

Climate Change in Arizona

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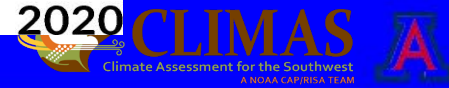
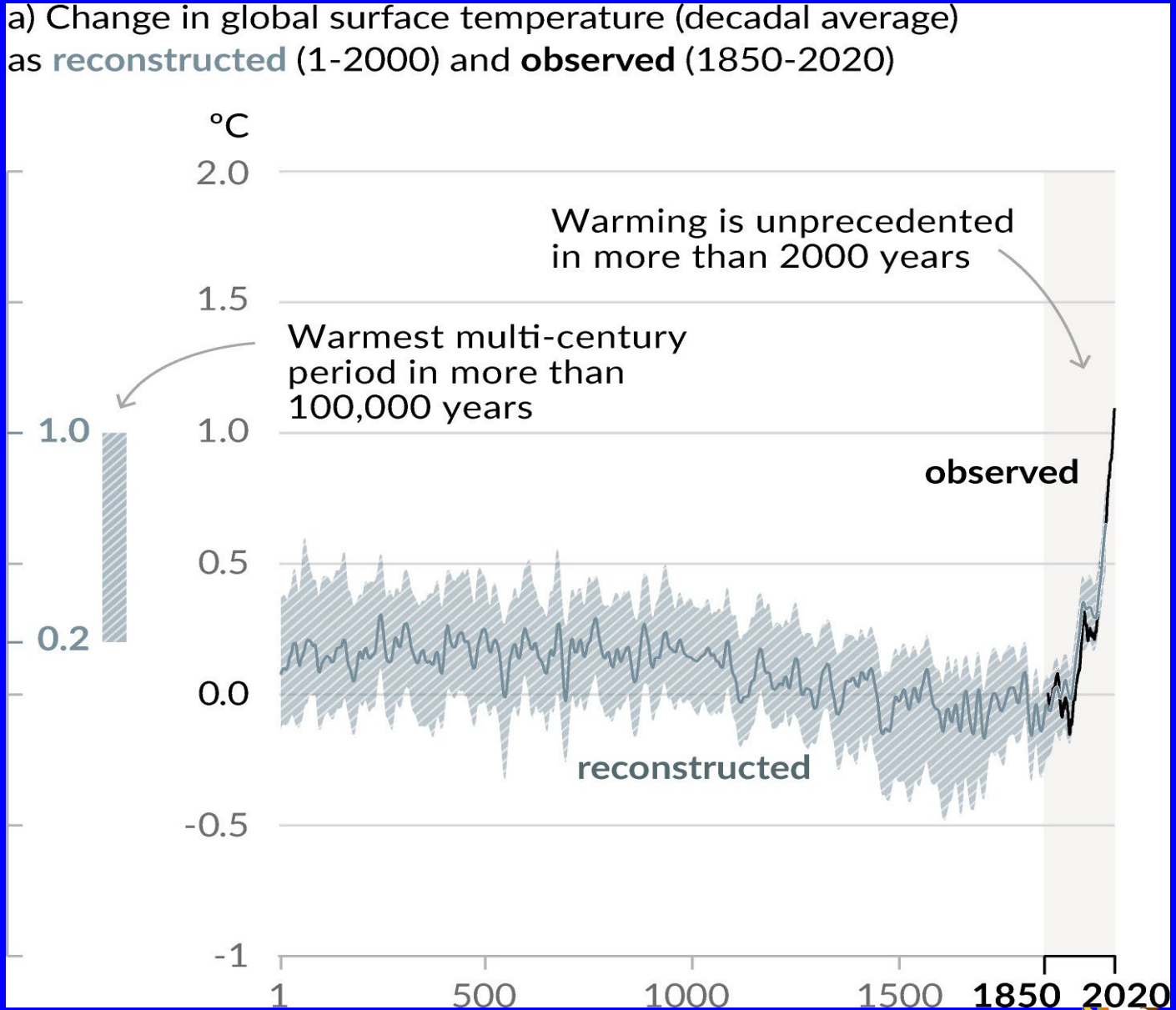
The University of Arizona



How has climate changed and how do we know what is causing it?

Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years

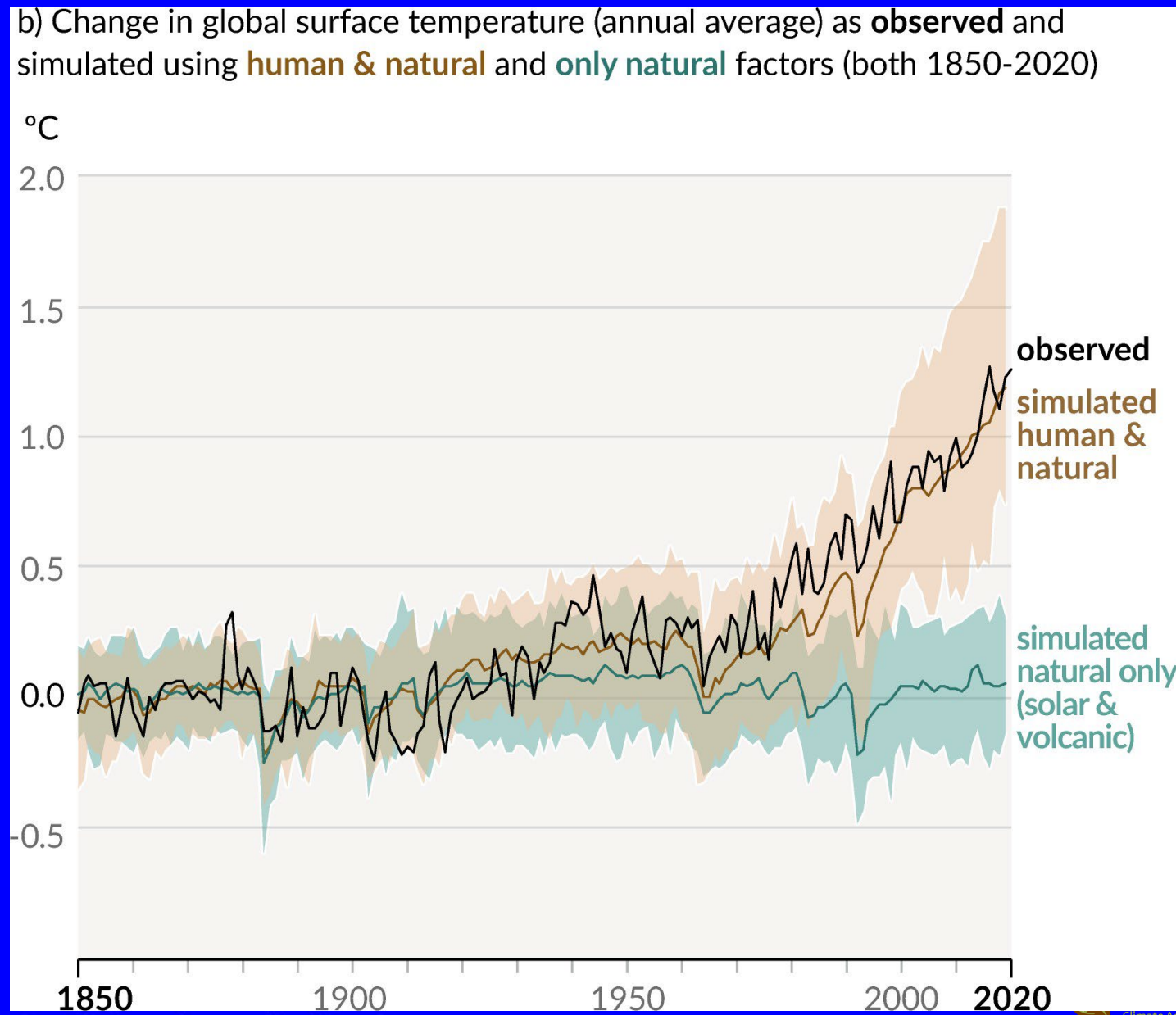
Figure SPM.1
IPCC AR6,
2021



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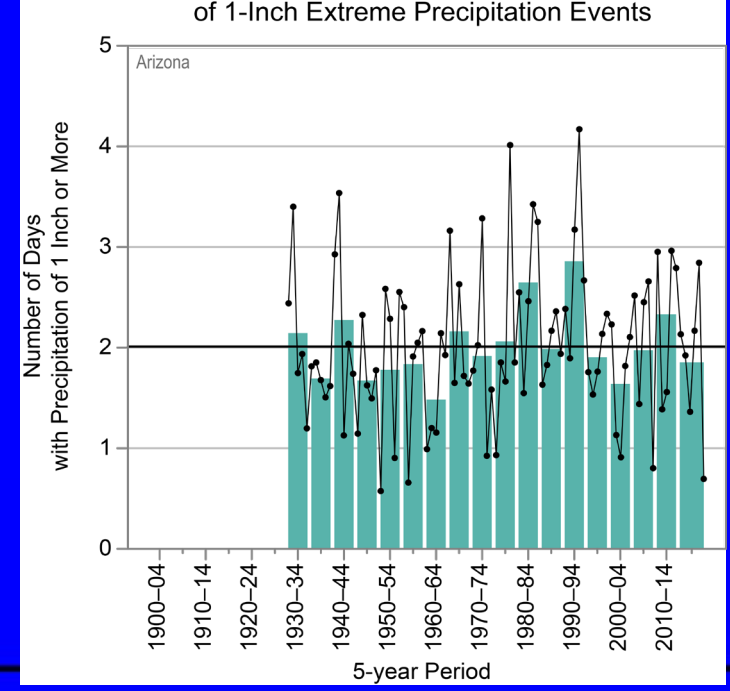
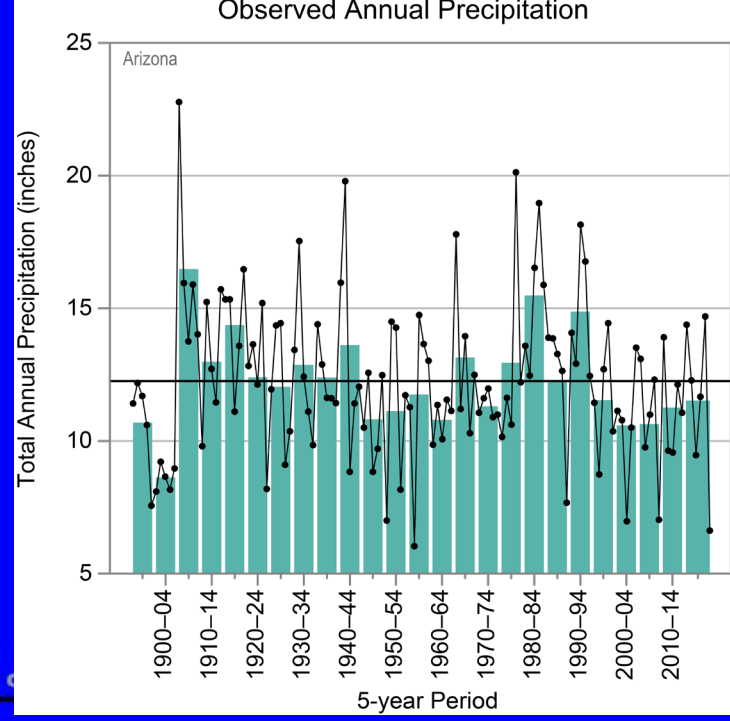
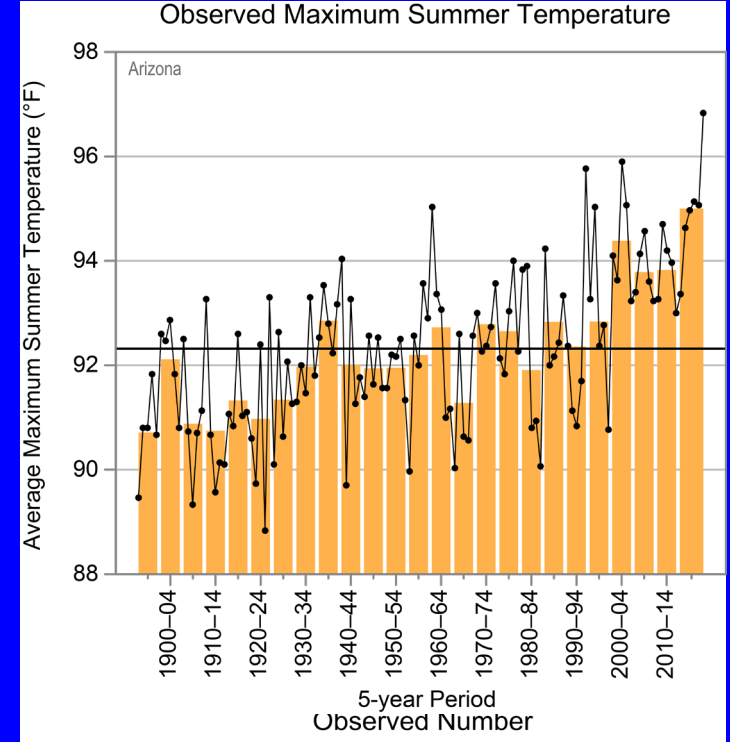
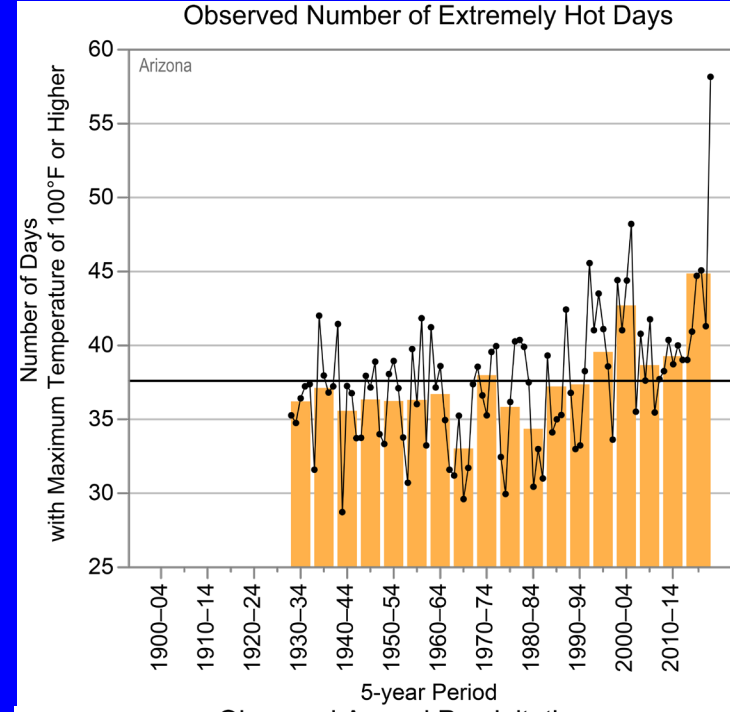


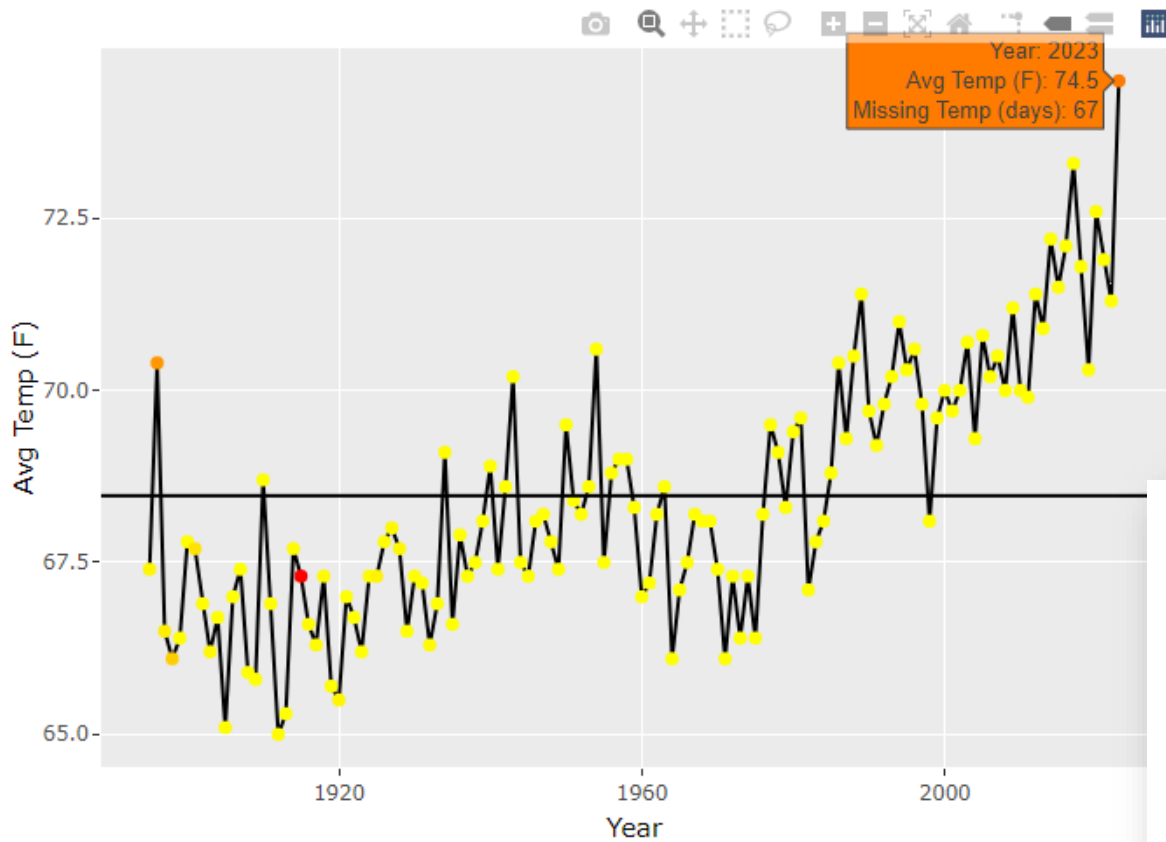
How has climate changed in Arizona?

