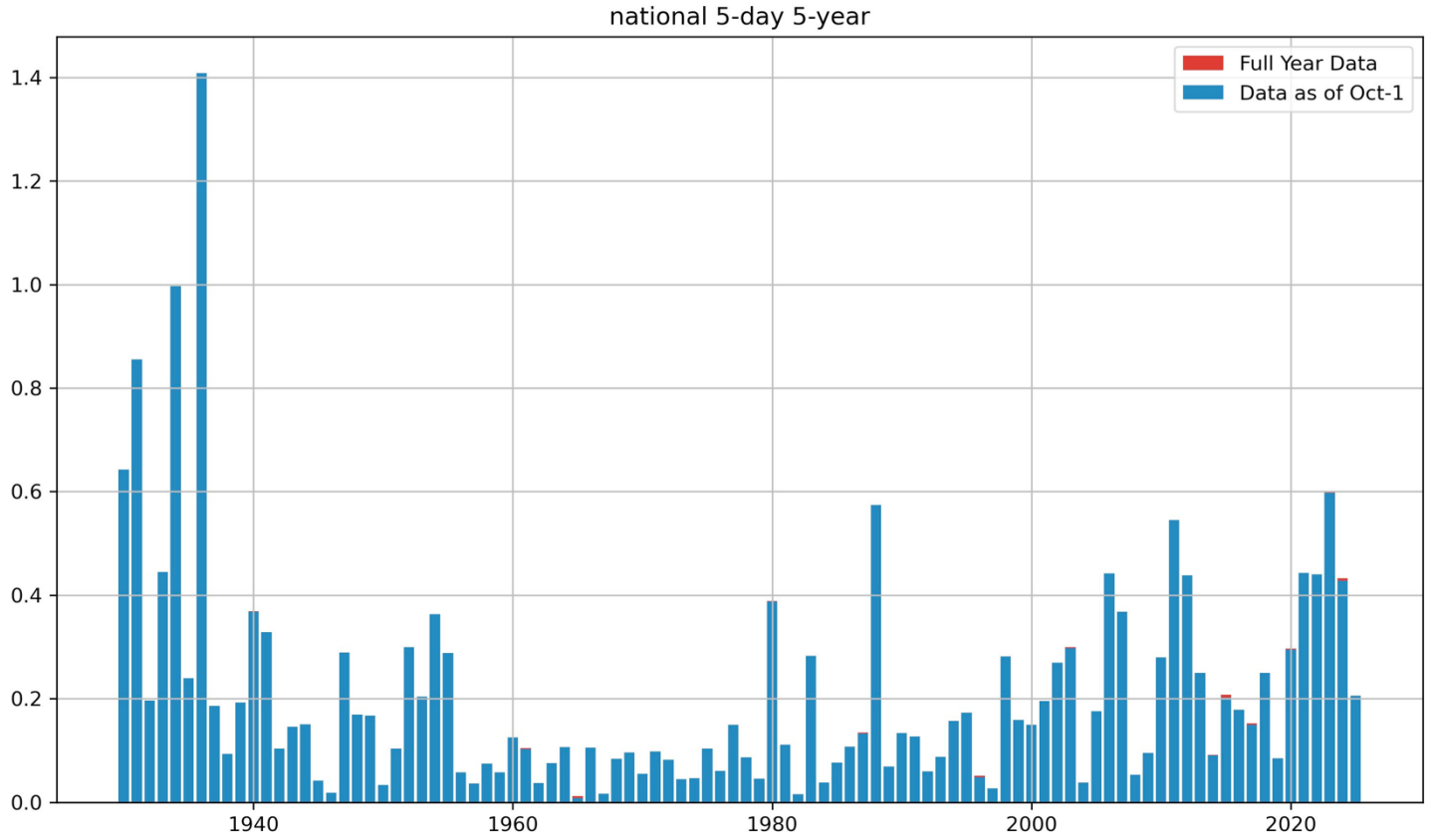
Rapid Response Framework

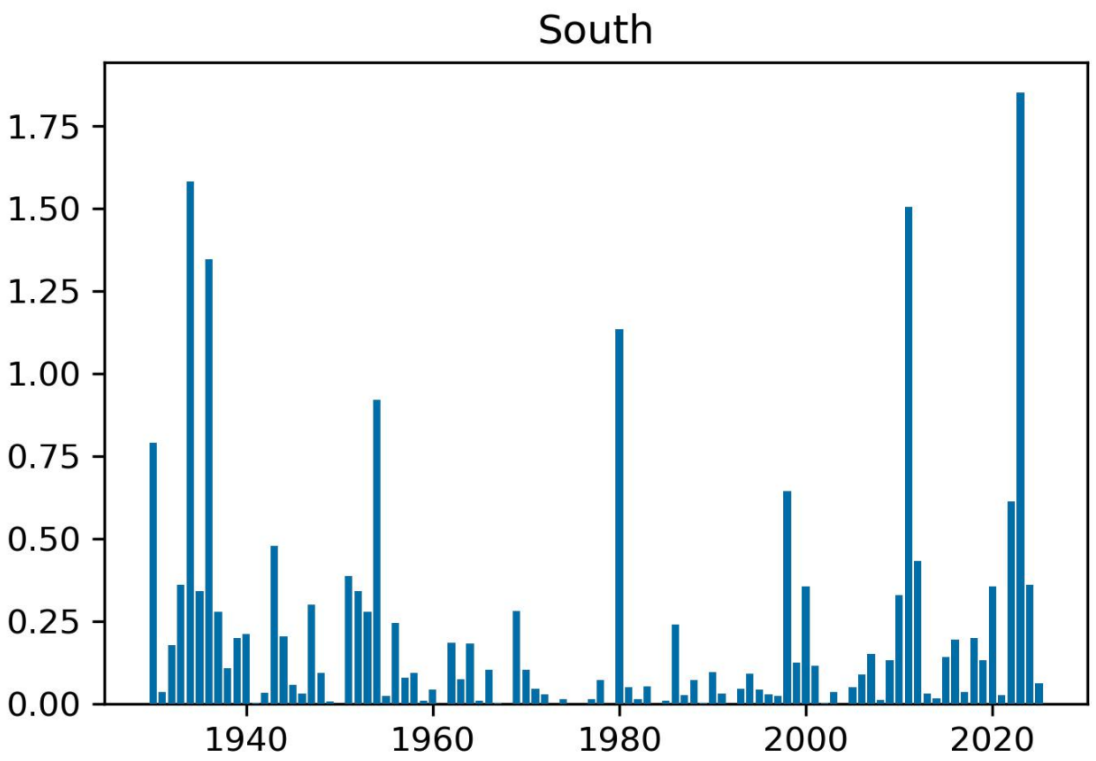
- Monitoring and Triggering
  - 5-day 5-year events are the benchmark.
- Observational Analysis
  - GPD shows how the rarity of the event has changed between 1951–1980 and 1981–2020.
- Synoptic Analysis
  - Identify climate variability drivers using teleconnection patterns.
- Model Analysis
  - Compare the event in SPEAR seasonal forecasts vs uninitialized SPEAR simulations
  - Compare the rarity of the event in SPEAR simulations between 1951–1980 and 1981–2020

