

Comparing the Causes and Unusualness of the Texas Heatwaves in 2022 and 2023 (*and 2011*)

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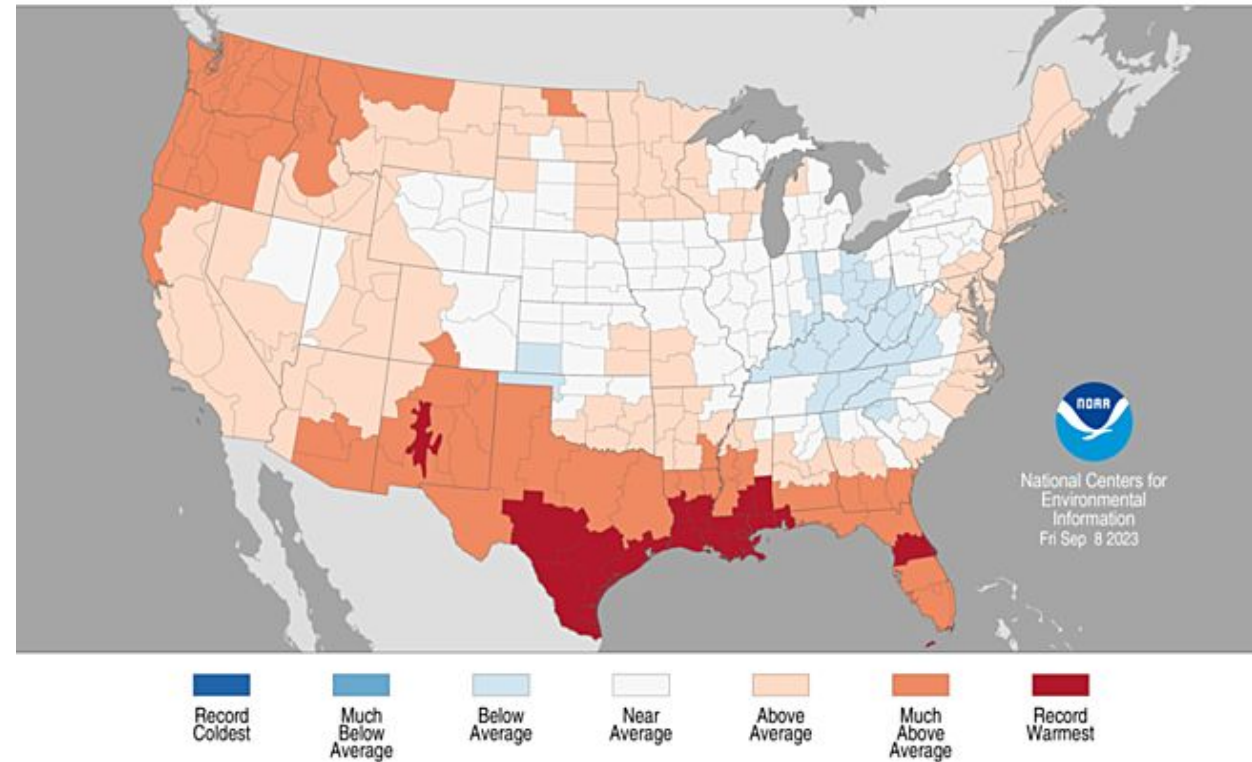
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Divisional Average Temperature Ranks
June–August 2023
Period: 1895–2023



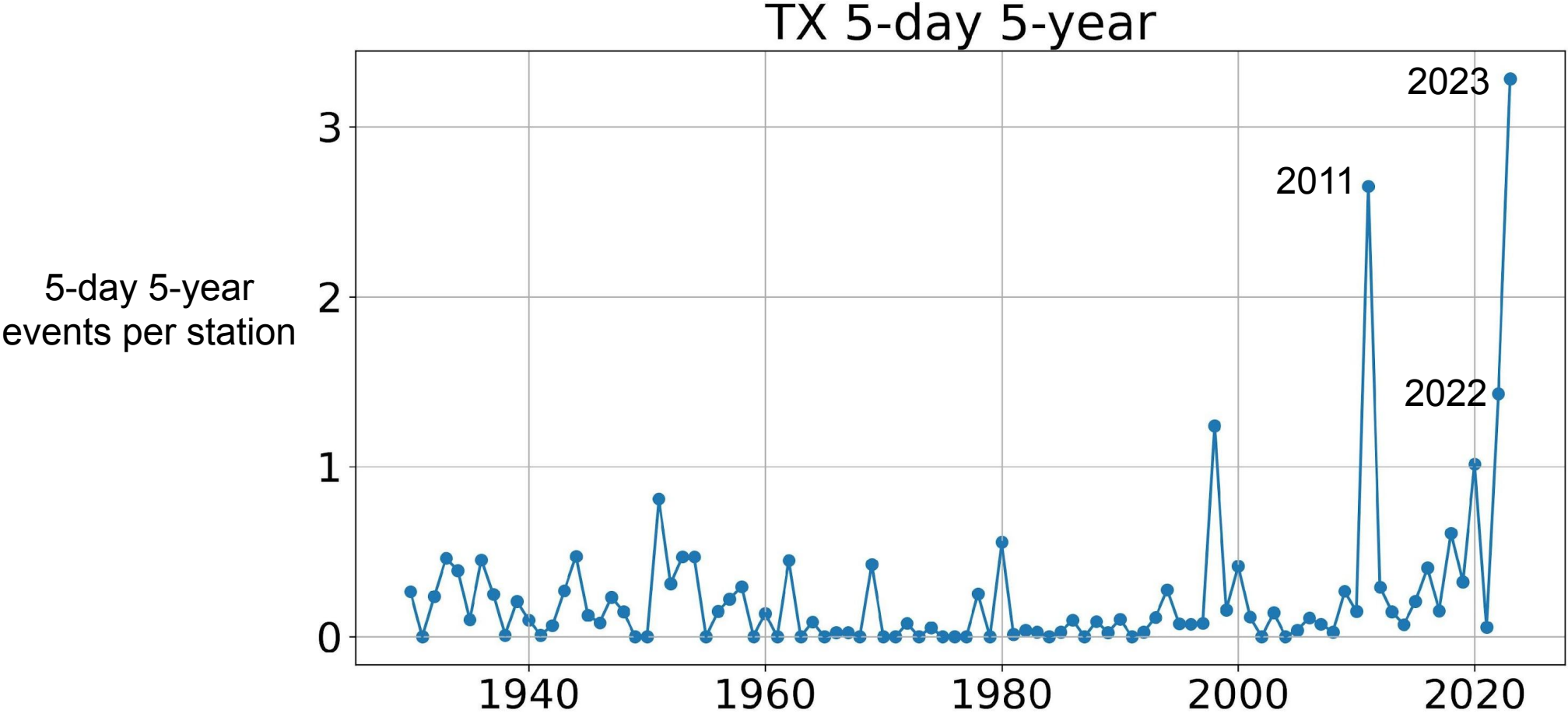
Summary

2023 joins 2011 and 2022 as the hottest summers on record for Texas (and Louisiana)