Temperatures →

<https://statesummaries.ncics.org/chapter/az/>

Precipitation →



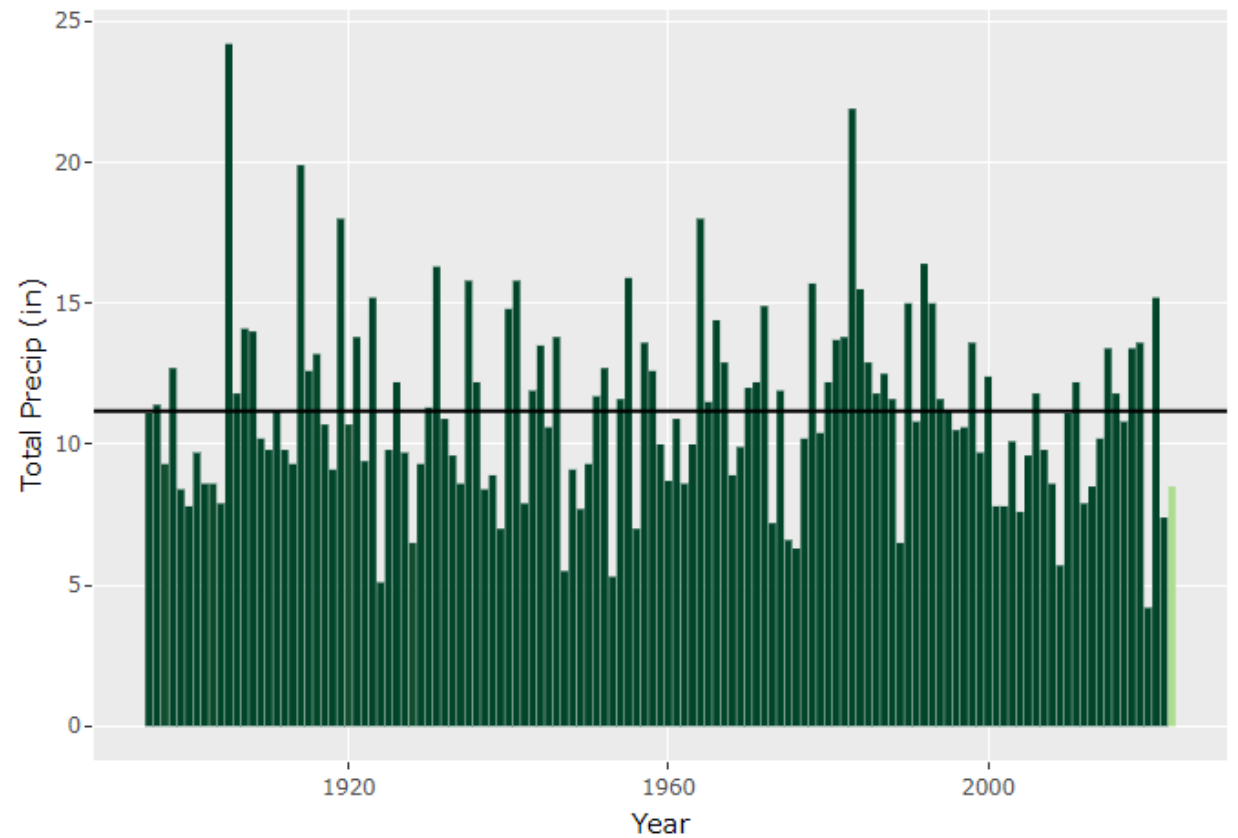


Tucson Annual Average Temperature

<https://caes.arizona.edu/climate/misc/stations/calYear/Tucson%20Area/stationHistory.html>

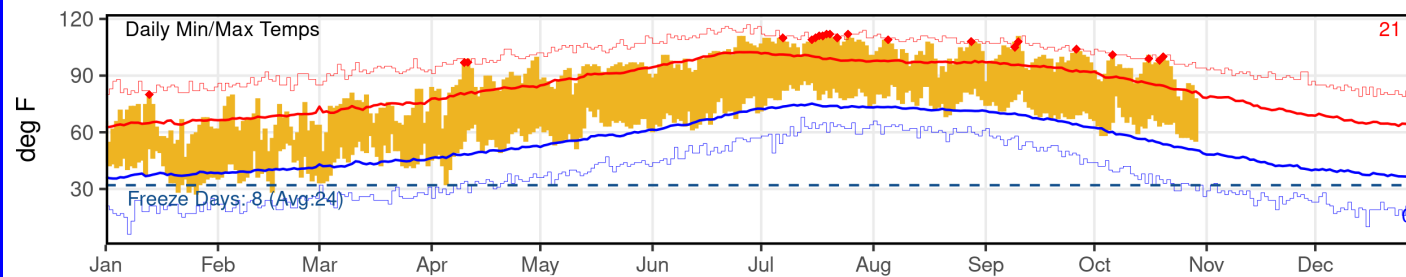
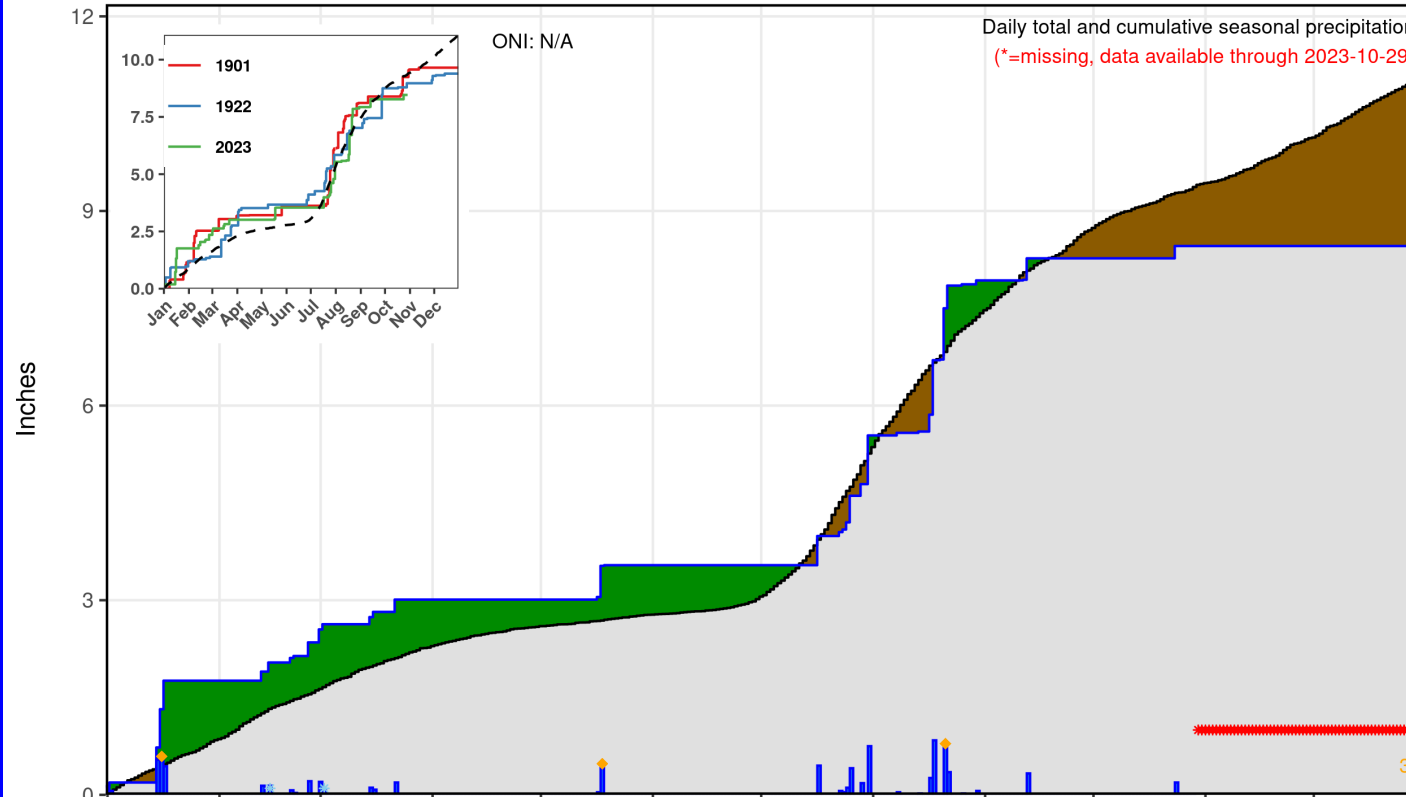
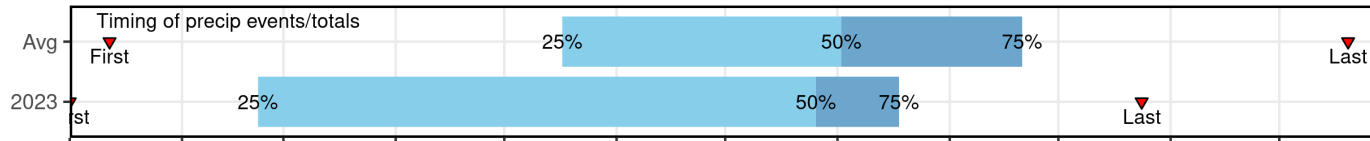
How has climate changed in Tucson?

