Climate Trends

Data / Information from NCEI and NCA5

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National Centers for
Environmental Information (NCEI)

March 2024

Today

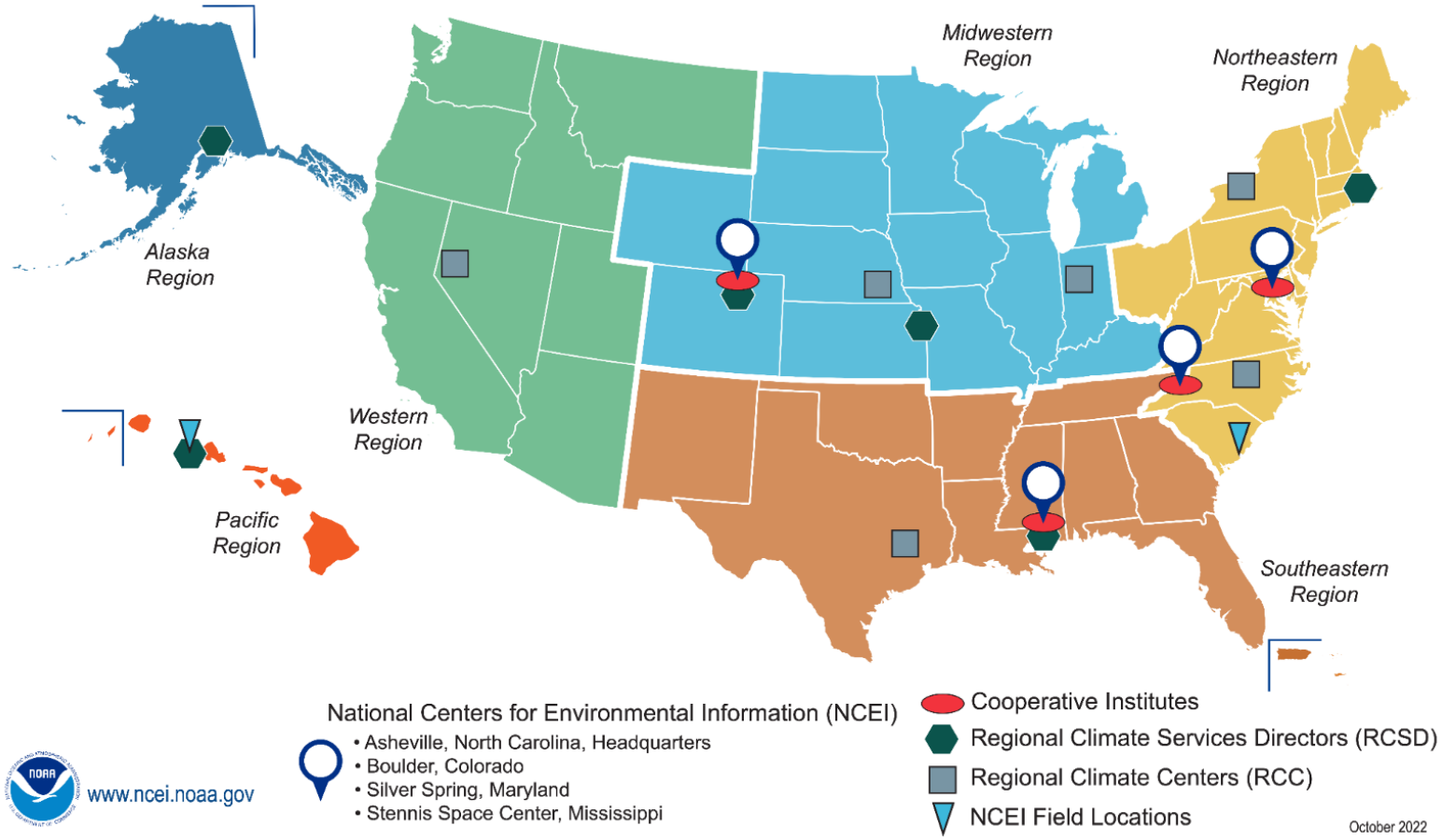
Hello from NCEI

- A few familiar products and perhaps some less familiar ones

Climate Trends

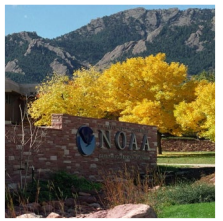
- What are observed trends in the earth system?
  - How do we know for sure?
  - How do we know it's us?