The strong El Niño probably did not contribute, but the record warm Atlantic and Gulf of Mexico probably did

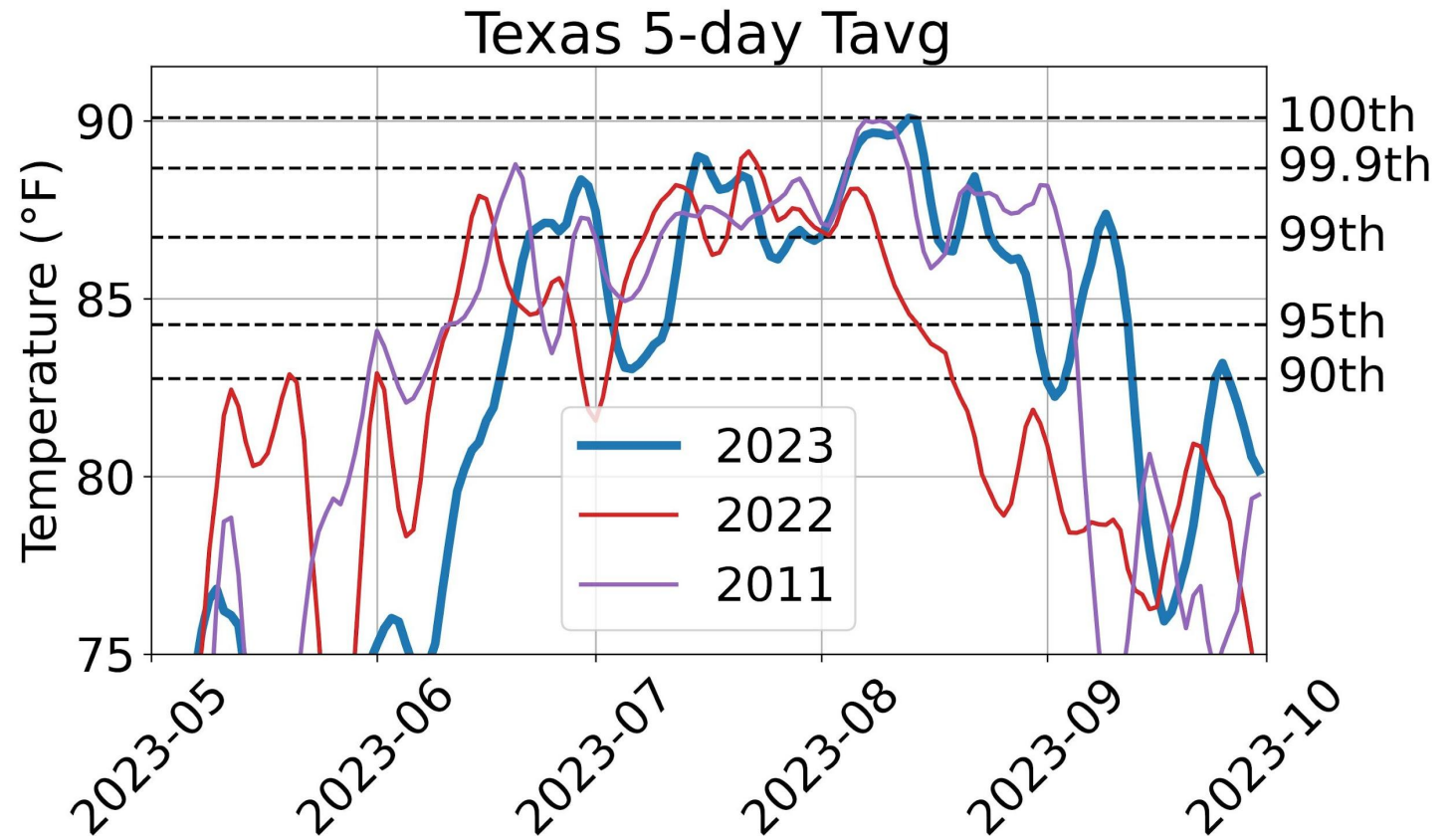
Temperature remains correlated with precipitation deficit, but the relationship has warmed by about 1°C in recent decades