Tucson Annual Total Precipitation



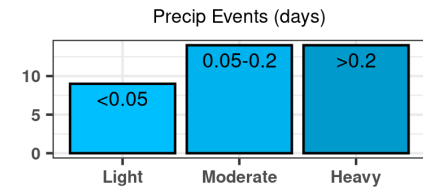
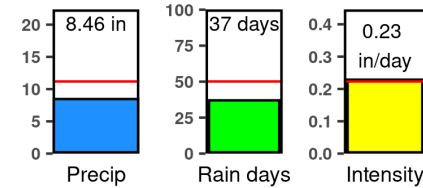
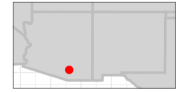
Tucson Climate: 2023

Station Climate Summary: 01-01-2023 to 12-31-2023 (Calendar Year)



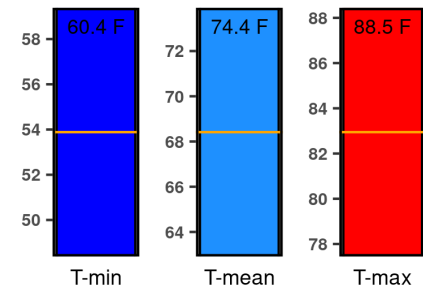
Tucson Area

Elevation (ft):
 Period of record: 1895-2023
 Years in record: 129
 Precip rank: 106 (1-wettest)
 Temp rank: 1 (1-warmest)
 Missing in 2023: 63
 Total snow (in): 1.5 (155 % avg)



Dry Spells

Avg length: 8 days (avg: 6)
 Max length: 63 days (avg: 62)



Data from <http://www.rcc-acis.org/>
 Plot created: 10-30-2023
 The University of Arizona
<https://cals.arizona.edu/climate/>