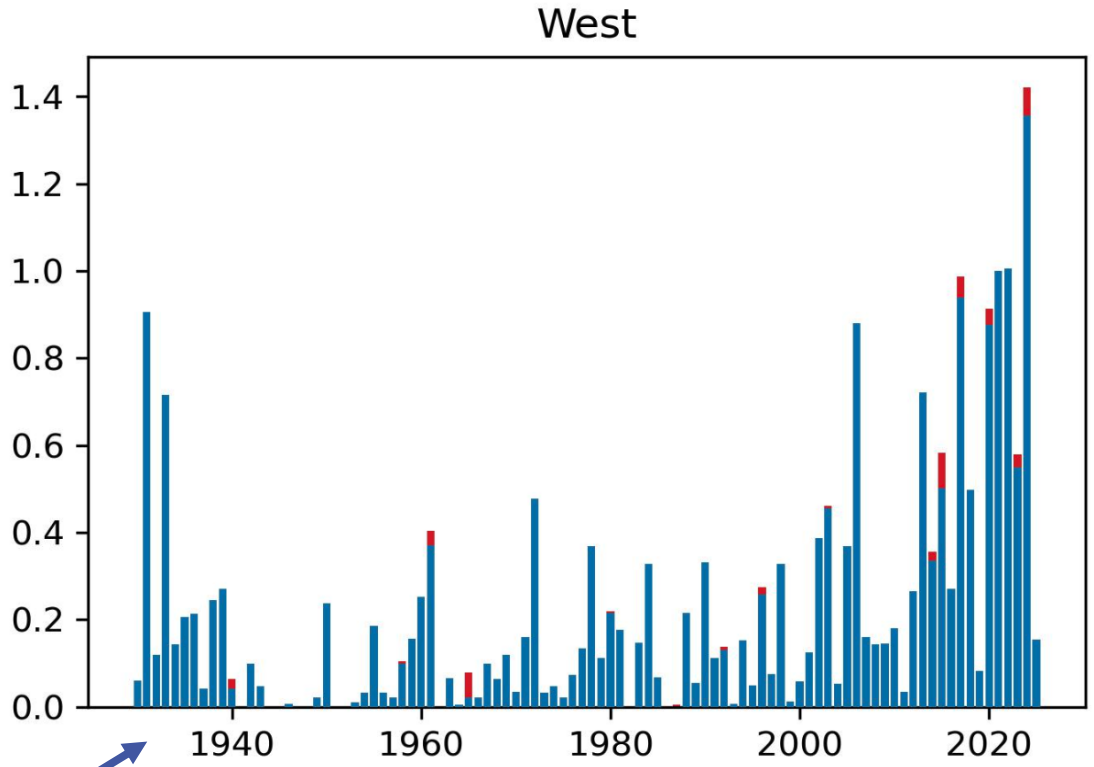
Monitoring and Triggering

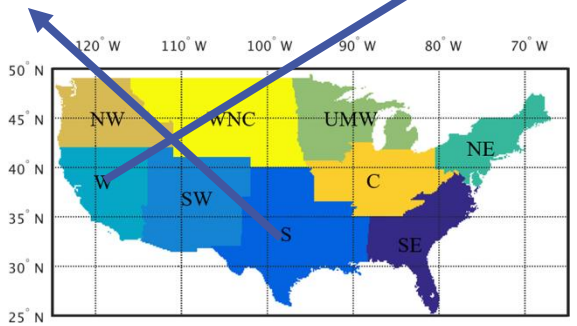


5-day 5-year events per station

Monitoring and Triggering

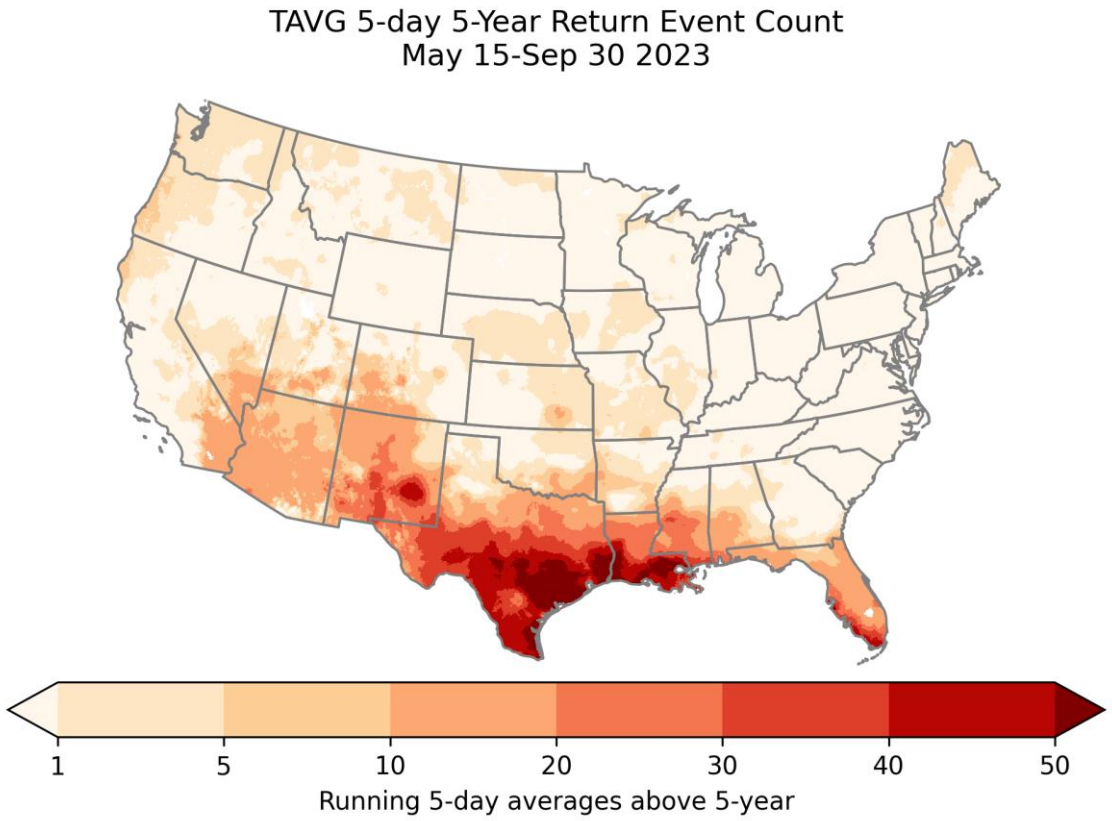




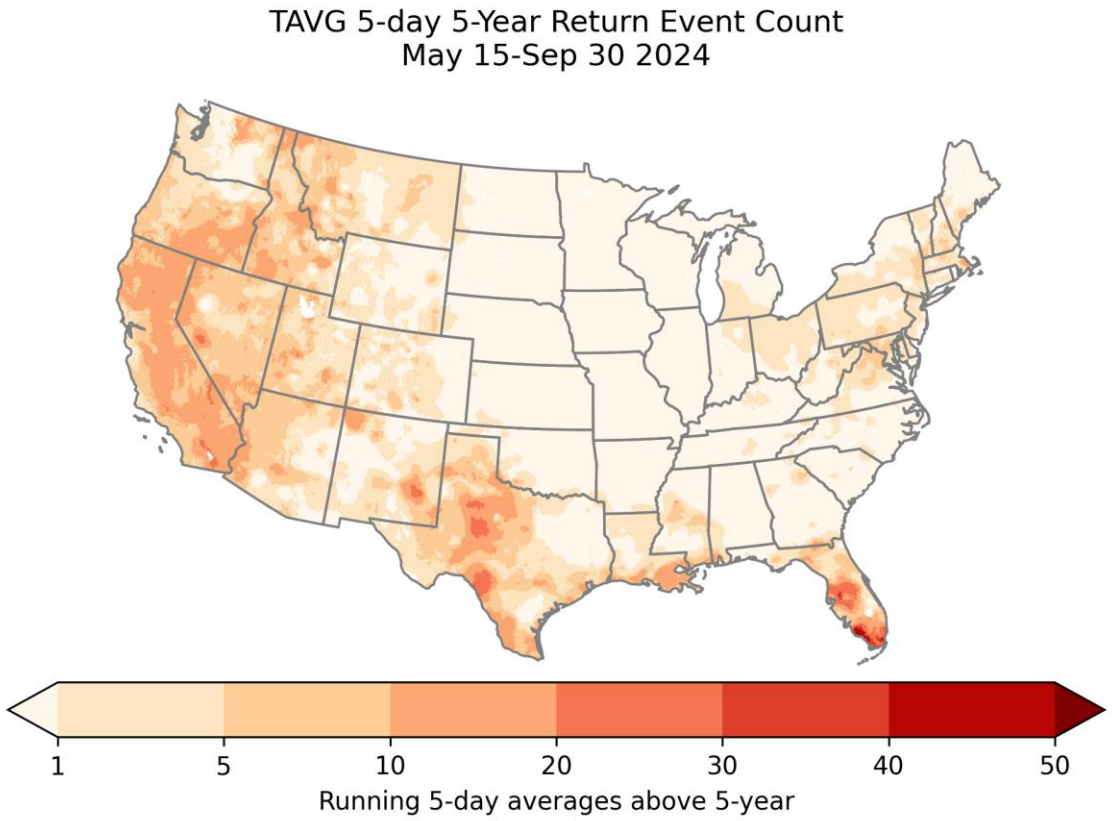