2023 set a record for 5-day 5-year events in Texas

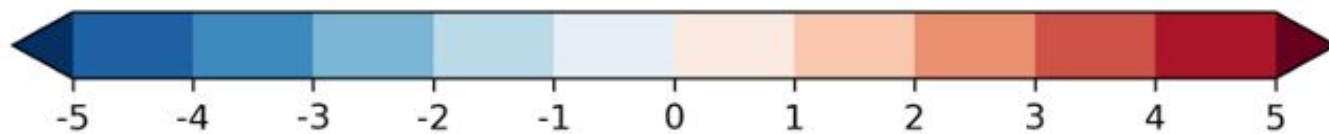
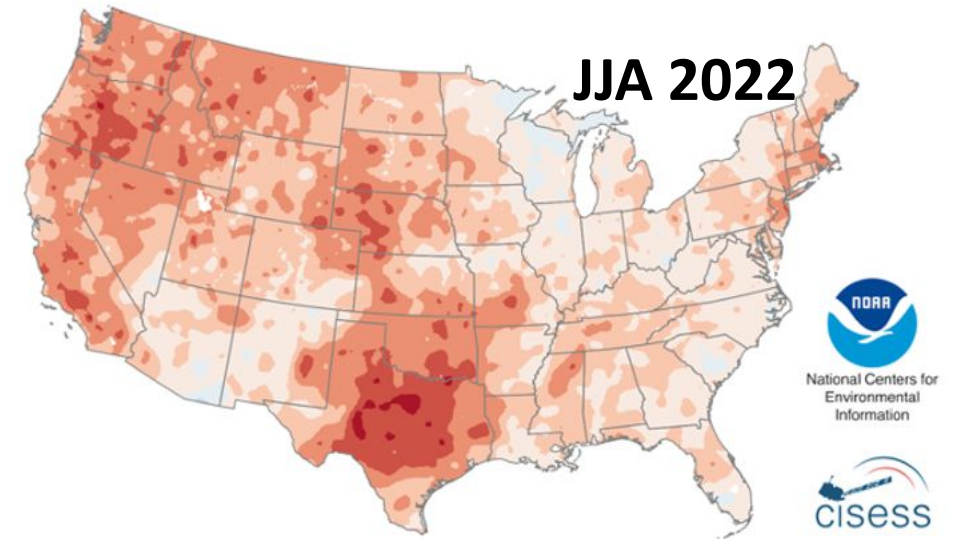
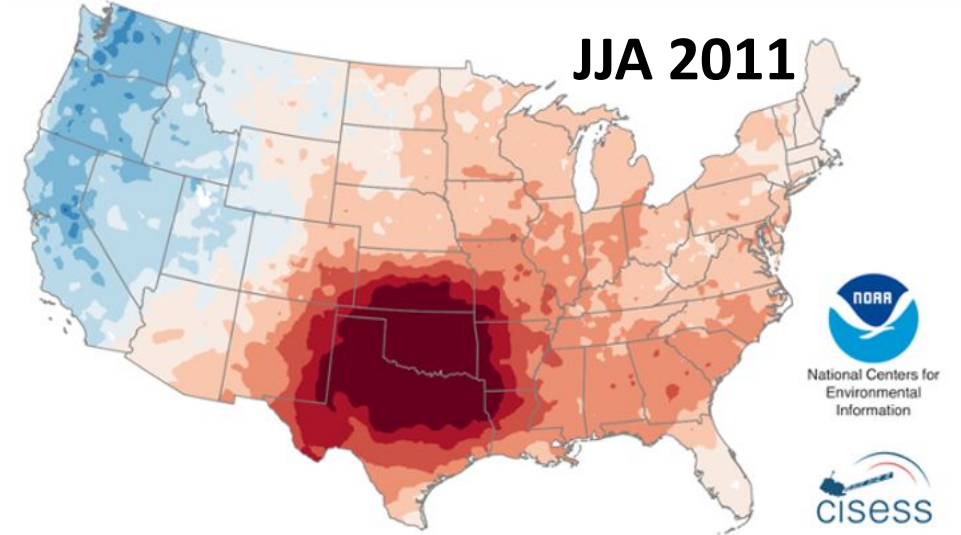
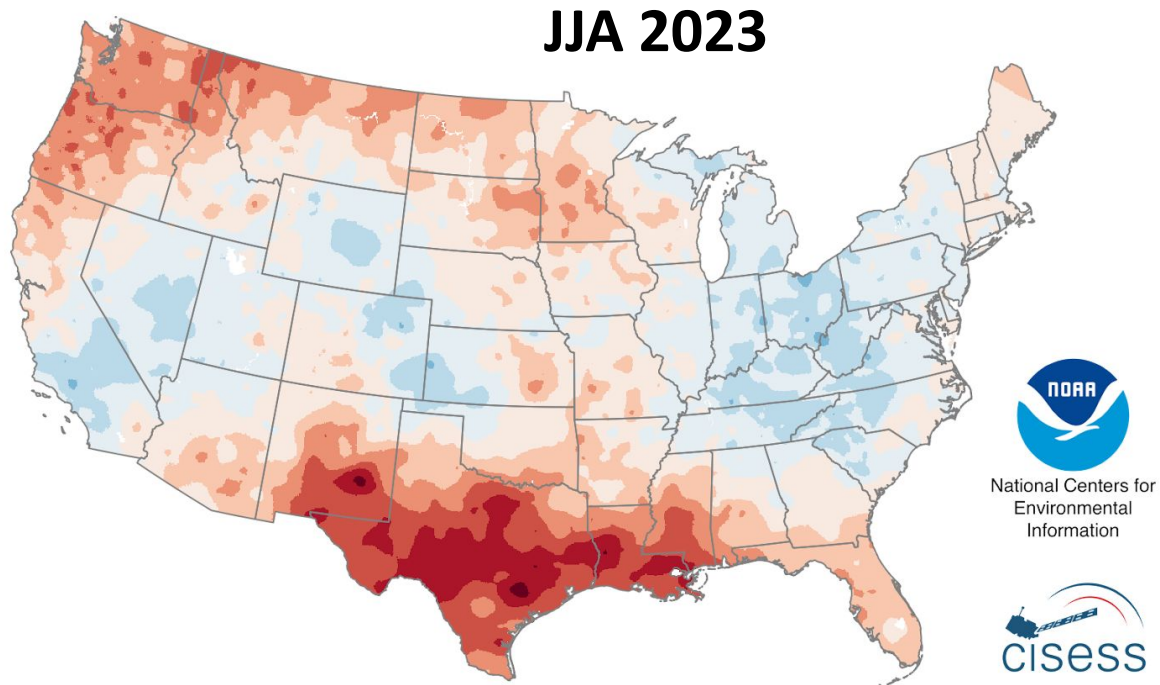


Texas mean temperature was more extreme for longer in 2023

- More days about the **99.9th** percentile in 2023 than in 2011
- **2023** had a later start in June
- **2022** had an earlier end in August
- **2011** was more persistent