<https://cales.arizona.edu/climate/misc/stations/index.html>

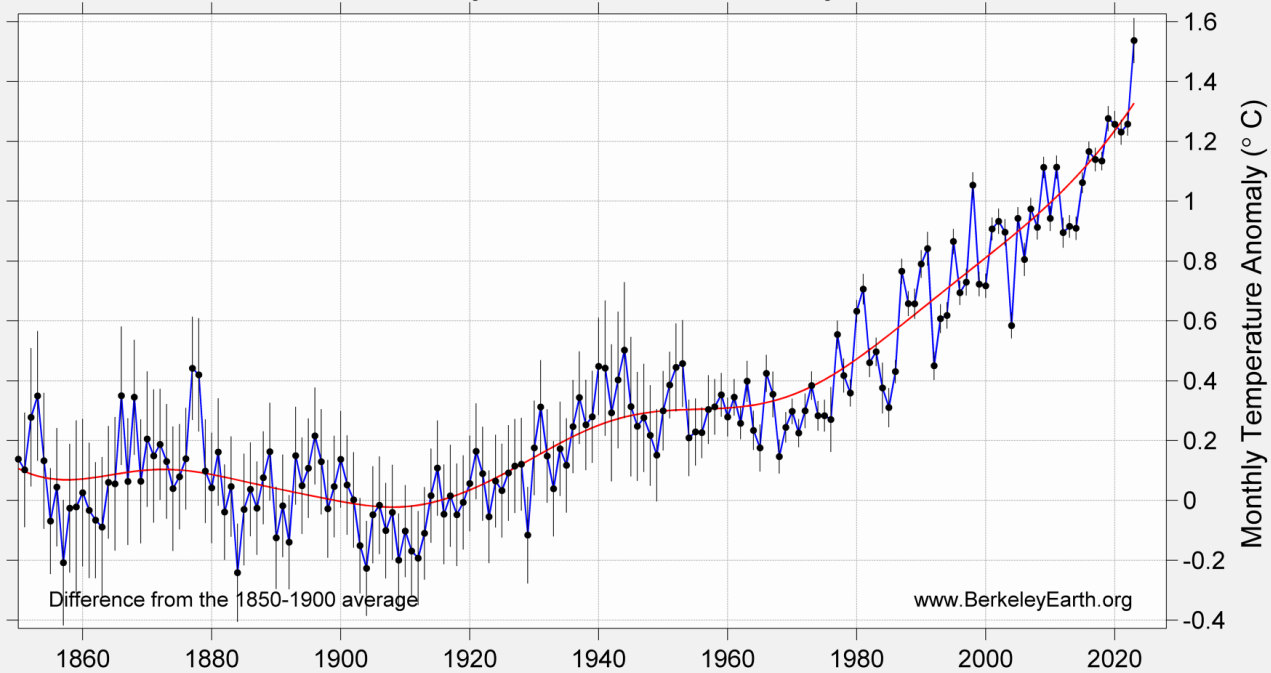


Climate Science Applications Program



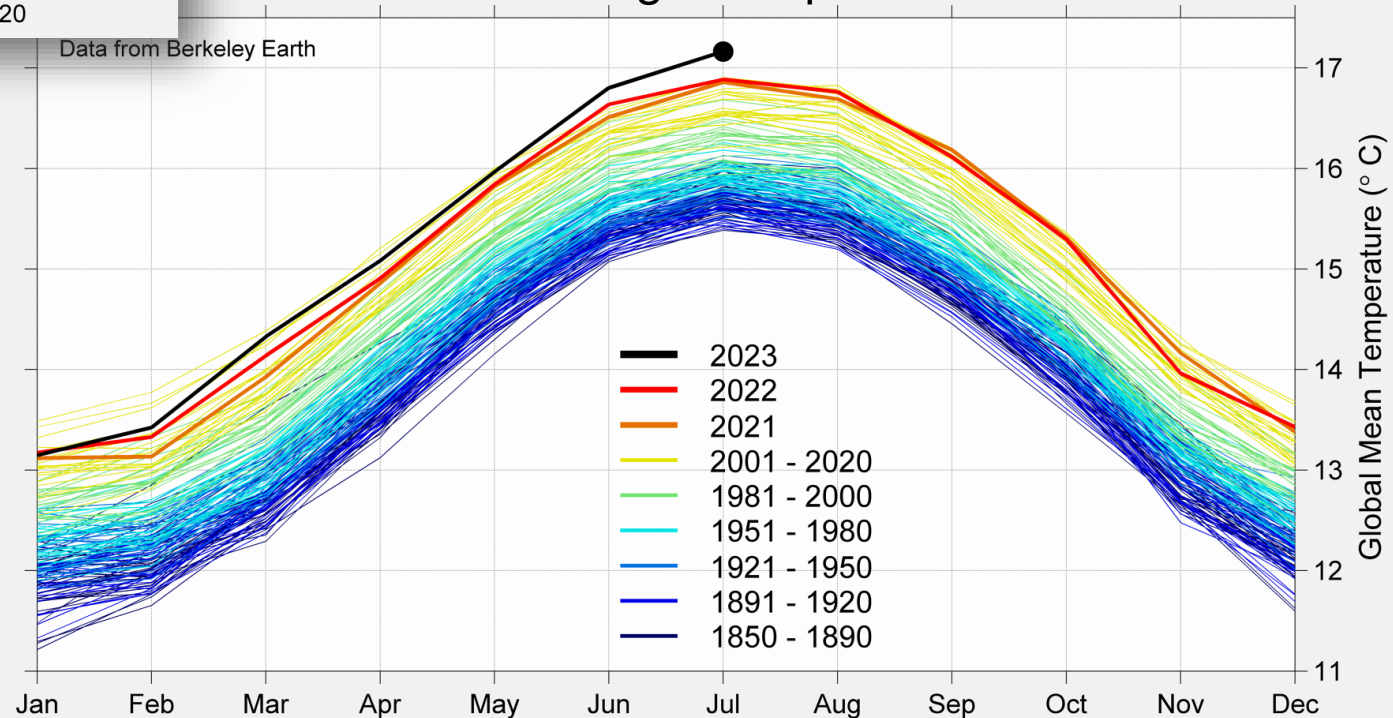
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Berkeley Earth - Global - July



Record breaking temperatures – July 2023

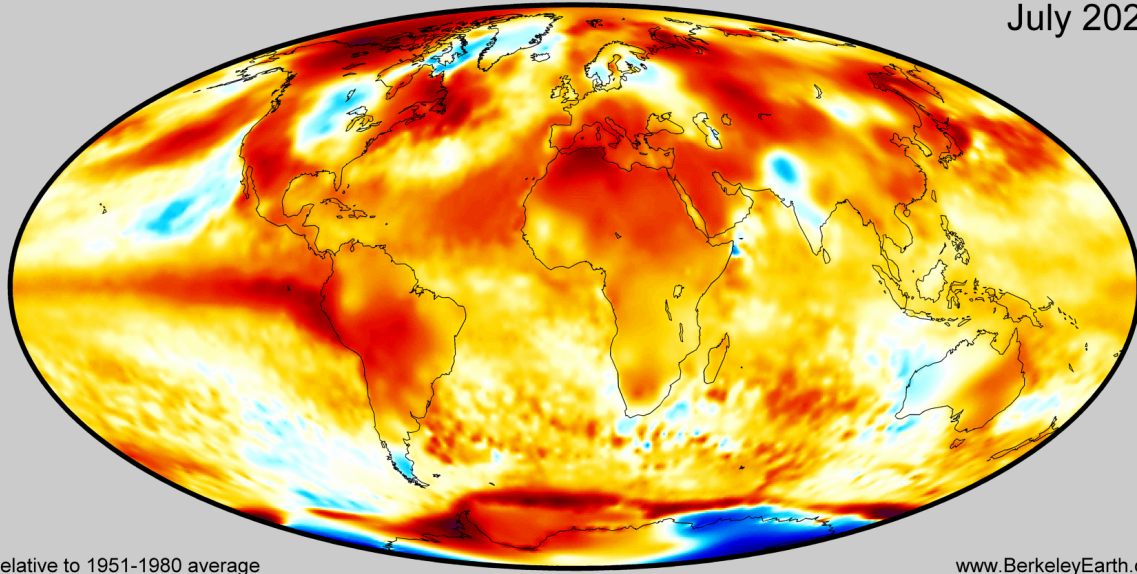
Earth's Average Temperature



<https://berkeleyearth.org/july-2023-temperature-update/>

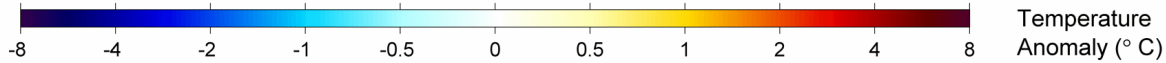


July 2023



Relative to 1951-1980 average

www.BerkeleyEarth.org

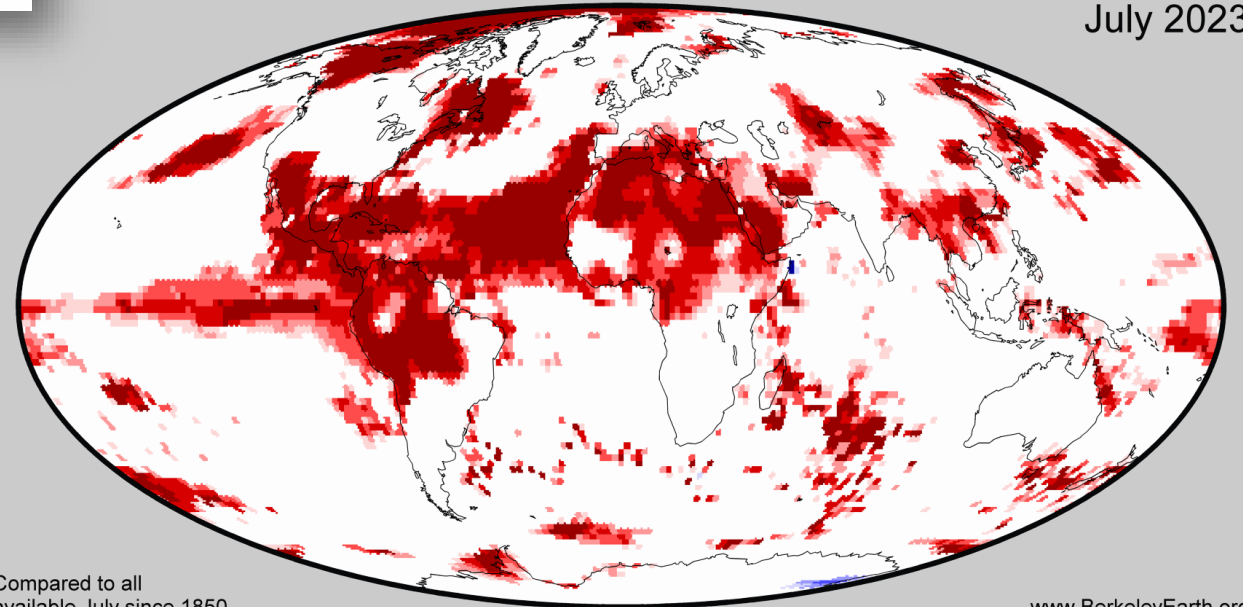


Temperature Anomaly (° C)