Hello from the National Centers for Environmental Information



www.ncei.noaa.gov

Asheville, NC
Headquarters

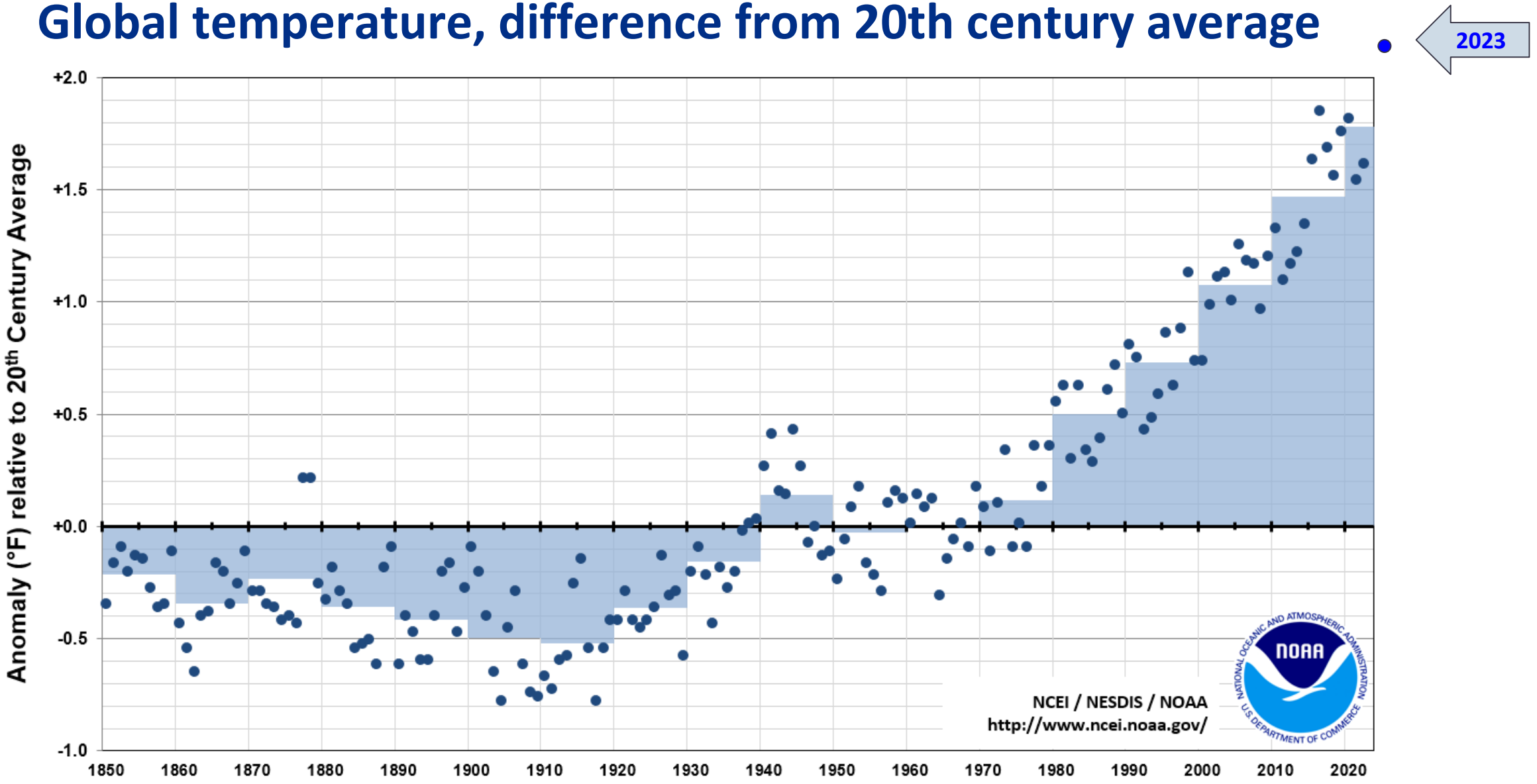


Boulder, CO

Silver Spring, MD

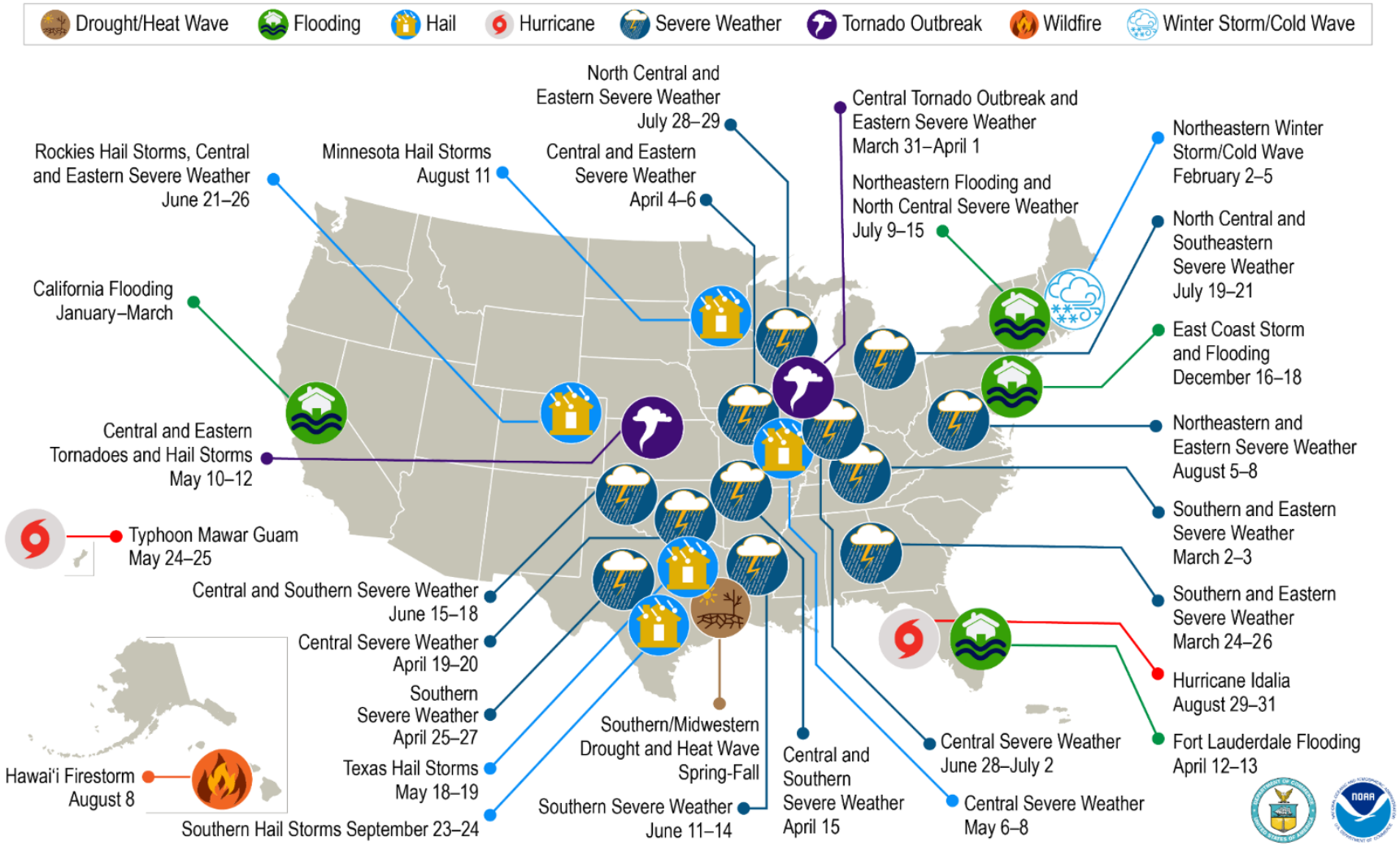
Stennis, MS

Global temperature, difference from 20th century average



Source: https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/

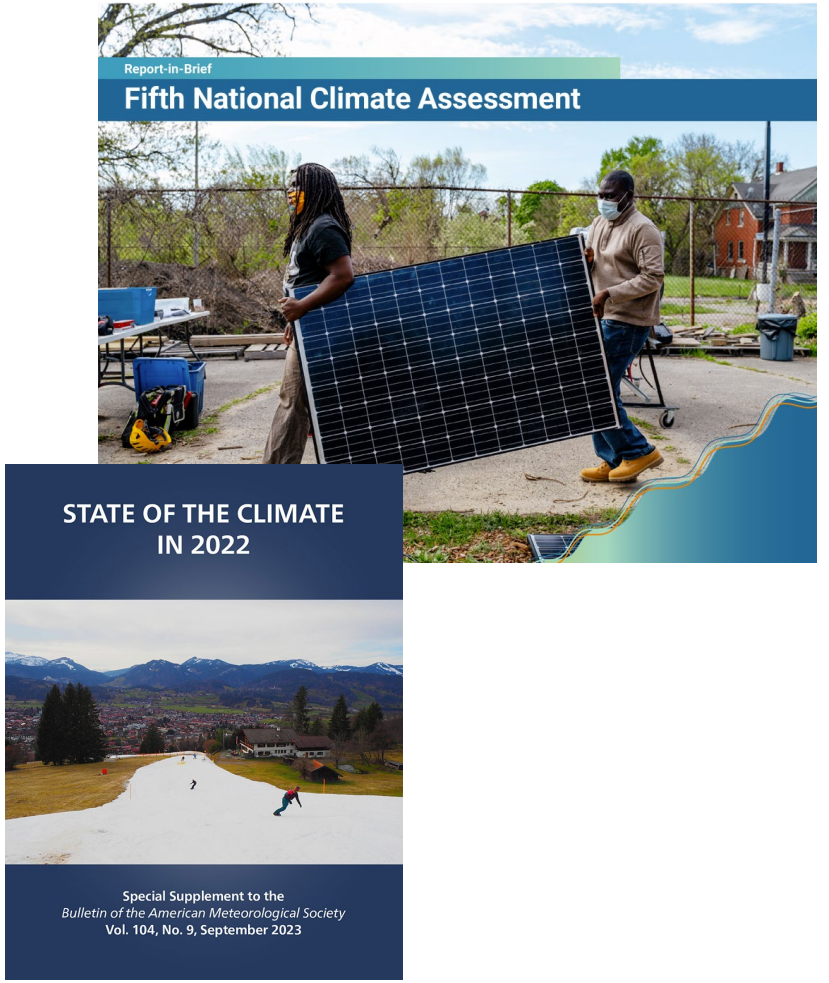
U.S. Billion Dollar Weather & Climate Disasters, 2023



*This map denotes the approximate location for each of the **28 separate billion-dollar weather and climate disasters that impacted the United States in 2023.***

For your own browsing

- ***Fifth National Climate Assessment:*** Broad, accessibly written comprehensive overview of the state of the climate and our relationship with it
  - https://nca2023.globalchange.gov/
- ***BAMS State of the Climate:*** Deep, observation-driven "annual physical" of the climate system
  - SoC 2022: https://doi.org/10.1175/2023BAMSStateoftheClimate.1
  - catalog: https://www.ncei.noaa.gov/bams-state-of-climate
- ***NCEI Climate Monitoring:*** Routine daily to monthly updates of climate conditions as measurements allow
  - https://www.ncei.noaa.gov/products/climate-monitoring