2011 was more sustained, 2022 was more widespread

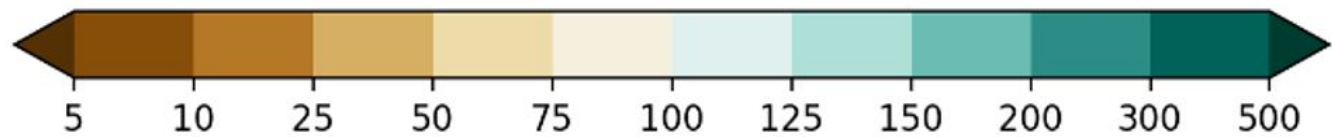
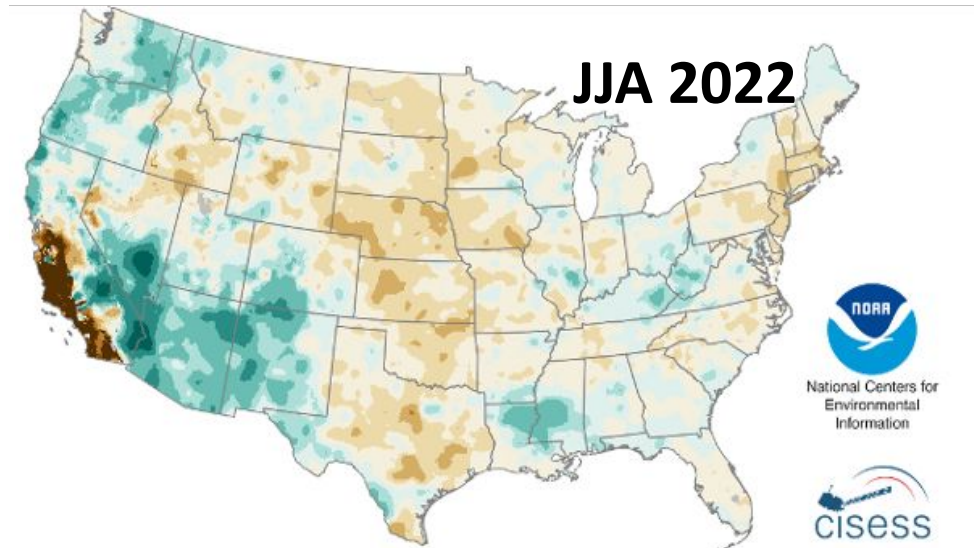
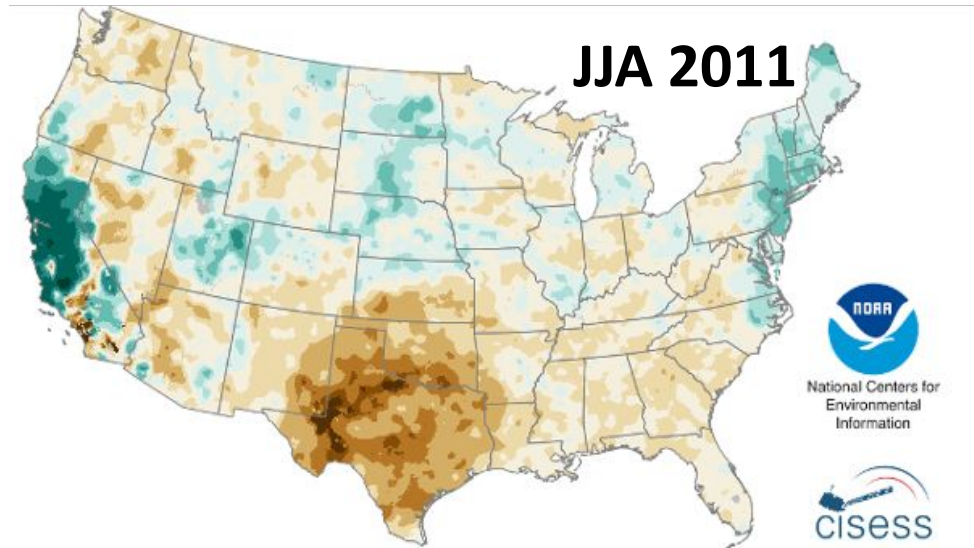
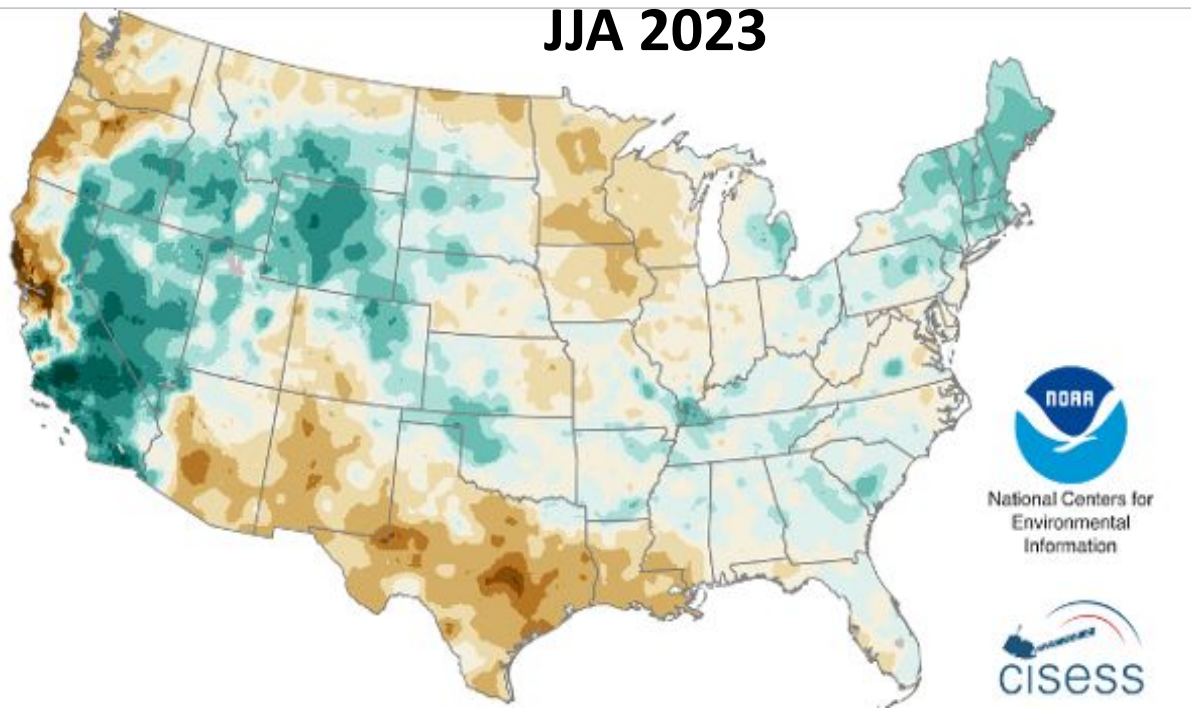