Record breaking temperatures – July 2023

<https://berkeleyearth.org/july-2023-temperature-update/>

July 2023



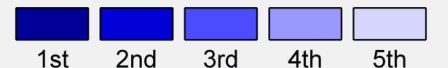
Compared to all available July since 1850

www.BerkeleyEarth.org

Warmest



Coldest

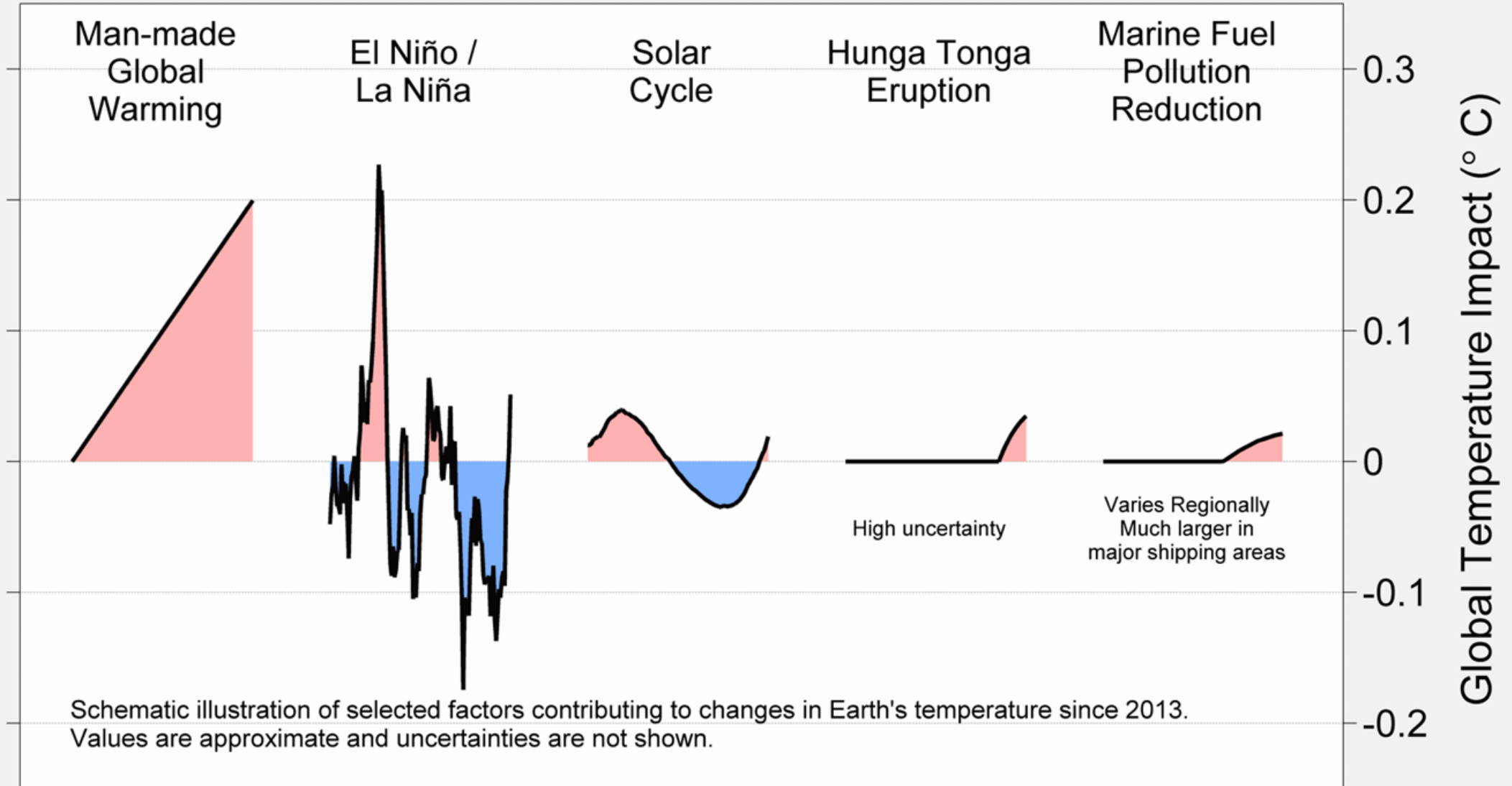


CSAP

Climate Science Applications Program - University of Arizona Cooperative E

Why so warm so fast this year?

Factors Contributing to Global Temperature Change - Last 10 Years

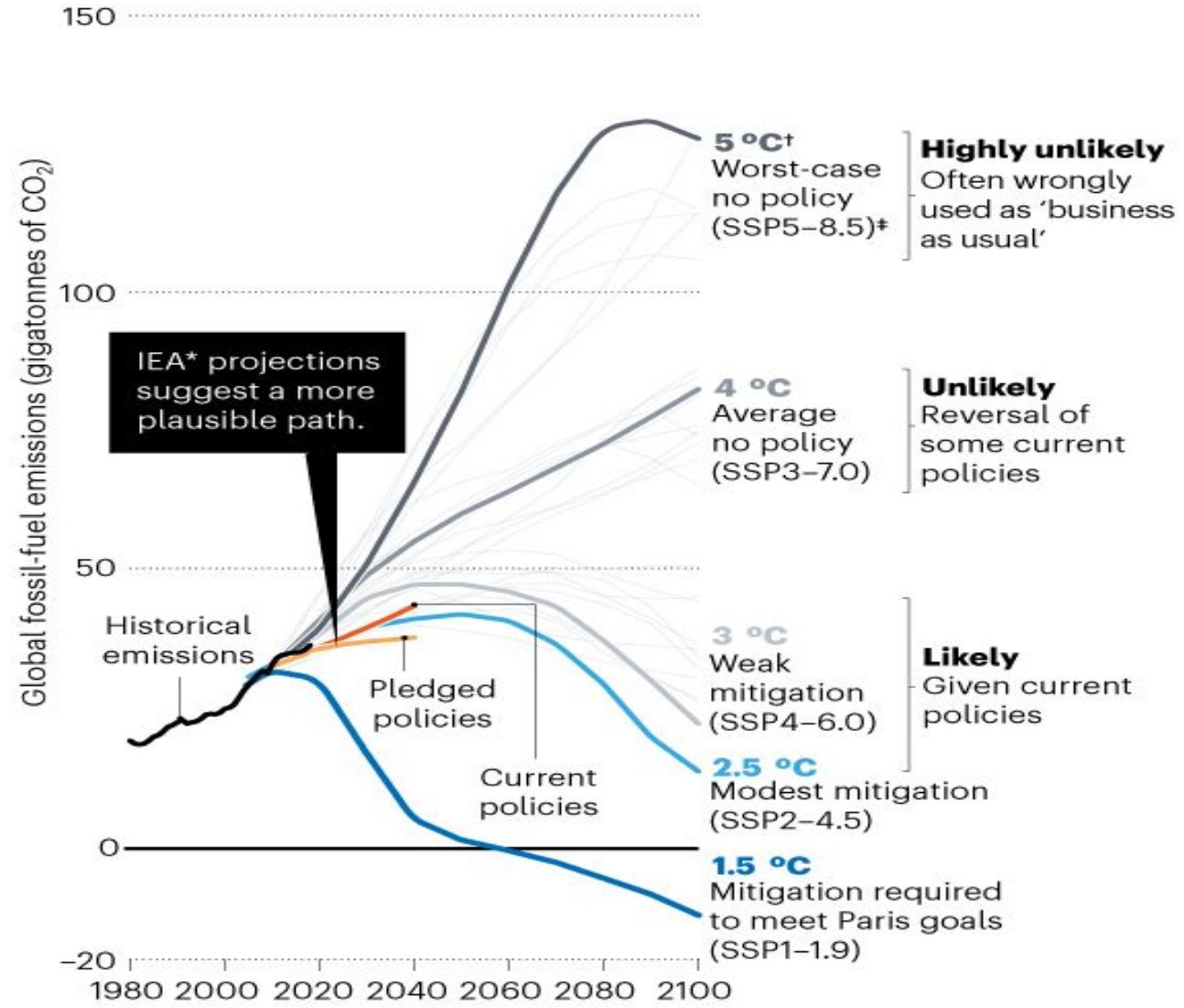


Schematic illustration of selected factors contributing to changes in Earth's temperature since 2013. Values are approximate and uncertainties are not shown.

How might climate change into the future?