Monitoring and Triggering

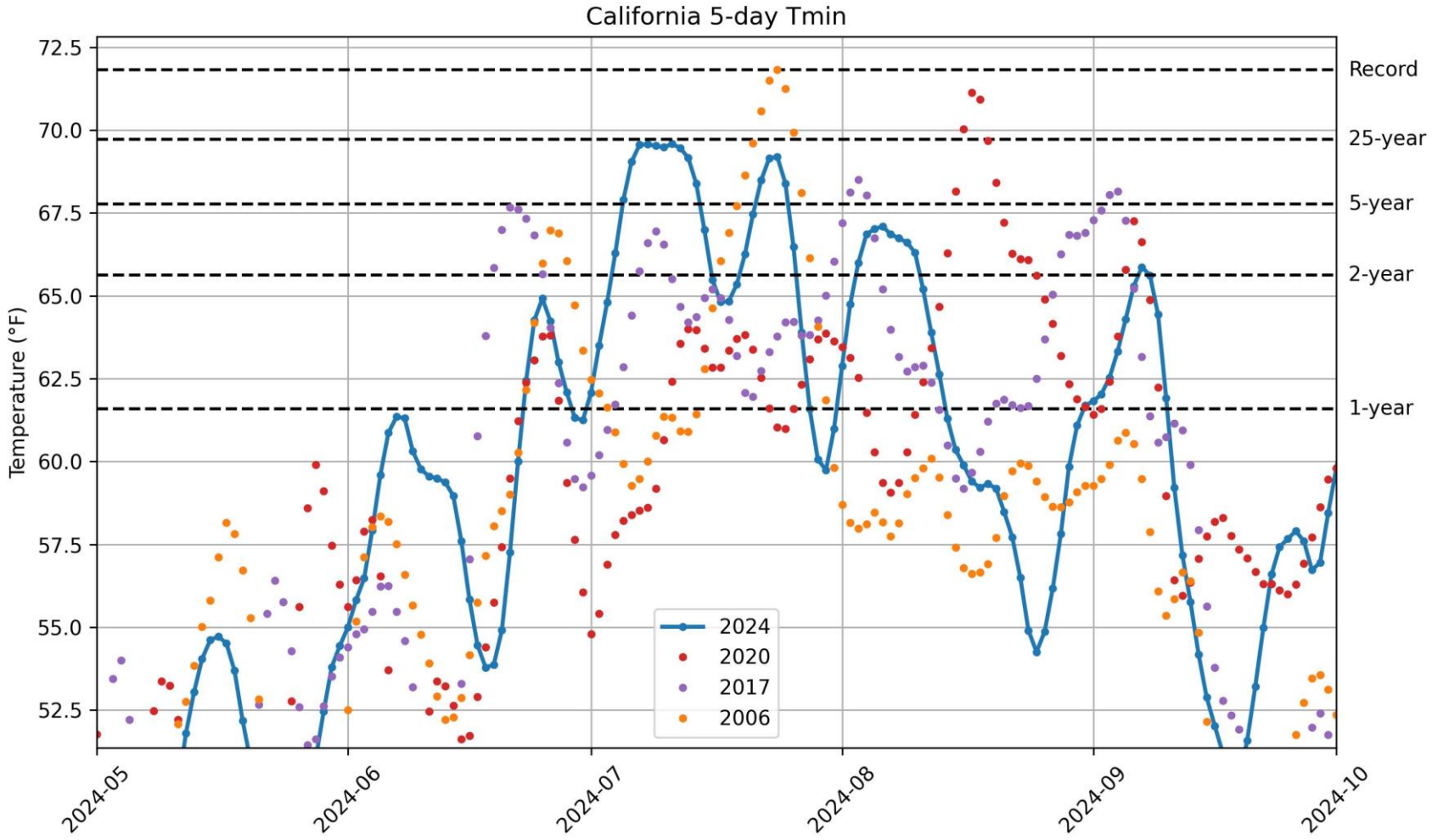
2023



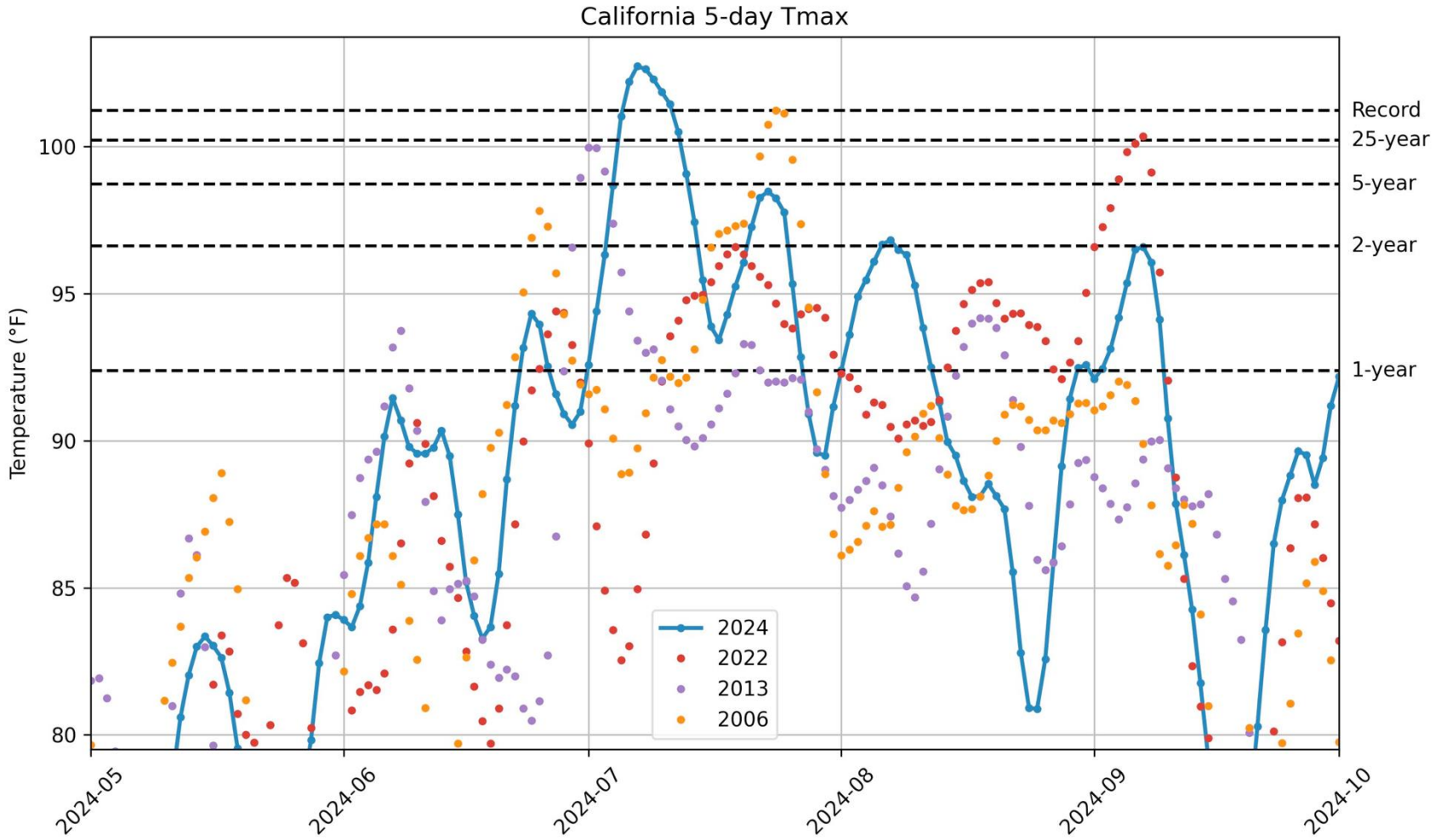
2024



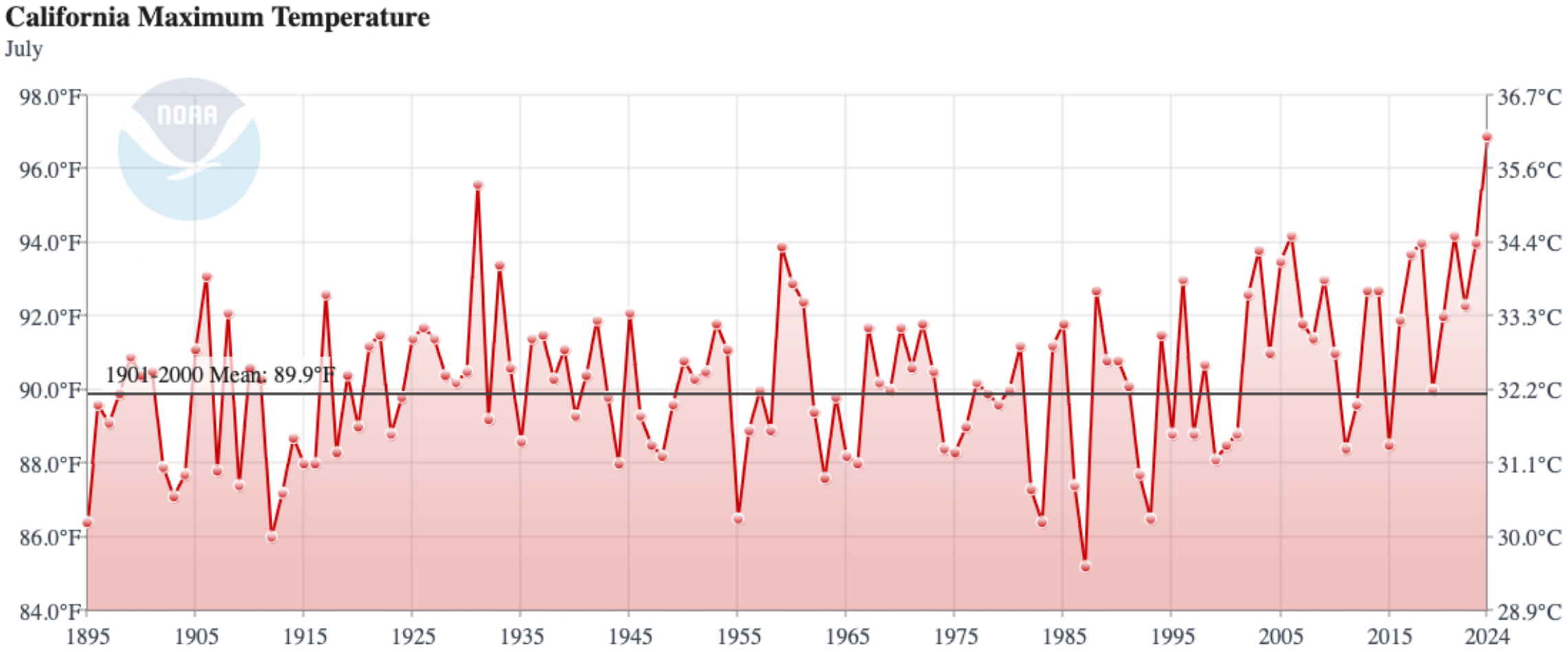
California 5-day Average Tmin



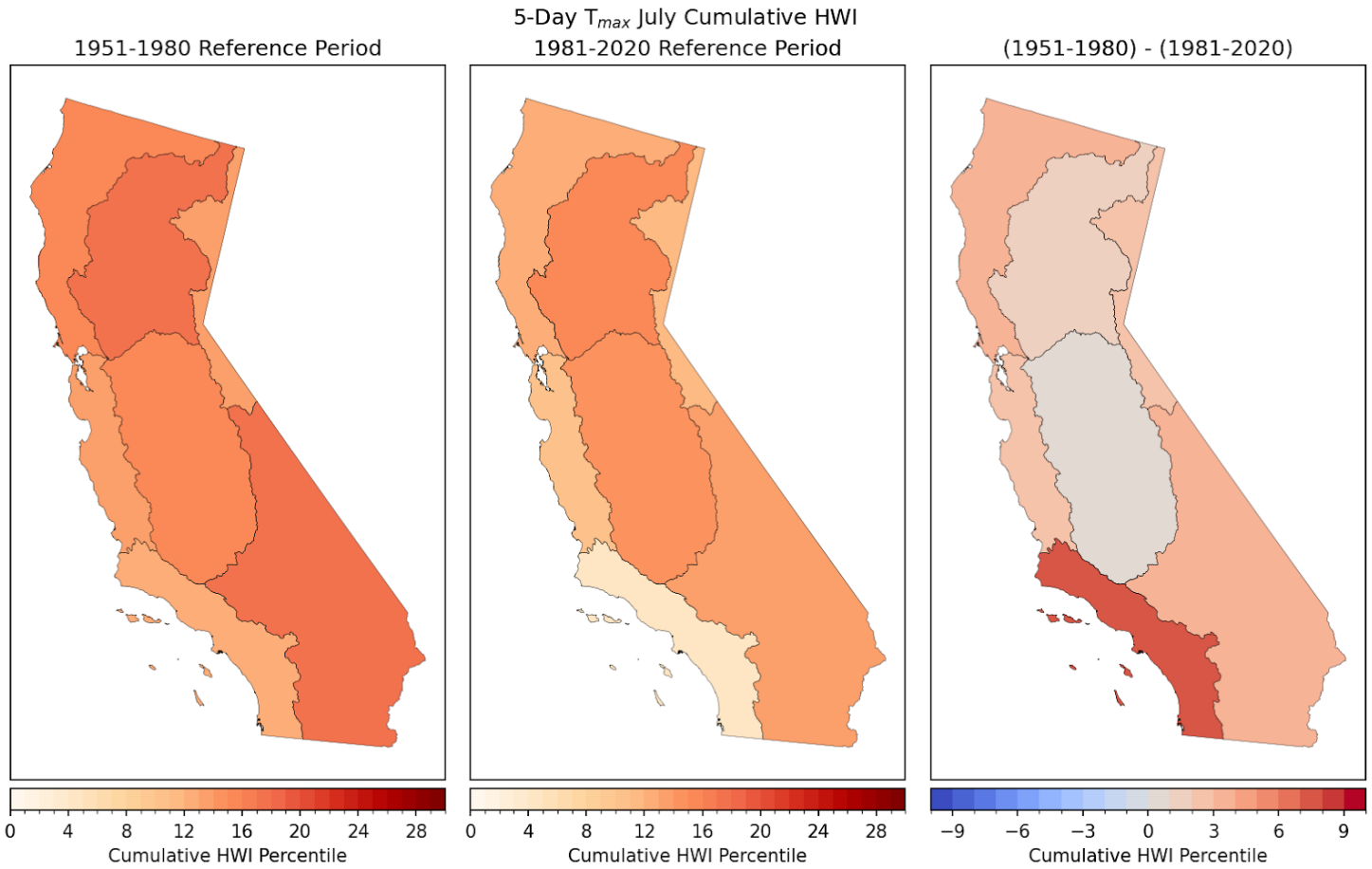
California 5-day Average Tmax