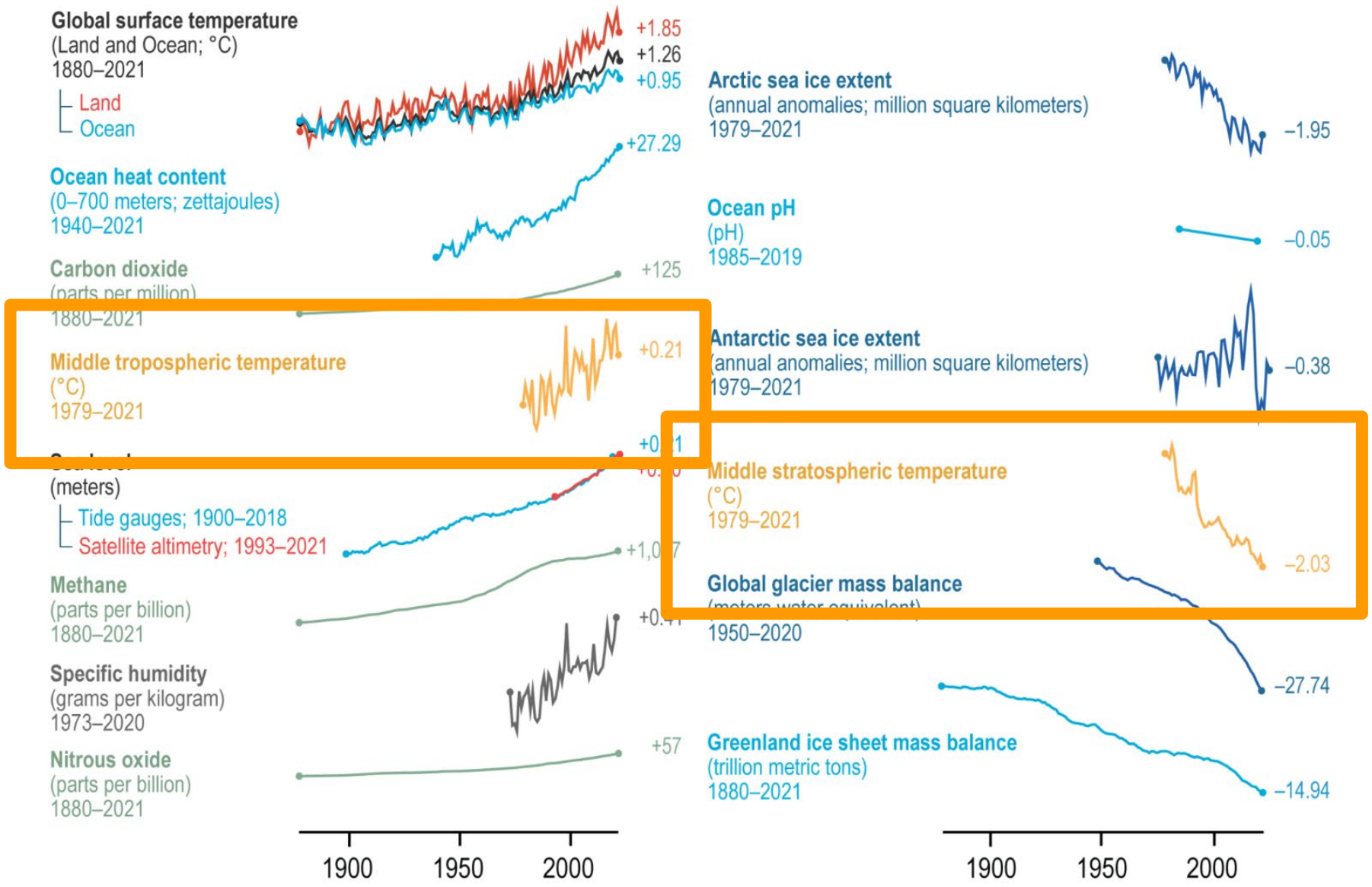
Let's talk about trends, but first …

" … human-caused climate change are already far-reaching and worsening across every region of the United States. Rapidly reducing greenhouse gas emissions can limit future warming and associated increases in many risks. **Across the country, efforts to adapt to climate change and reduce emissions have expanded since 2018, and US emissions have fallen since peaking in 2007.** *However, without deeper cuts in global net greenhouse gas emissions and accelerated adaptation efforts, severe climate risks to the United States will continue to grow*.