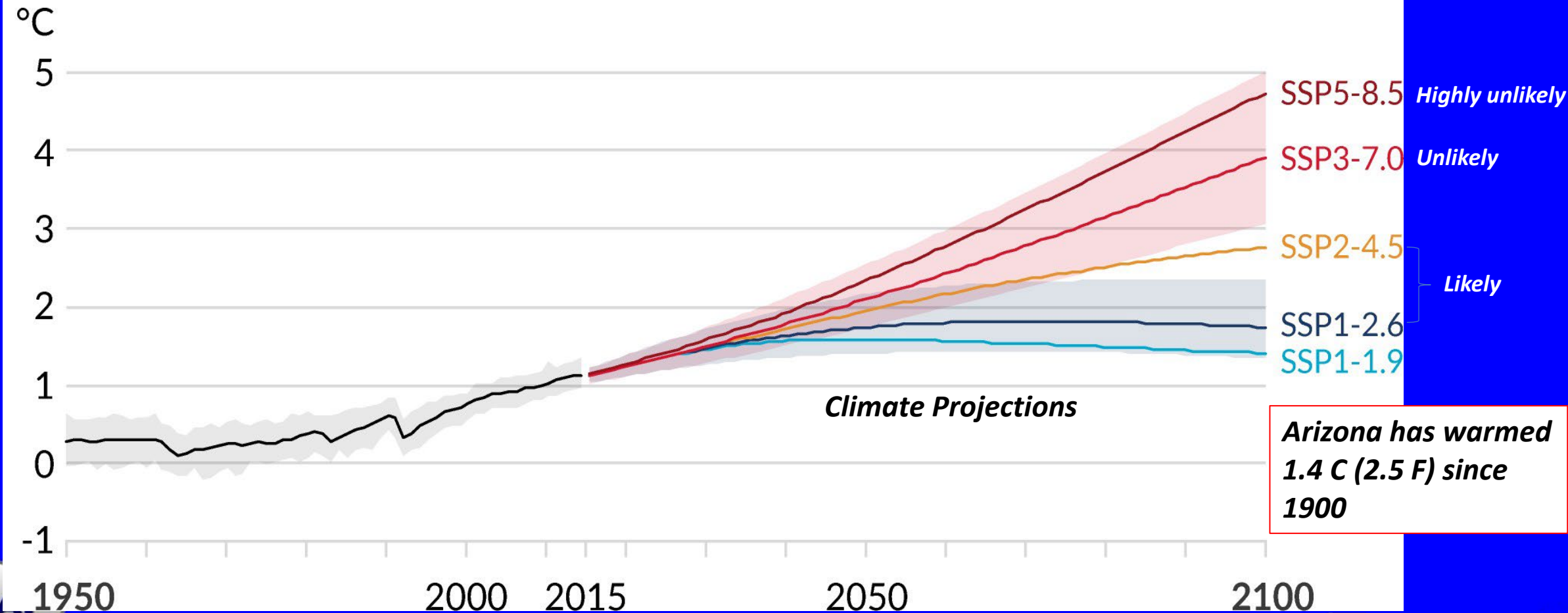
POSSIBLE FUTURES <https://www.nature.com/articles/d41586-020-00177-3>

The Intergovernmental Panel on Climate Change (IPCC) uses scenarios called pathways to explore possible changes in future energy use, greenhouse-gas emissions and temperature. These depend on which policies are enacted, where and when. In the upcoming IPCC Sixth Assessment Report, the new pathways (SSPs) must not be misused as previous pathways (RCPs) were. Business-as-usual emissions are unlikely to result in the worst-case scenario. More-plausible trajectories make better baselines for the huge policy push needed to keep global temperature rise below 1.5 °C.



How might climate change into the future?

a) Global surface temperature change relative to 1850-1900



IPCC AR6, 2021

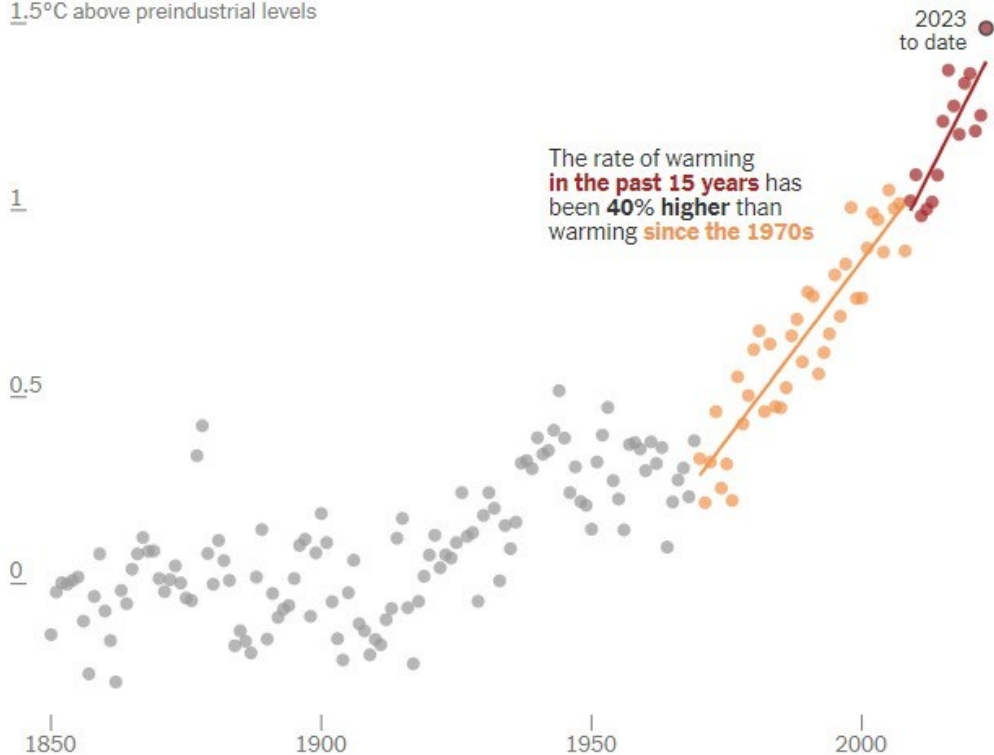
I Study Climate Change. The Data Is Telling Us Something New.

Oct. 13, 2023

Global warming may have accelerated in the past 15 years

Annual average temperatures since 1850

1.5°C above preindustrial levels

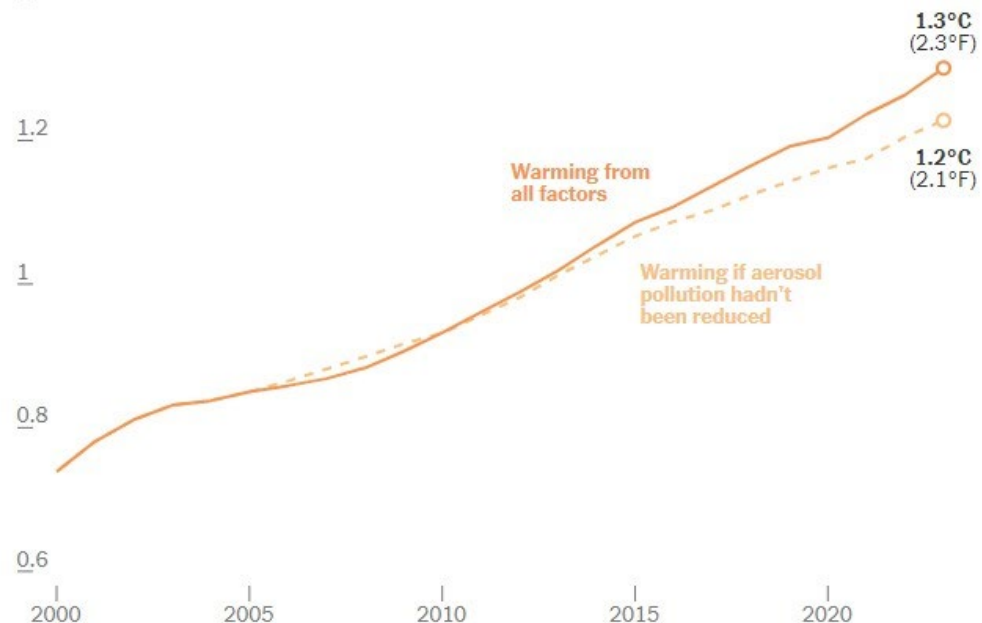


Source: Berkeley Earth Land/Ocean Temperature Record

Reducing aerosols in the atmosphere has quickened global warming

Recent global temperatures compared with estimates of what they might have been if aerosol pollution had continued at its 2005 level