California July Temperature Record Shattered



Observational Analysis: Change in Extremity for Tmin



Cumulative daily percentile above the 90th using GPD

<90th percentile = 0

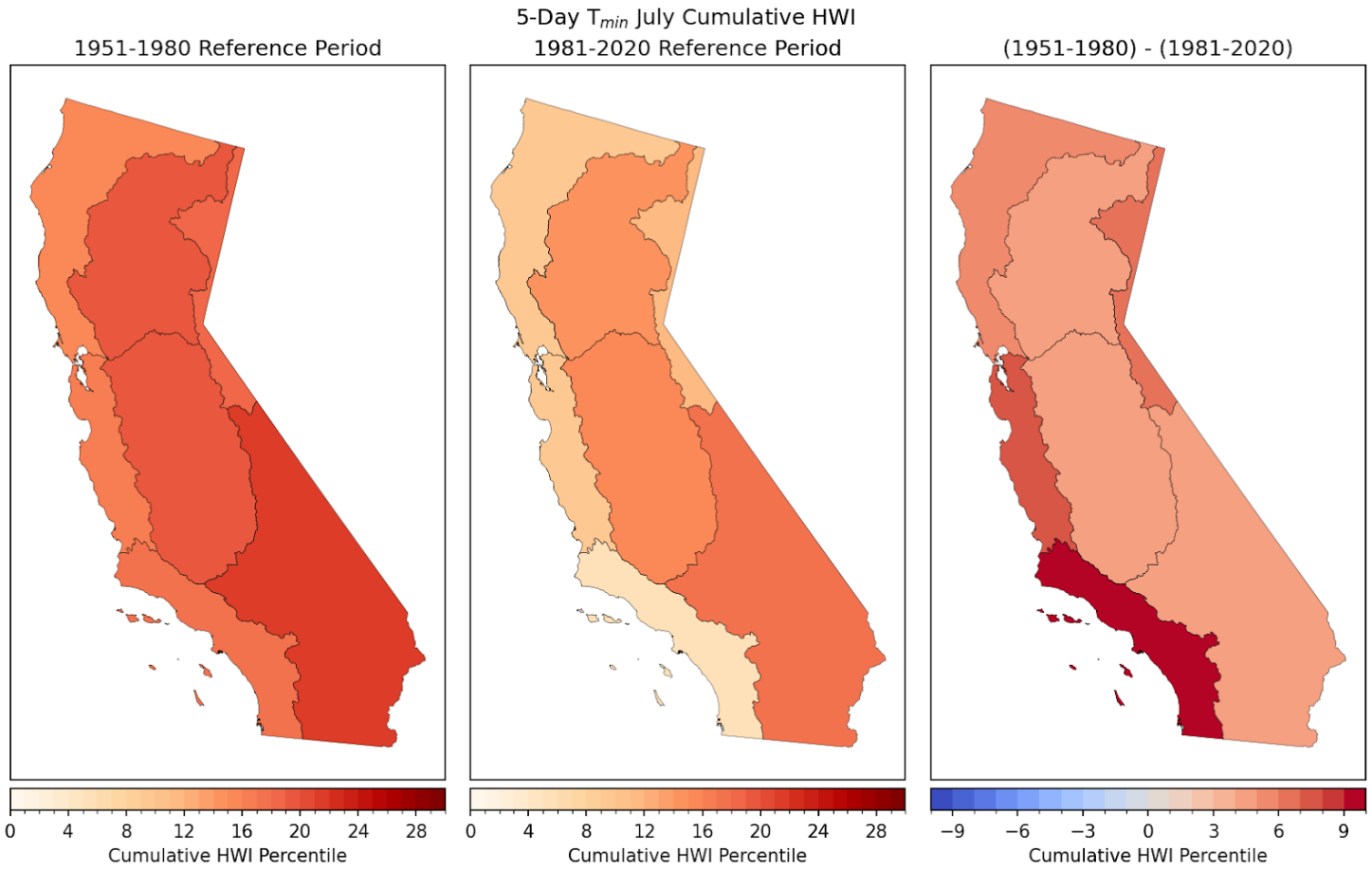
91st percentile = 0.1