Fifth National Climate Assessment

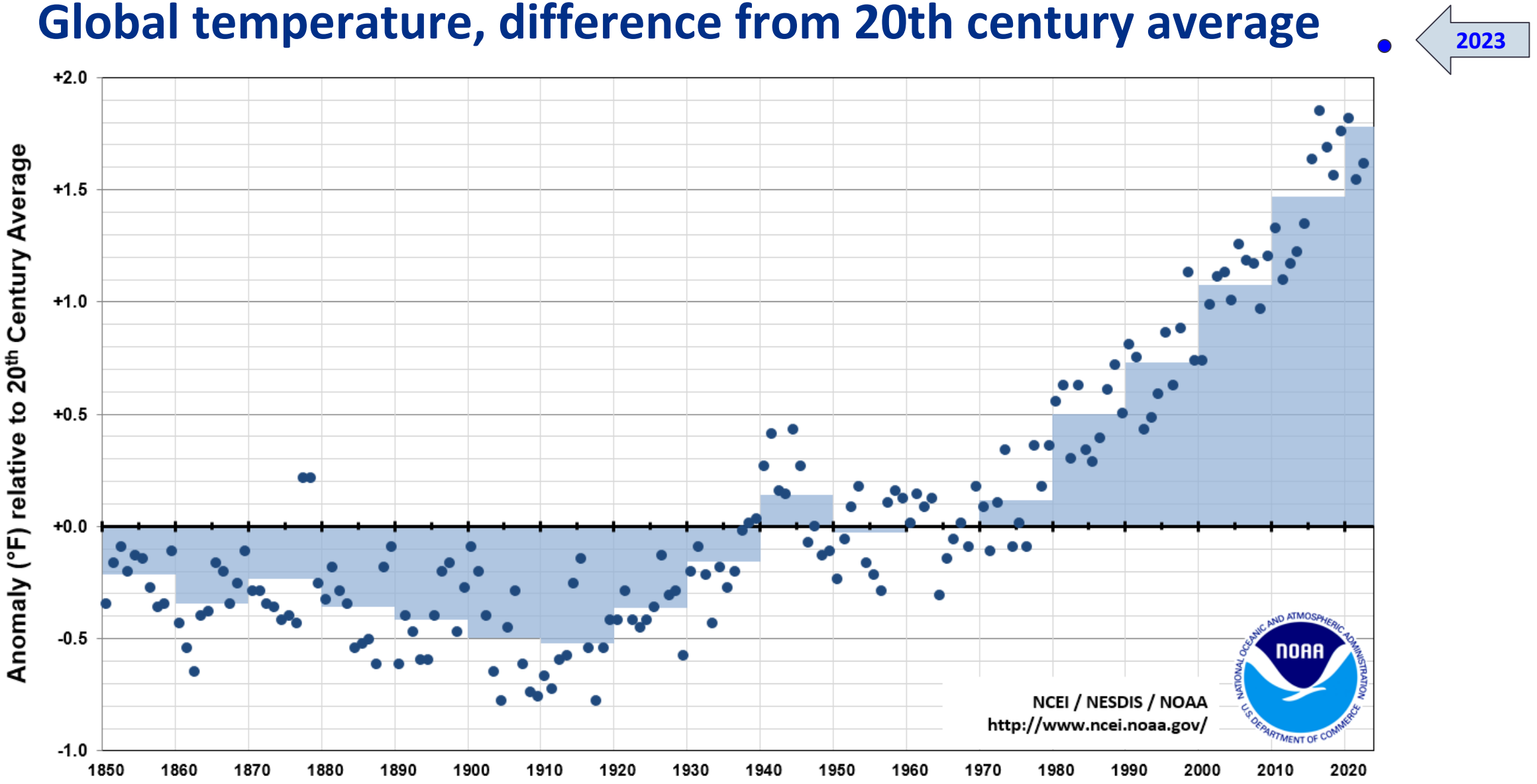
Climate Trends dashboard view

Fifth National Climate Assessment, Figure 2.3.



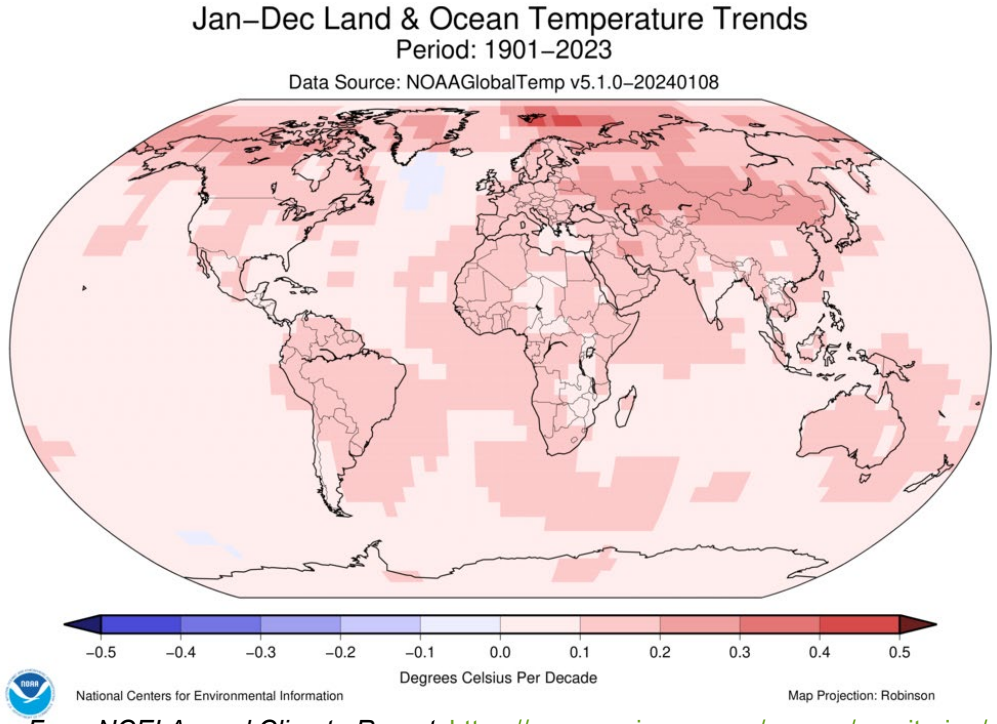
Source: https://www.ncei.noaa.gov/access/monitoring/cei/

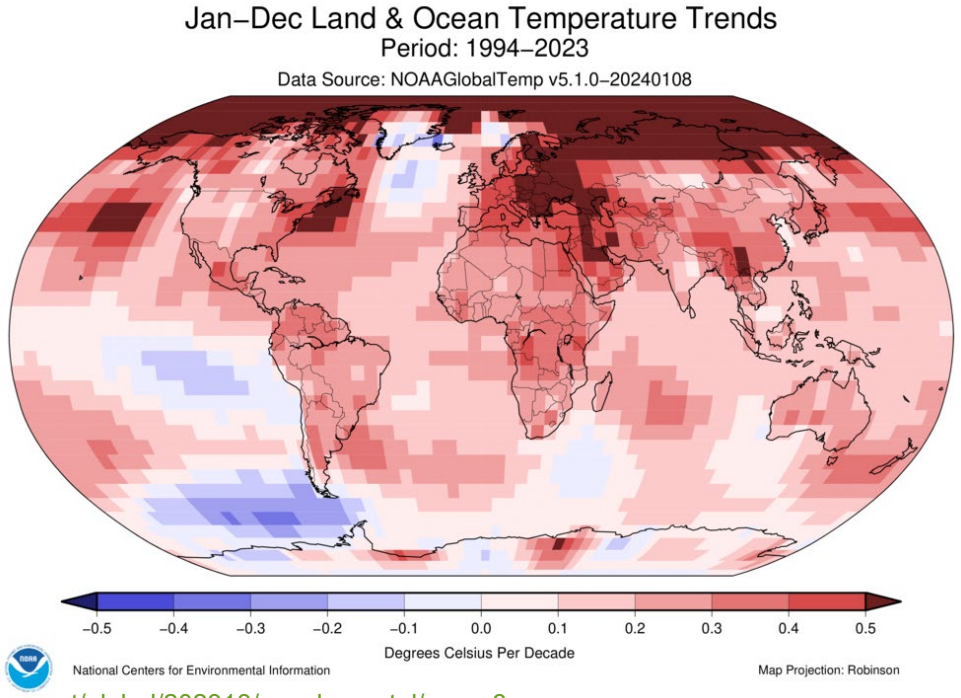
Global temperature, difference from 20th century average



Source: https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/

The rate of warming varies around the world





From NCEI Annual Climate Report: https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202313/supplemental/page-3