1.4°C above preindustrial levels

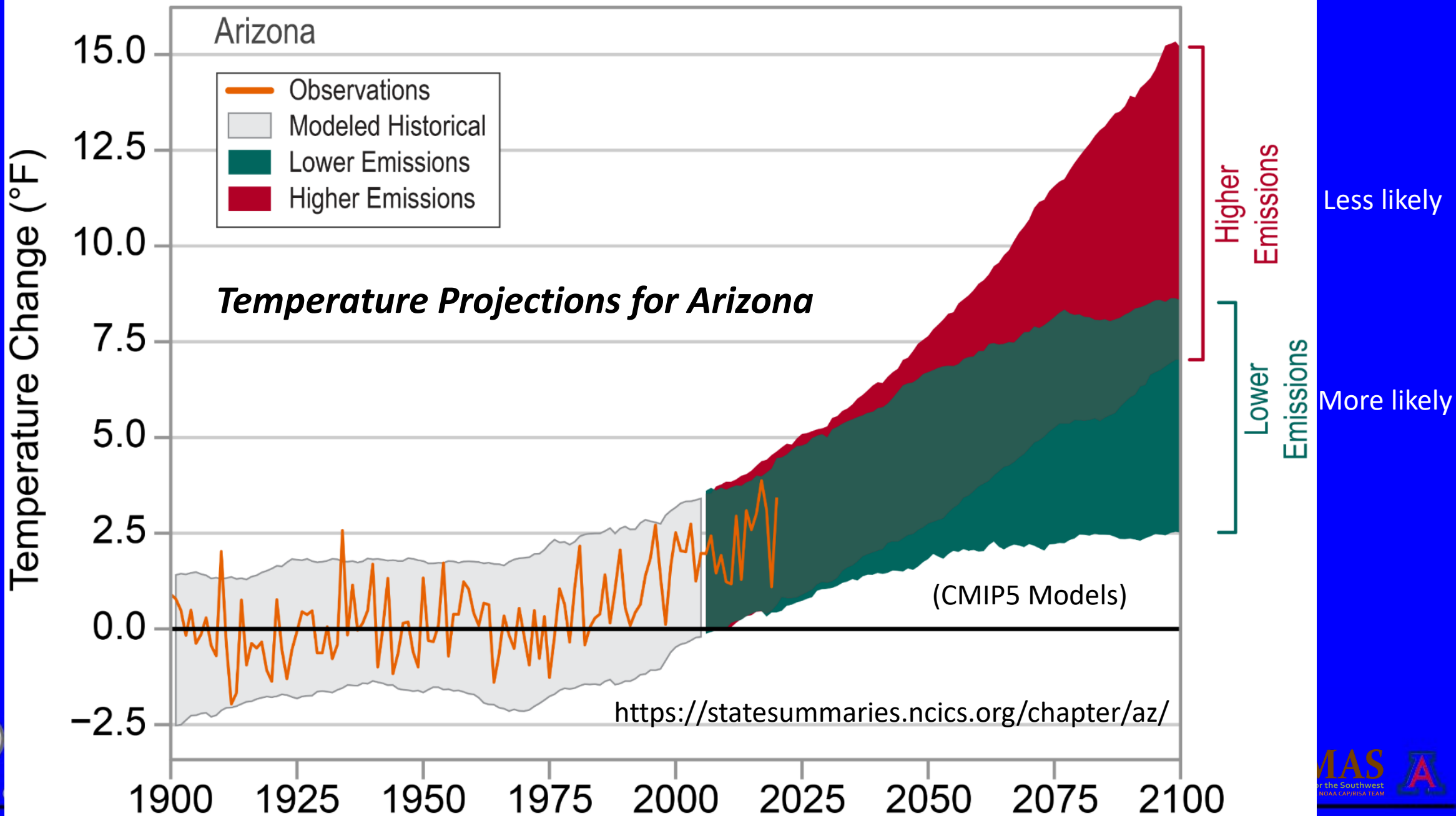


Source: Based on FAIR model runs performed by Dr. Chris Smith at the University of Leeds - Note: This model does not fully account for the 2020 change in marine fuel standards to lower sulfur emissions, as updated emissions data is not yet available.

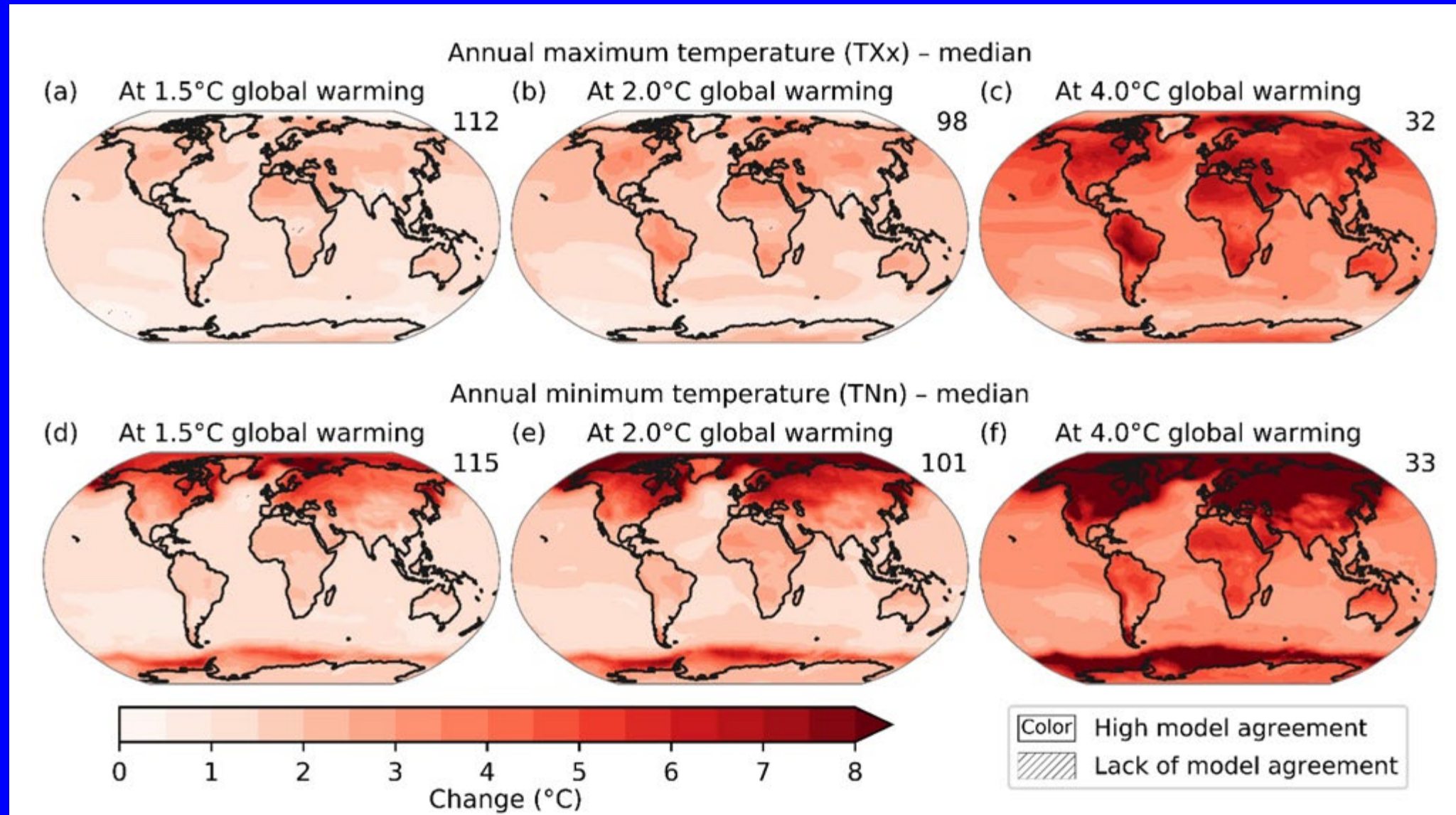
Hausfather, Oct. 13, 2023 <https://www.nytimes.com/2023/10/13/opinion/climate-change-excessive-heat-2023.html>



Observed and Projected Temperature Change



Heat extremes scale with level of warming



Closing thoughts

- Climate, especially temperatures, are changing at all scales from global to local
- Rising global temperatures are increasing the risk of local temperature extremes, especially in the summer
- Mitigation measures (e.g. move towards renewable energy) are gradually reducing GHG emissions making extreme climate scenarios unlikely
- But, heat extremes are likely to occur more frequently even with more moderate emission scenarios
- Need to continue to mitigate GHGs as well as adapt to changing conditions (e.g. heat extremes)



A sunset landscape with a white text box in the center. The sky is a mix of blue and orange, with large, dark clouds. The foreground is dark, showing silhouettes of trees and a utility pole.

Thanks!

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<http://cals.arizona.edu/climate>

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<https://www.climas.arizona.edu/>