92nd percentile = 0.2

…

99th percentile = 0.9

Observational Analysis: Change in Extremity for Tmax



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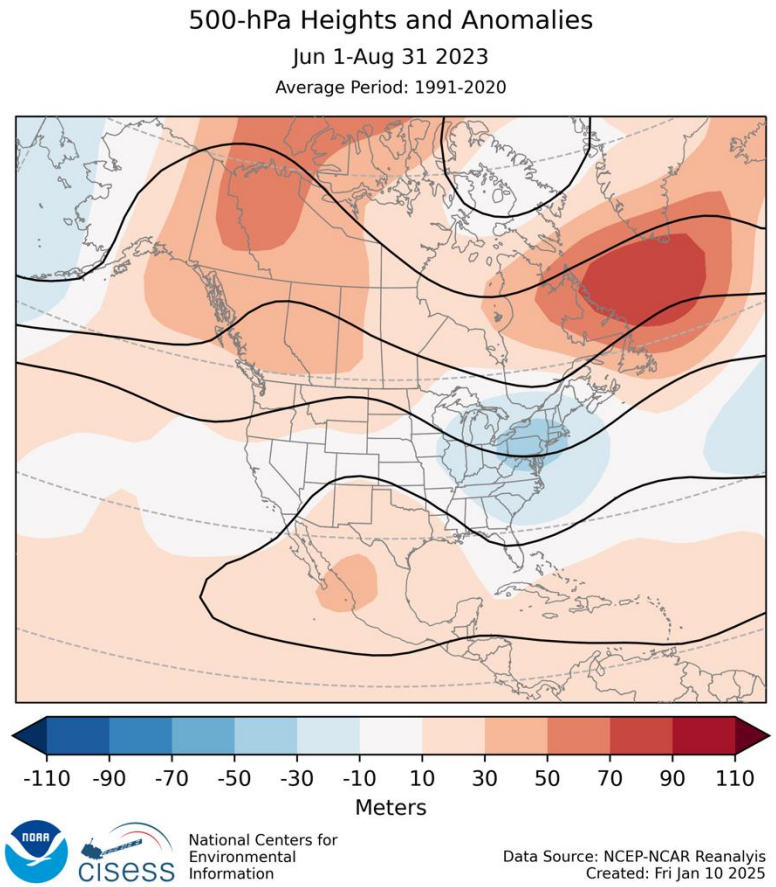
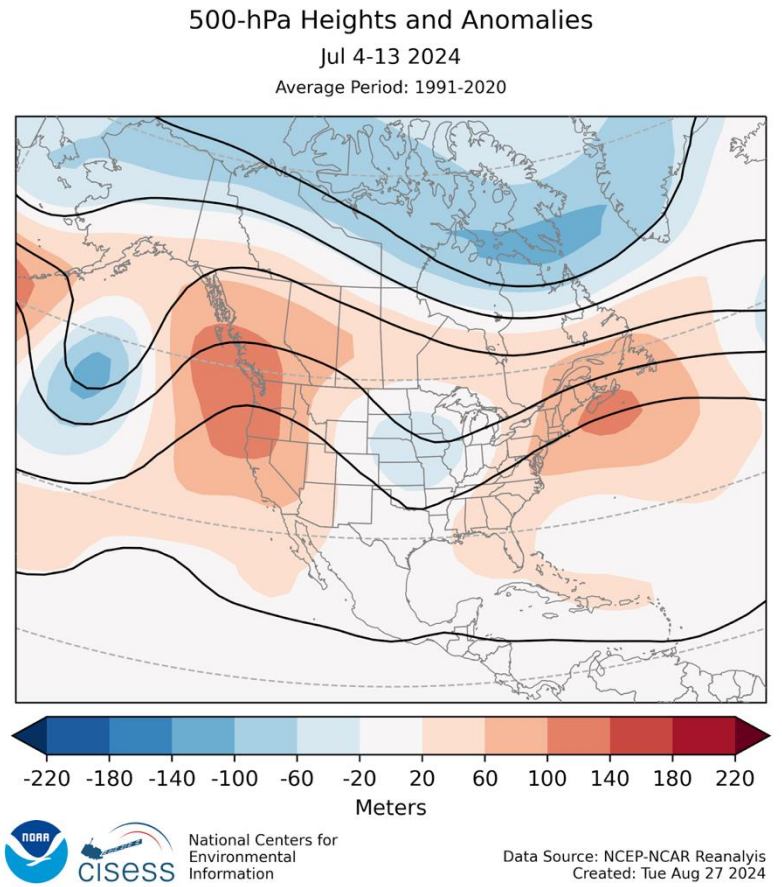
Synoptic Analysis