In the past half century, temperatures in these major zones increased by:

Arctic: 1.05°F / decade

Land surface: 0.60°F / decade

Sea surface: 0.23°F / decade

Data: NOAAGlobalTemp, from Climate at a Glance: https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/global/time-series

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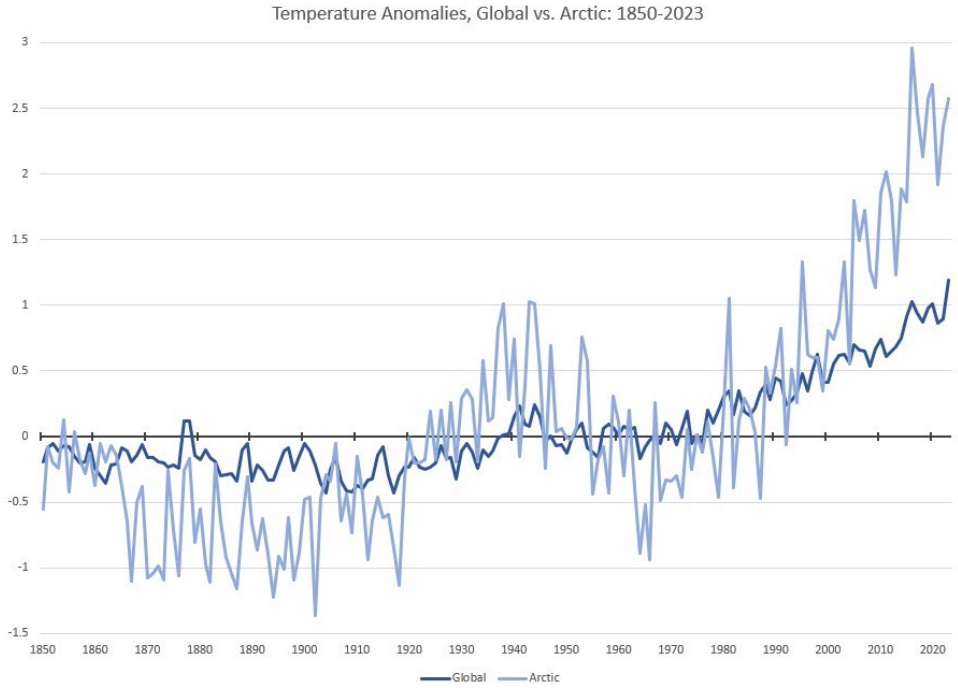