Created: Tue Sep 12 2023
Scaled data

Degrees Fahrenheit

Data Source: 5km Gridded
nClimGrid-Daily v1-0-0

Heat aligns with dry conditions

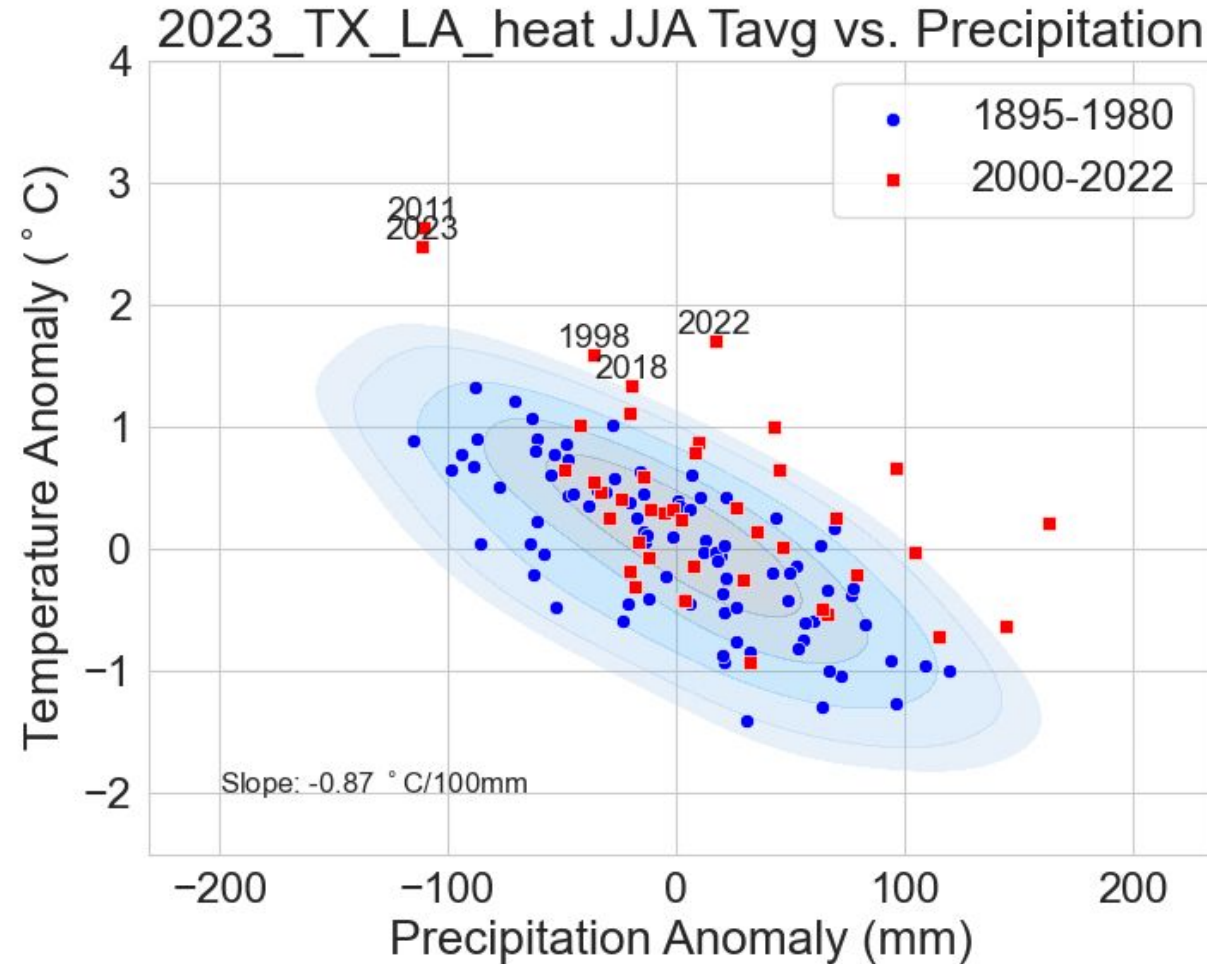


Percent

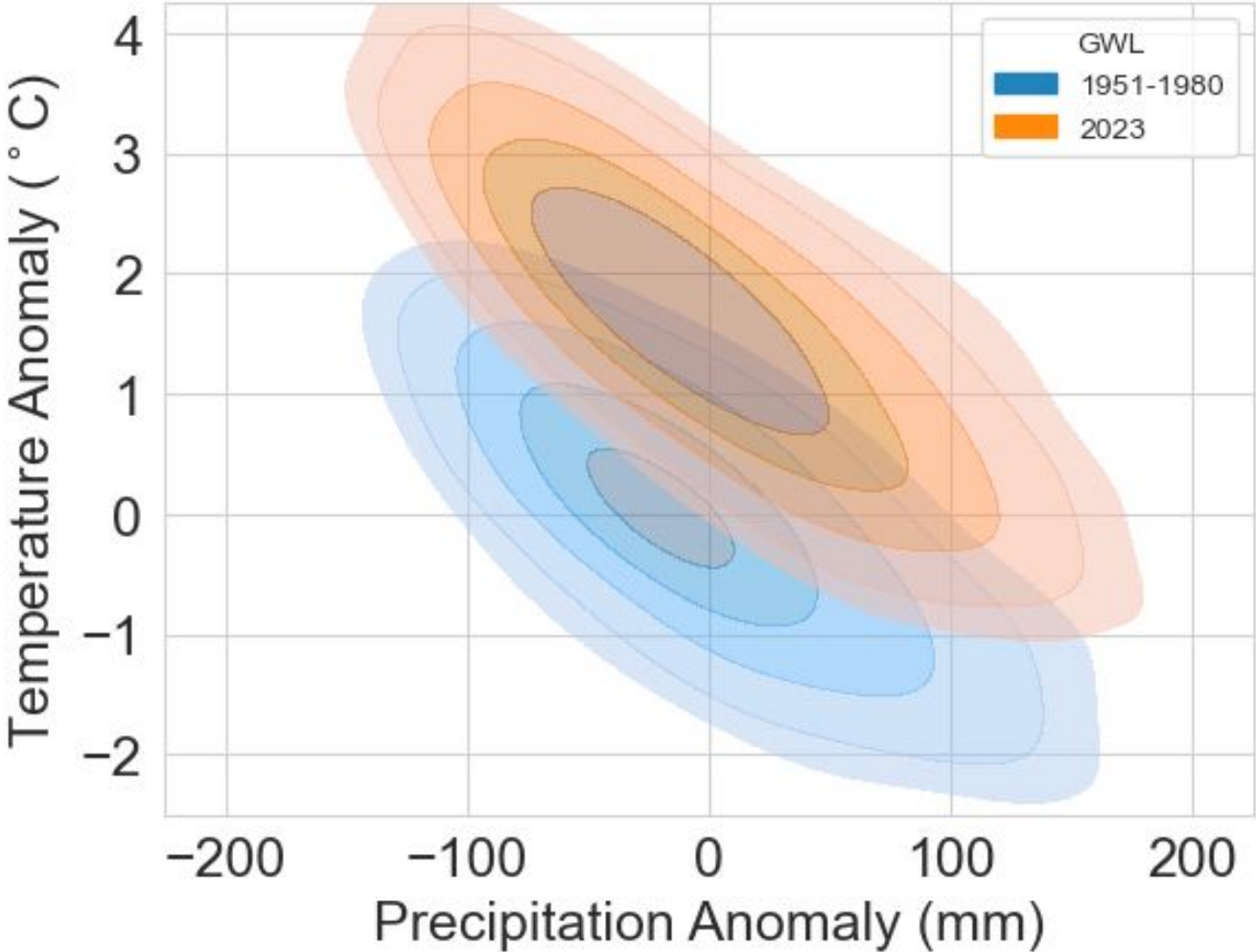
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In recent decades, observed temperatures have been warmer by about a degree Celsius, for a given precipitation deficit



Climate models show the same physical relationship between seasonal precipitation and temperature with increasing temperature for a given precipitation anomaly.