2023

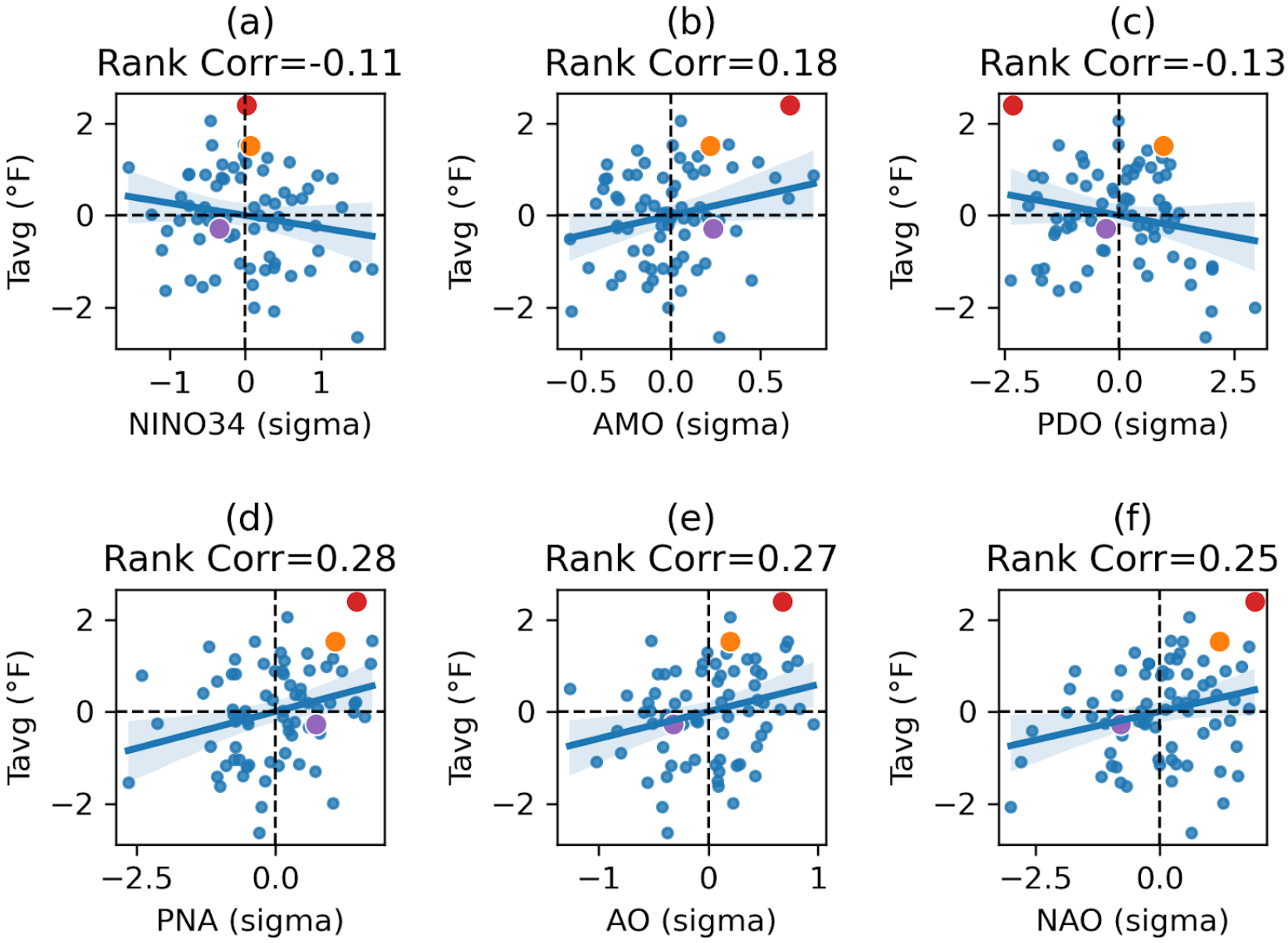


2024

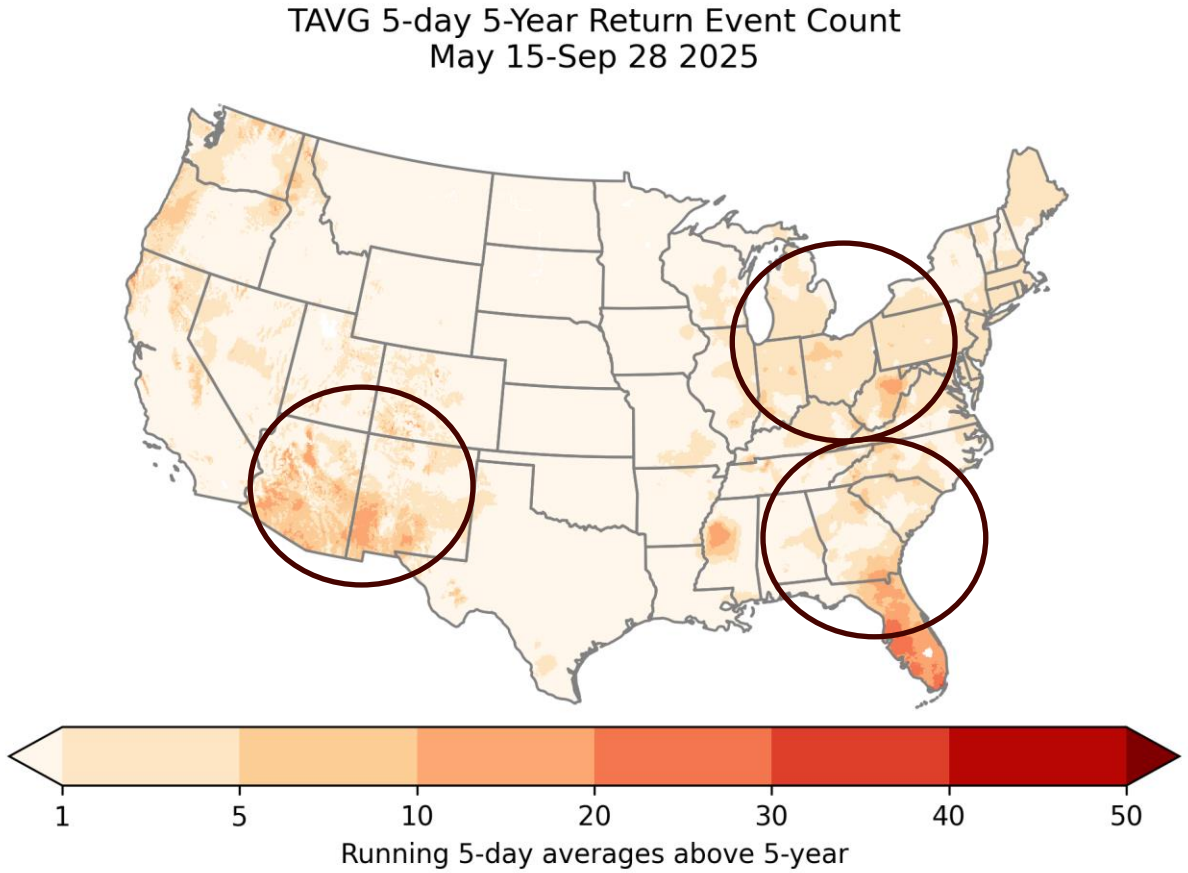


Synoptic Analysis

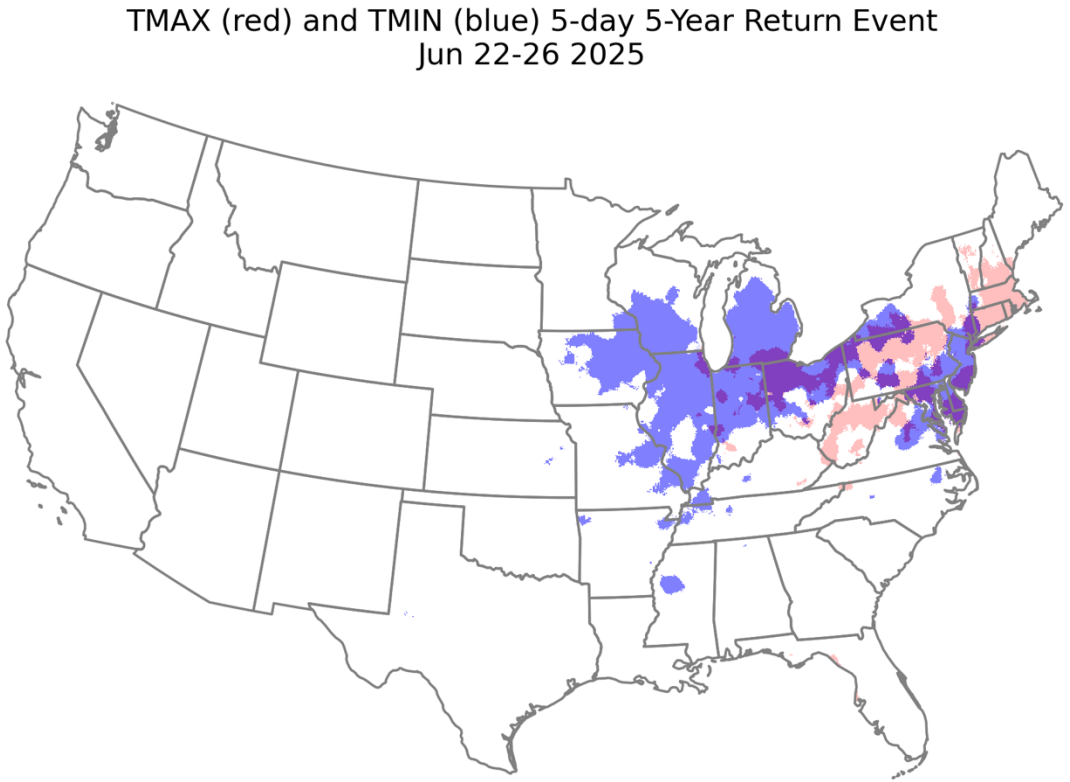
July California Tavg
vs
various teleconnections