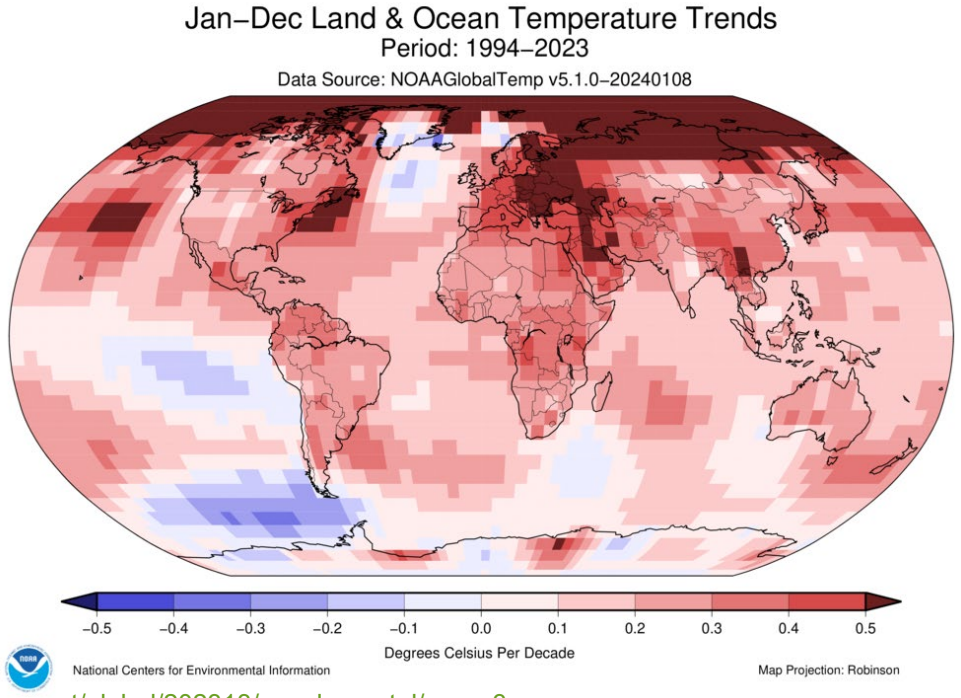

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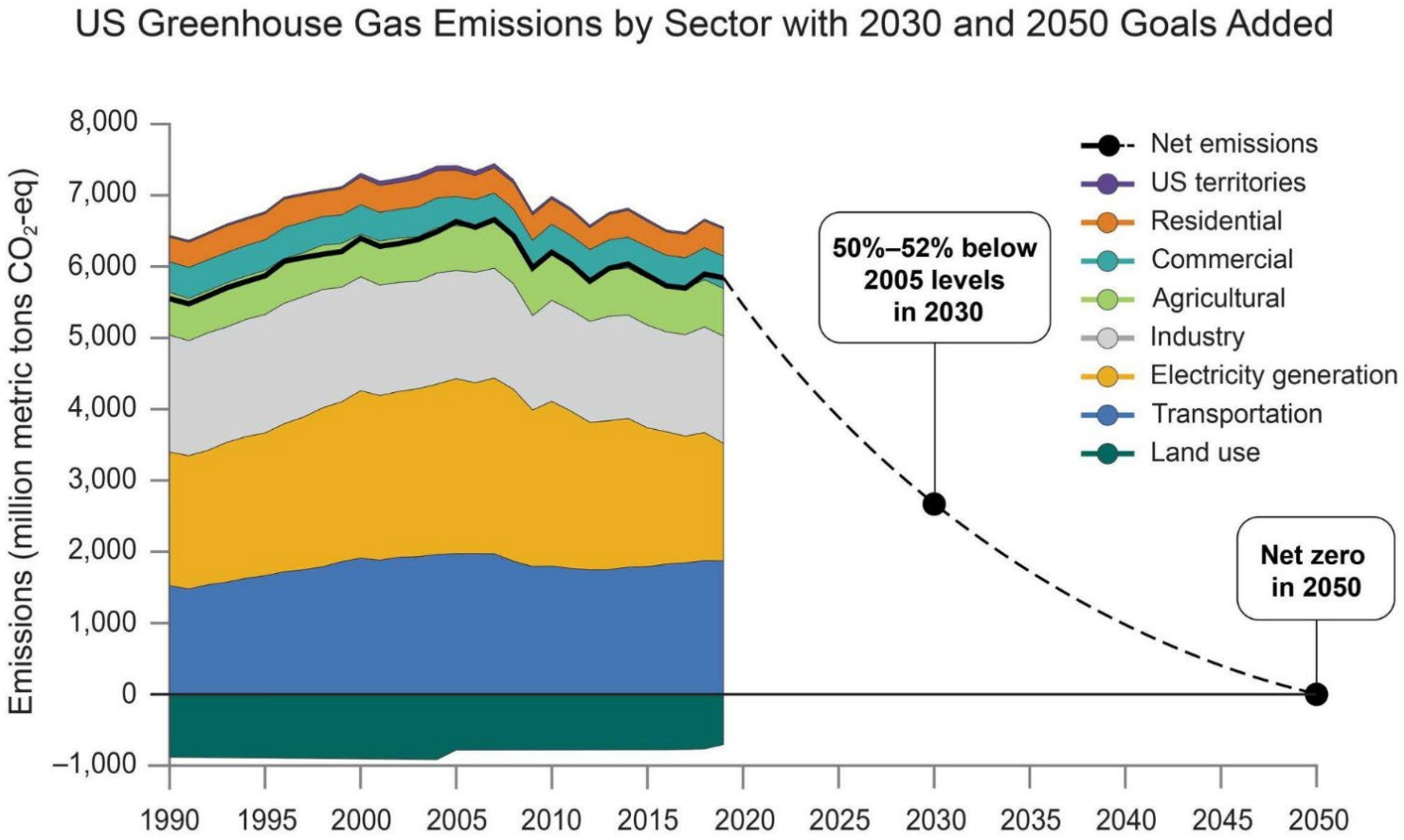
U.S. GHG Emissions Profile since 1990

U.S. emissions have fallen since peaking in 2007. Without deeper cuts in *global* net GHG emissions and accelerated adaptation efforts, severe climate risks to the U.S. will continue to grow.

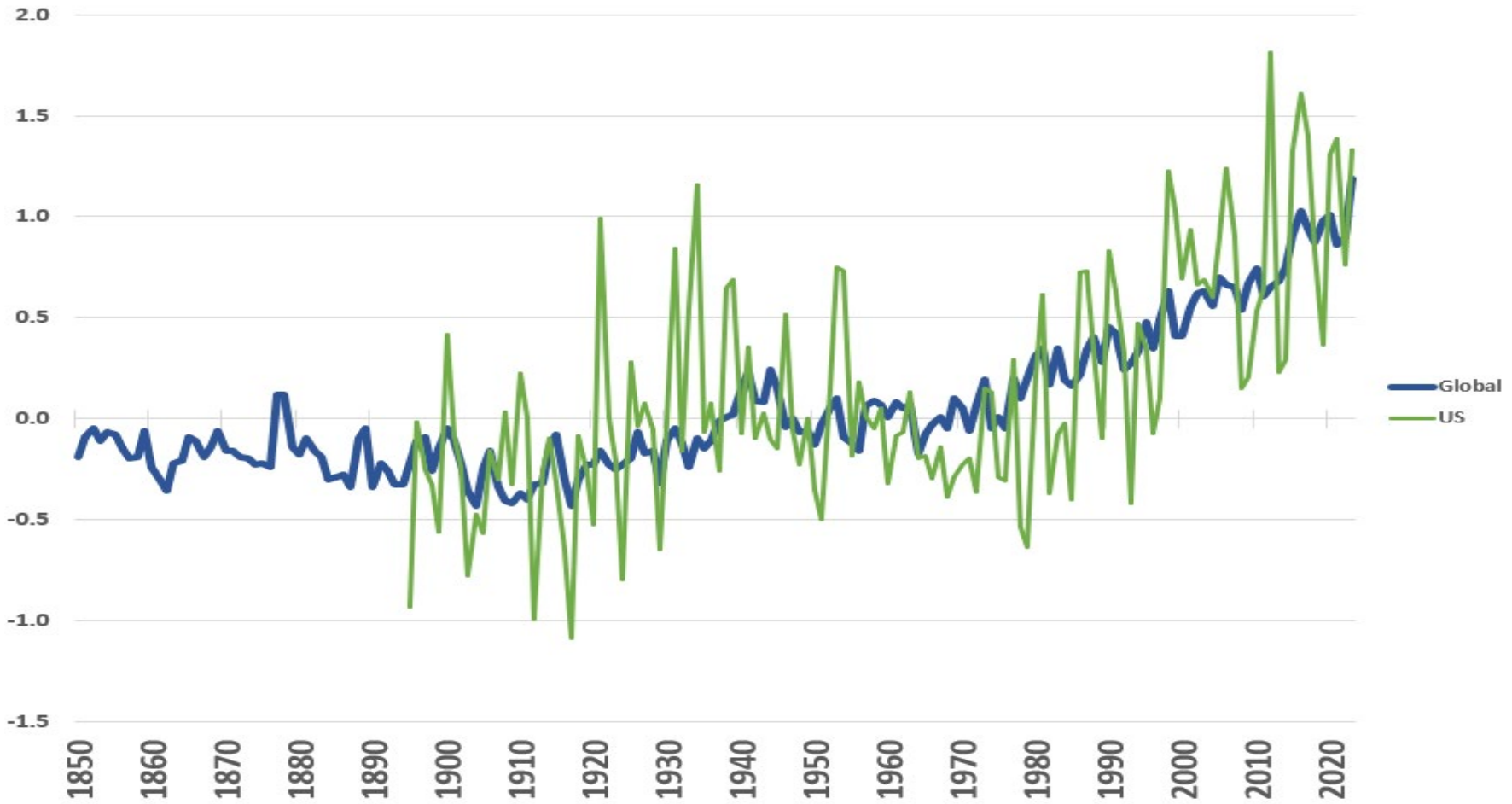
Paraphrased from Fifth National Climate Assessment