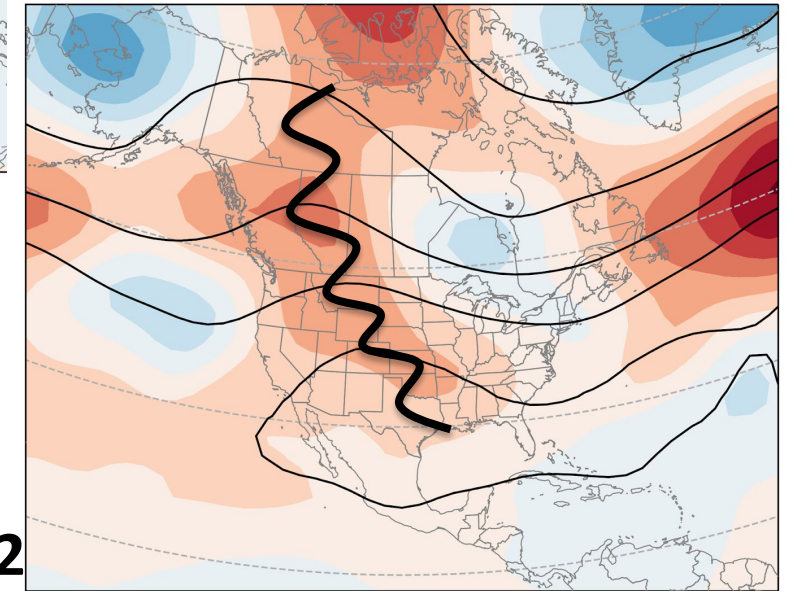
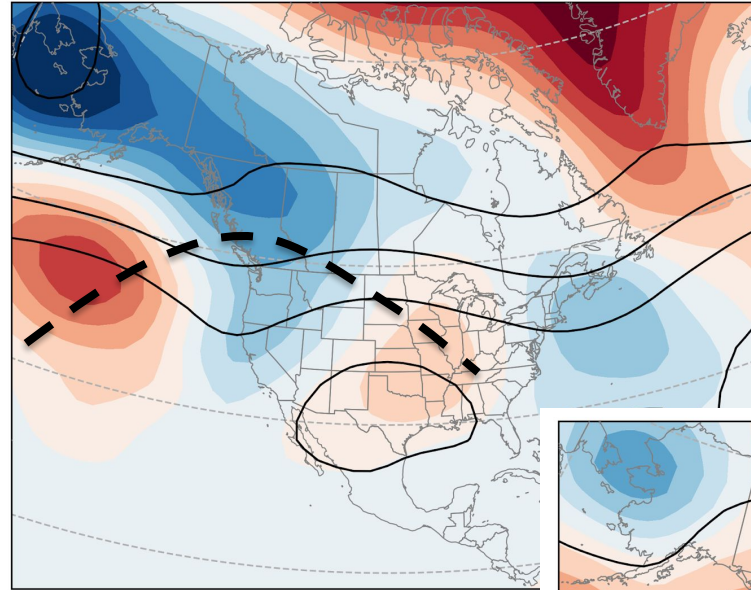


GFDL-SPEAR Climate Model Large Ensemble

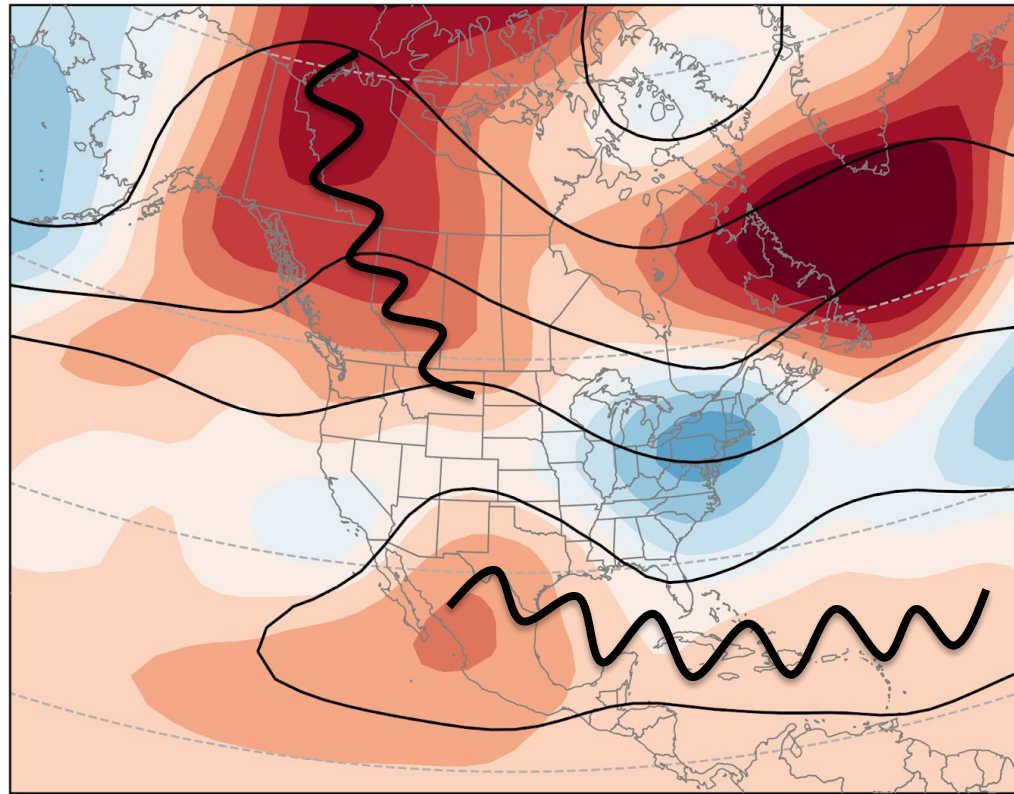
Ridging extended from the Atlantic to Northwest Canada