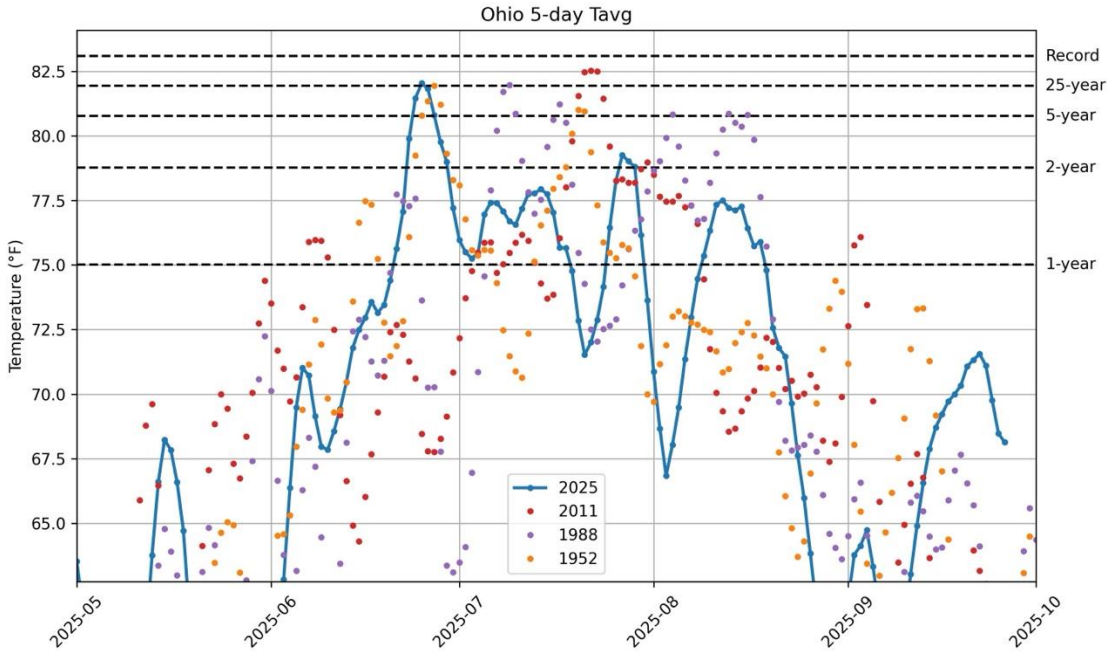


2025 Candidates

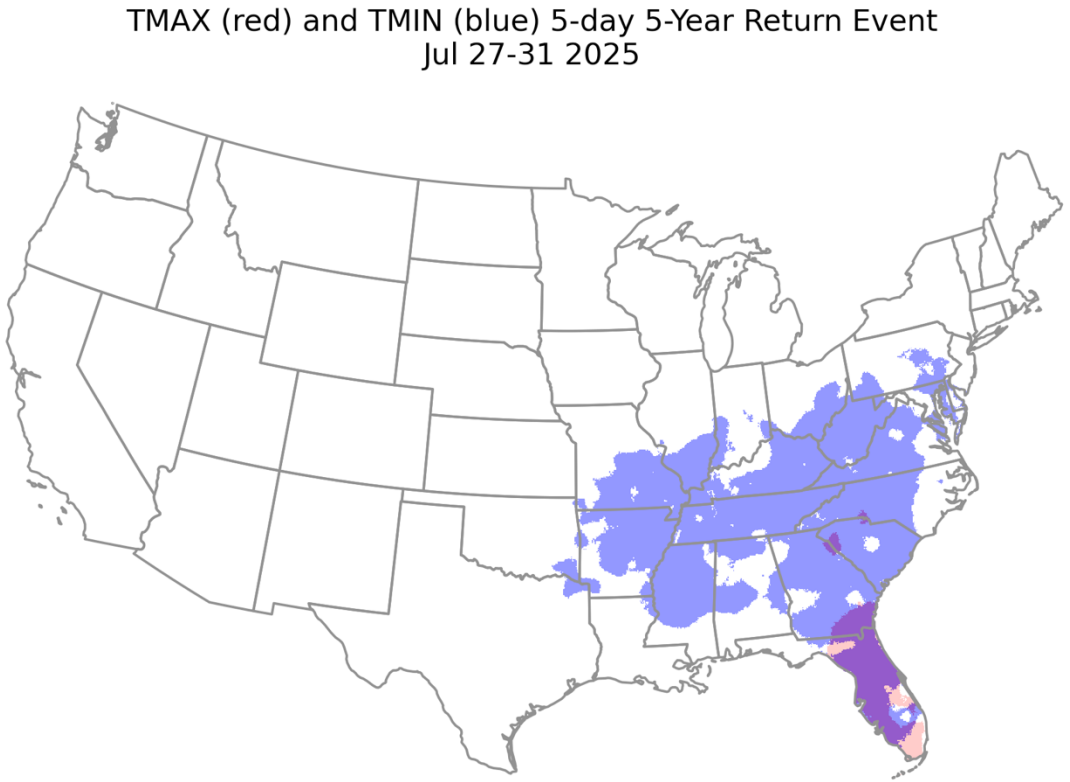


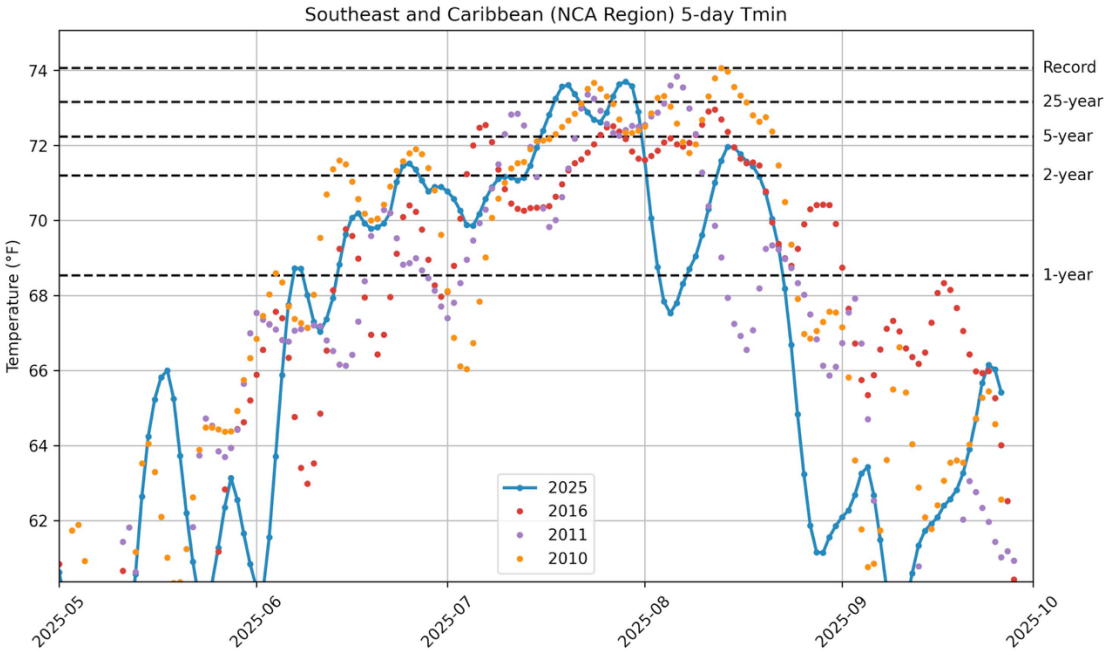
Ohio June Tavg



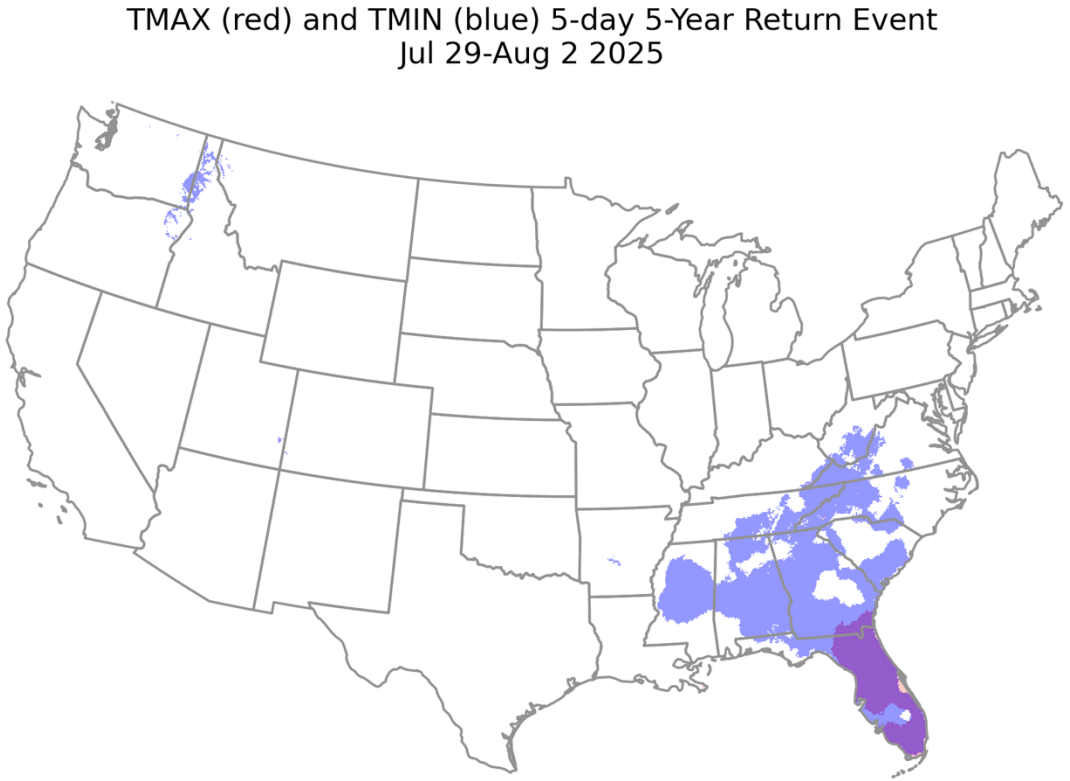


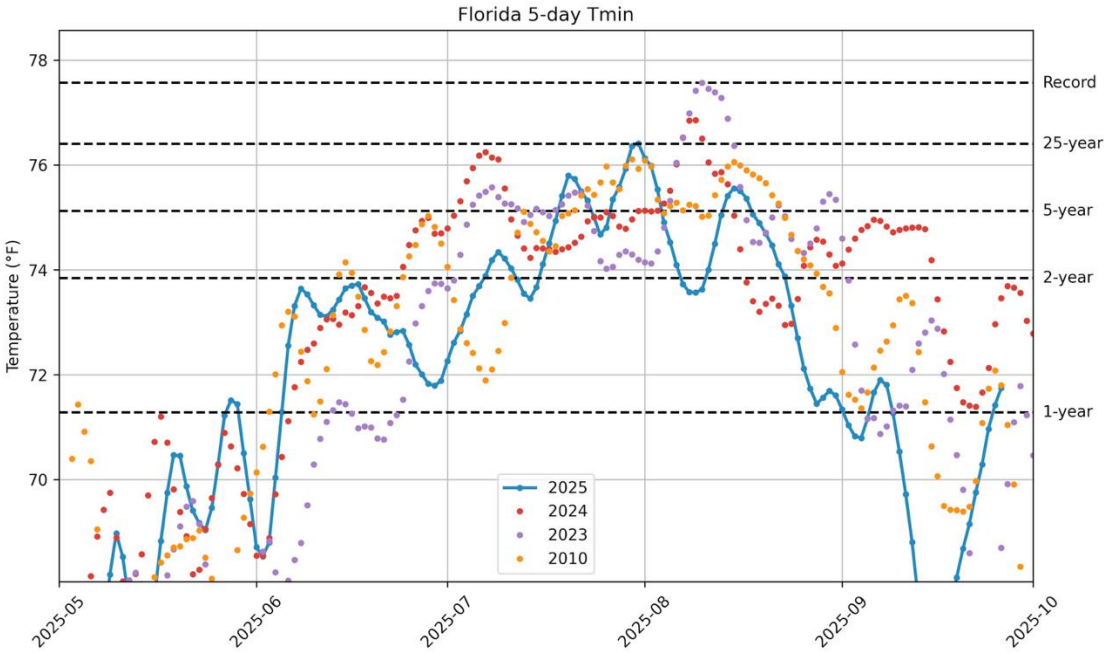
Southeast July Tmin



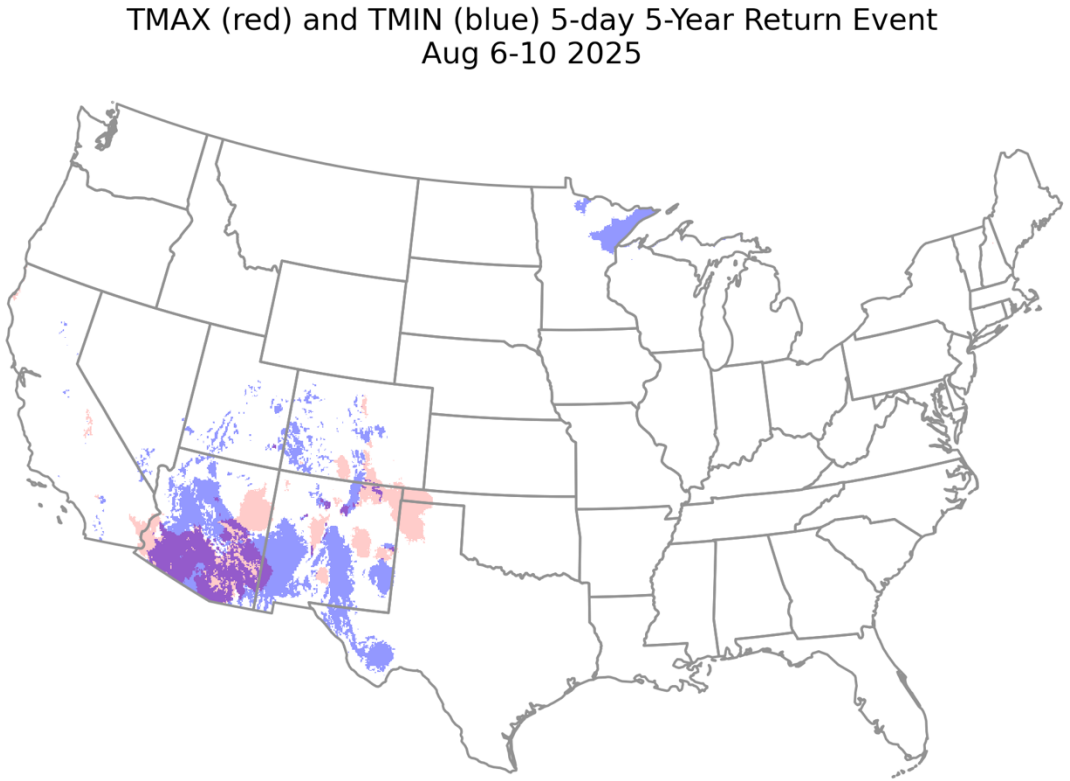


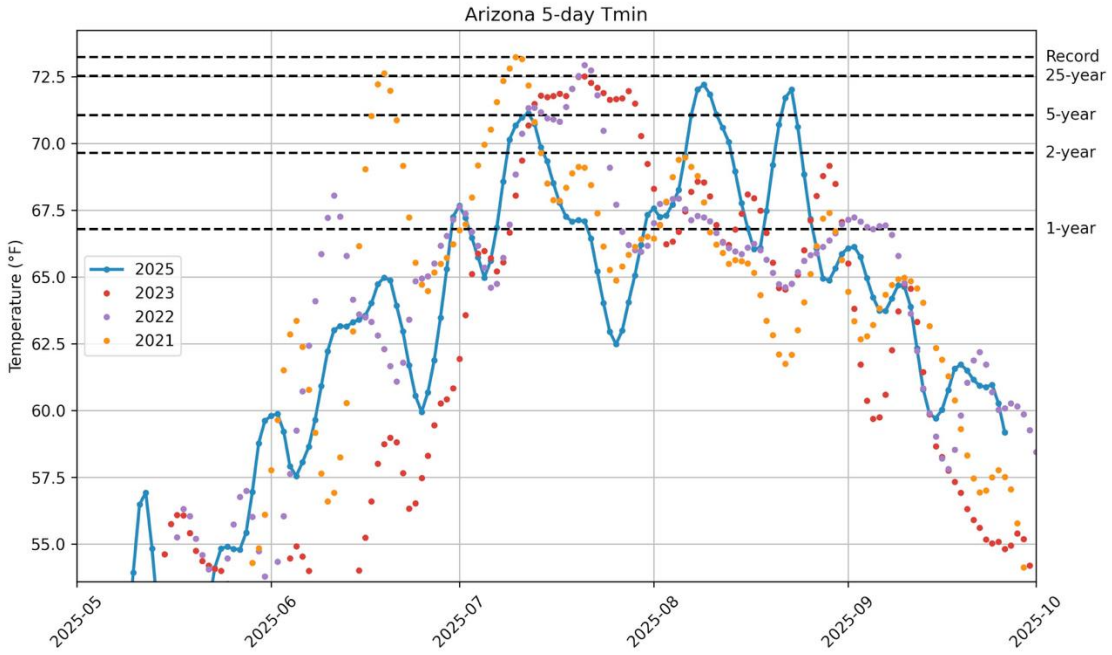
Floriday Tmin





Arizona August Tmin





Summary

- The Western United States experienced an acute heat wave July 4–13 2024.
- A secondary heat wave followed July 21–26.
- California was particularly hard hit with record temperatures set across the state for the month of July in large part due to these two heat waves.
- Large positive values of the Pacific–North American pattern, North Atlantic Oscillation, and Arctic Oscillation all contributed to the heat.
- Model analysis is in progress to quantify the effect of climate change.