JJA 2023

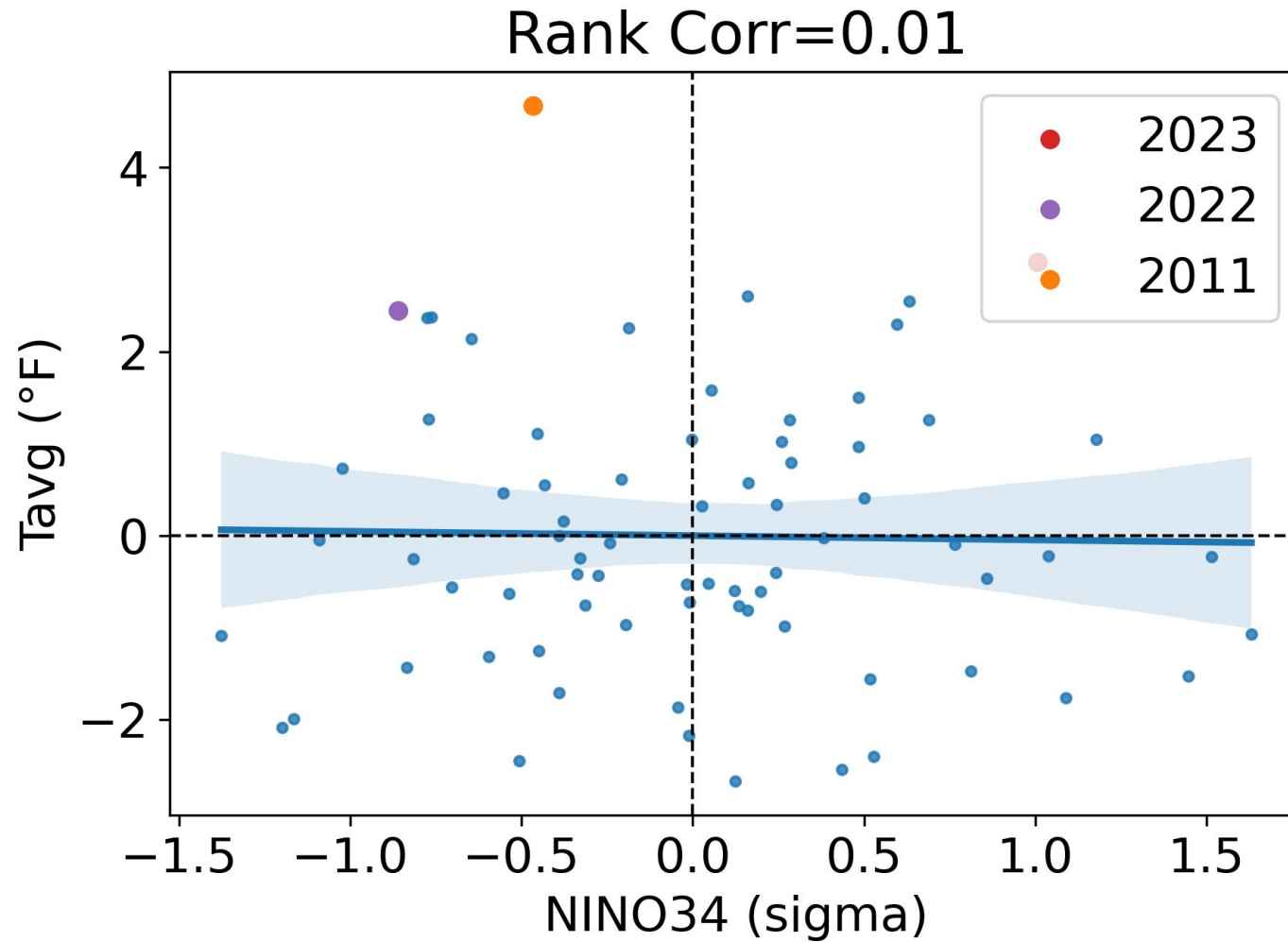
JJA 2011



JJA 2022

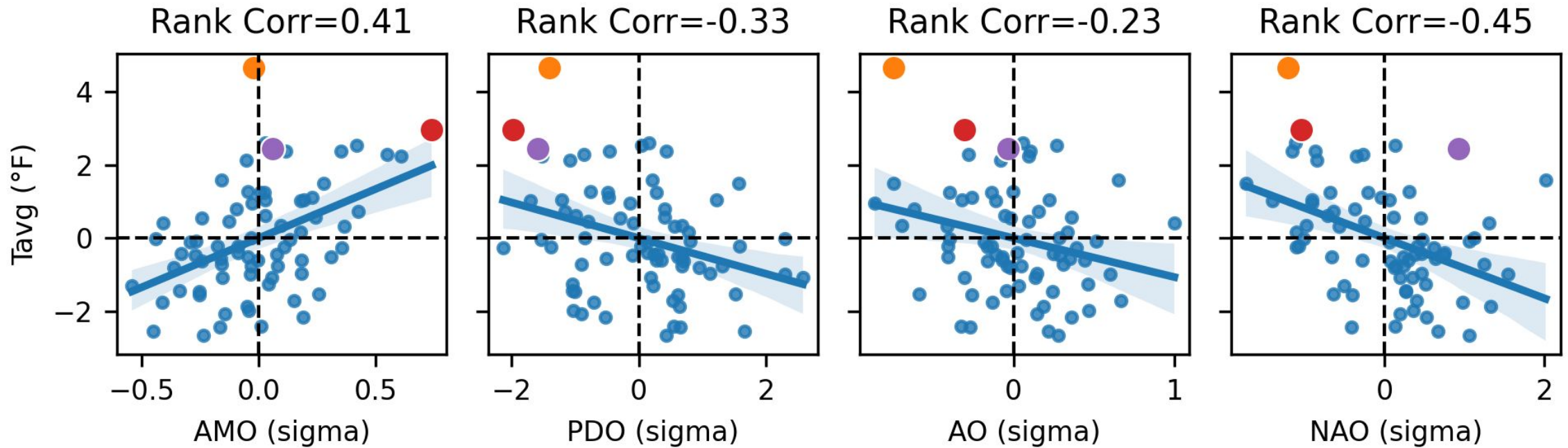


No **detrended** relationship between Texas summer temperature and ENSO

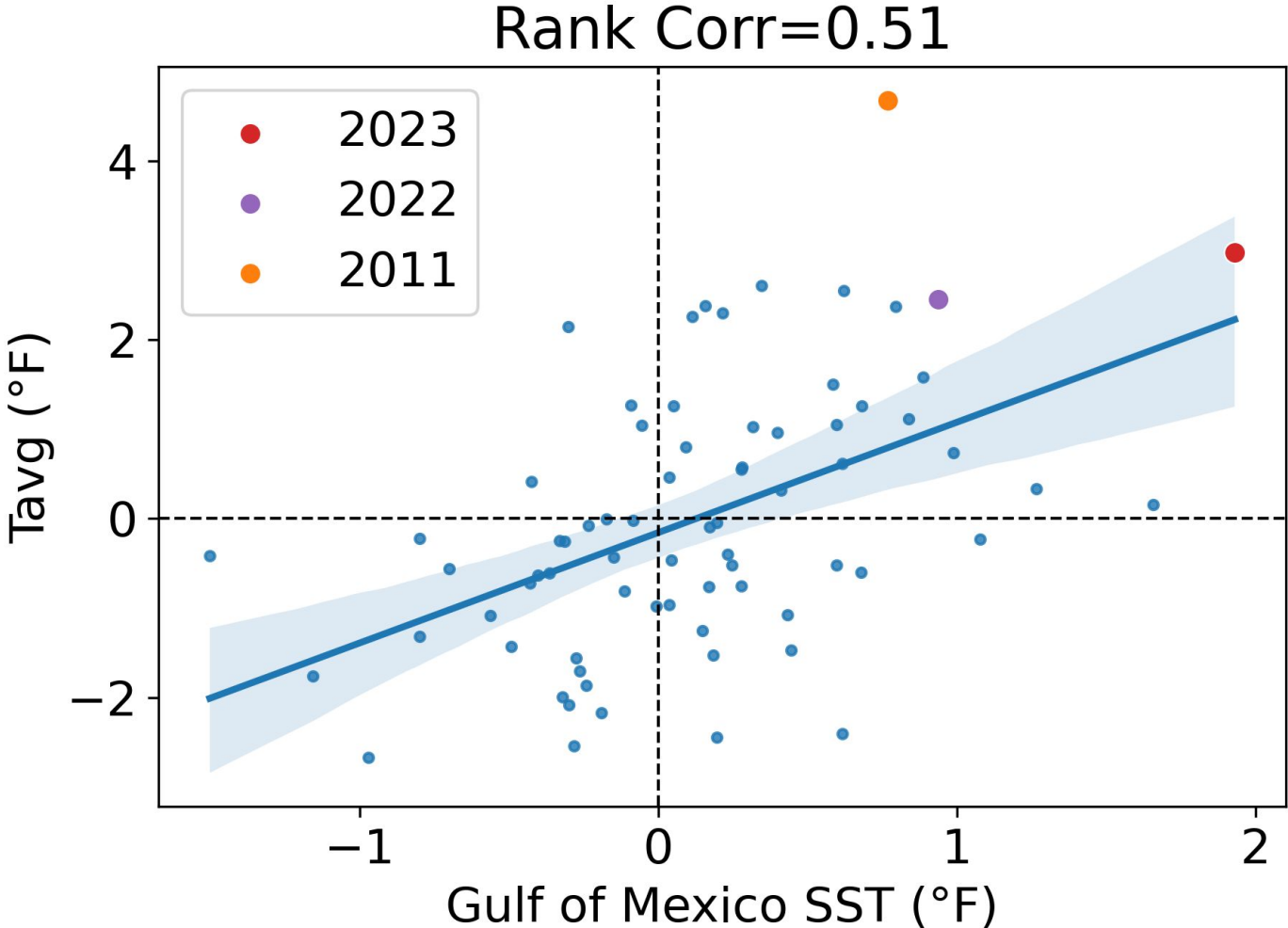


Positive correlation with AMO

Negative with PDO, AO, and NAO

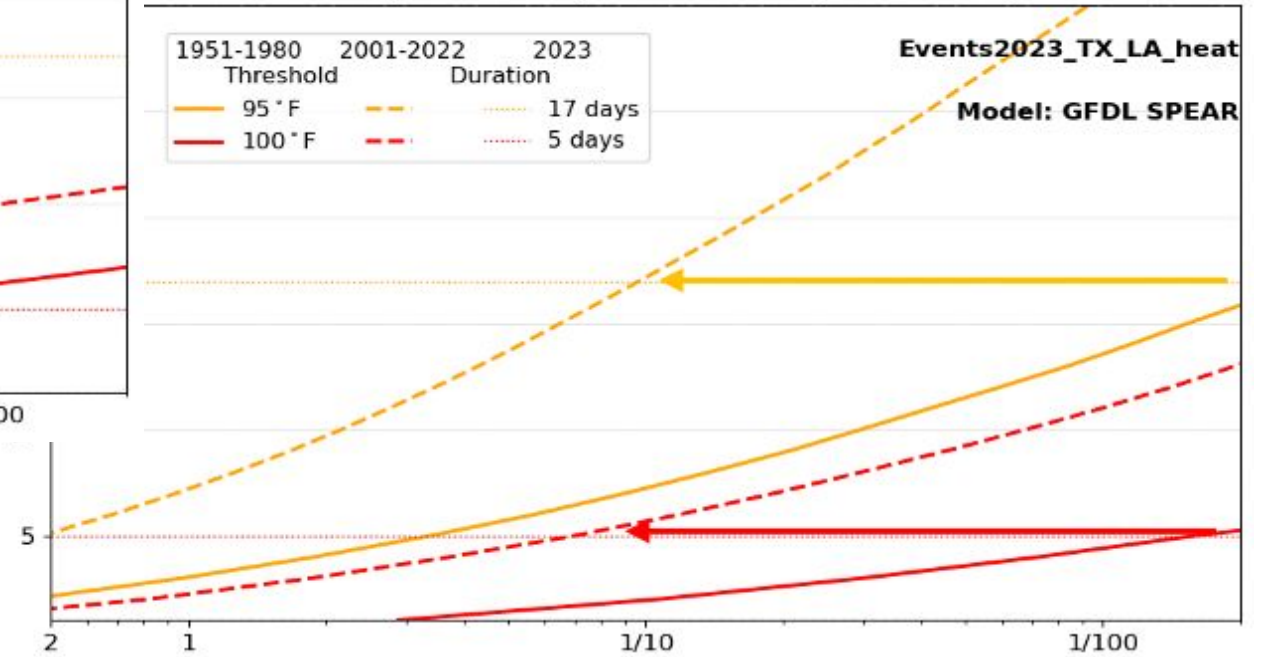
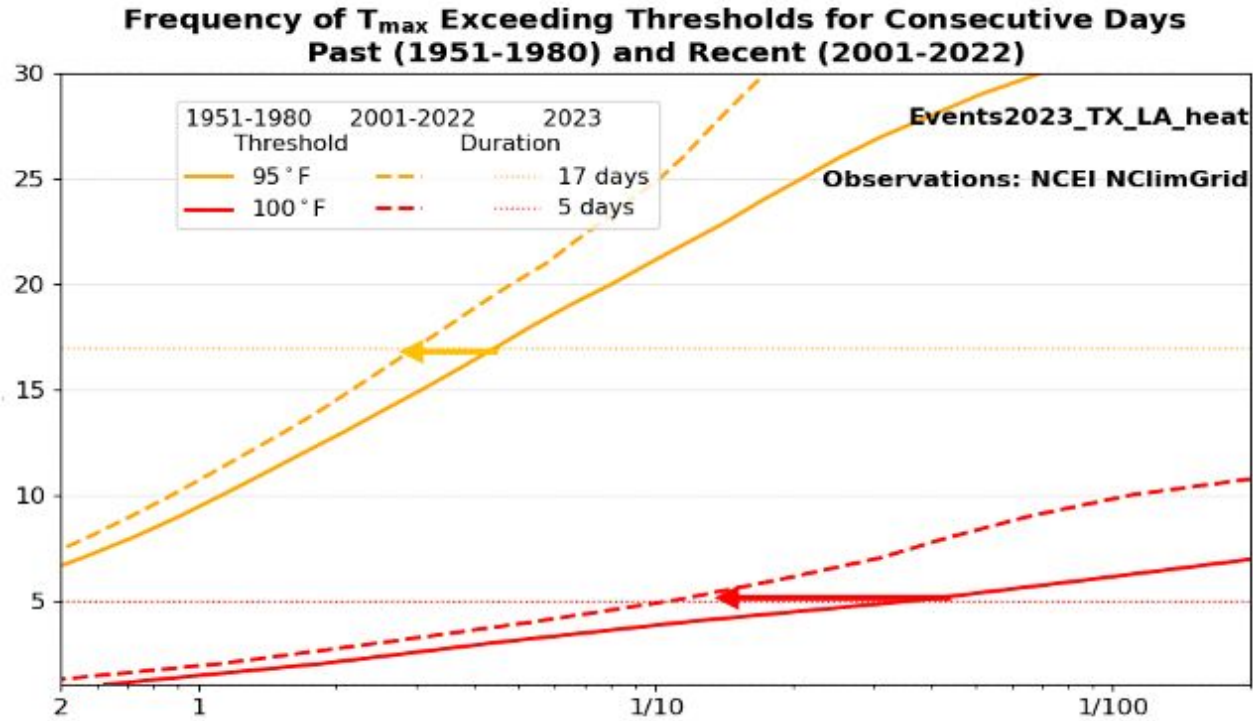


Strong correlation with record Gulf of Mexico heat



Probability of the observed runs of consecutive days over a threshold has increased in both models and observations

Consecutive Days



Annual Probability (1/return period)

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