https://nca2023.globalchange.gov/chapter/32/ Fig. 32.1

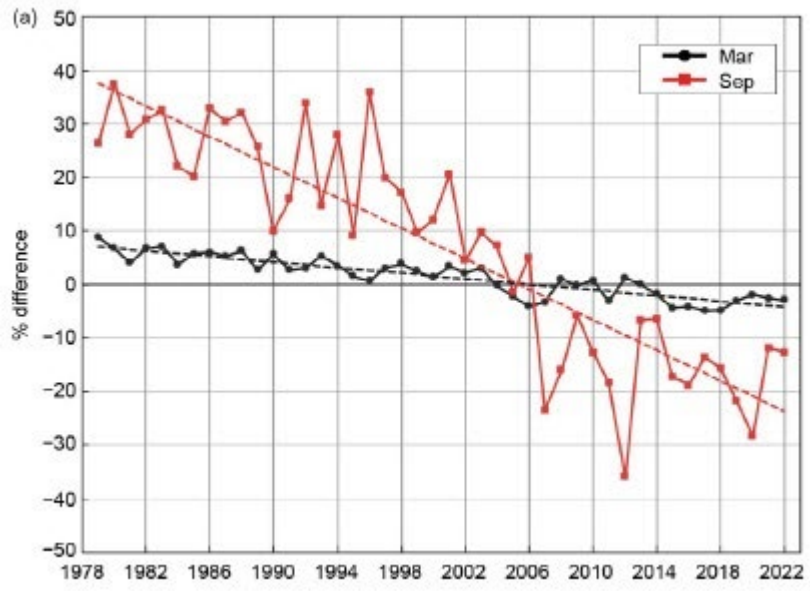
Global & Conterminous US temperature

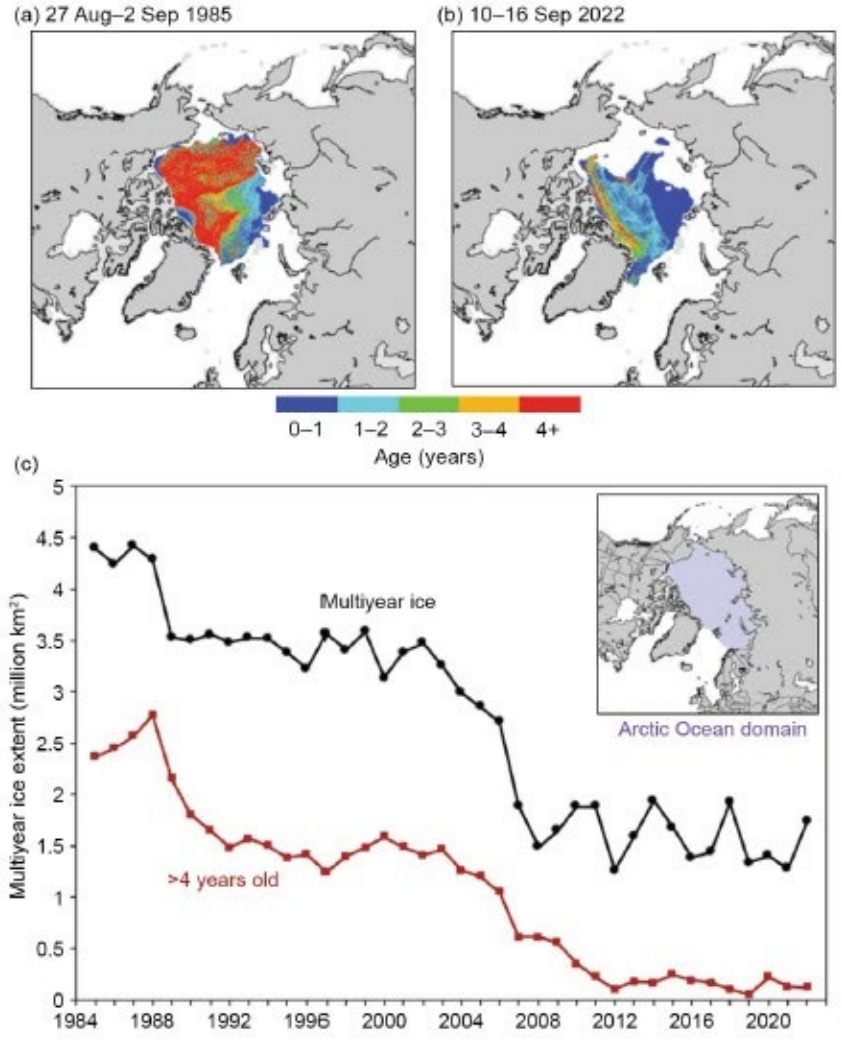
vs. 1901-2000 average, deg Celsius



Source: https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/

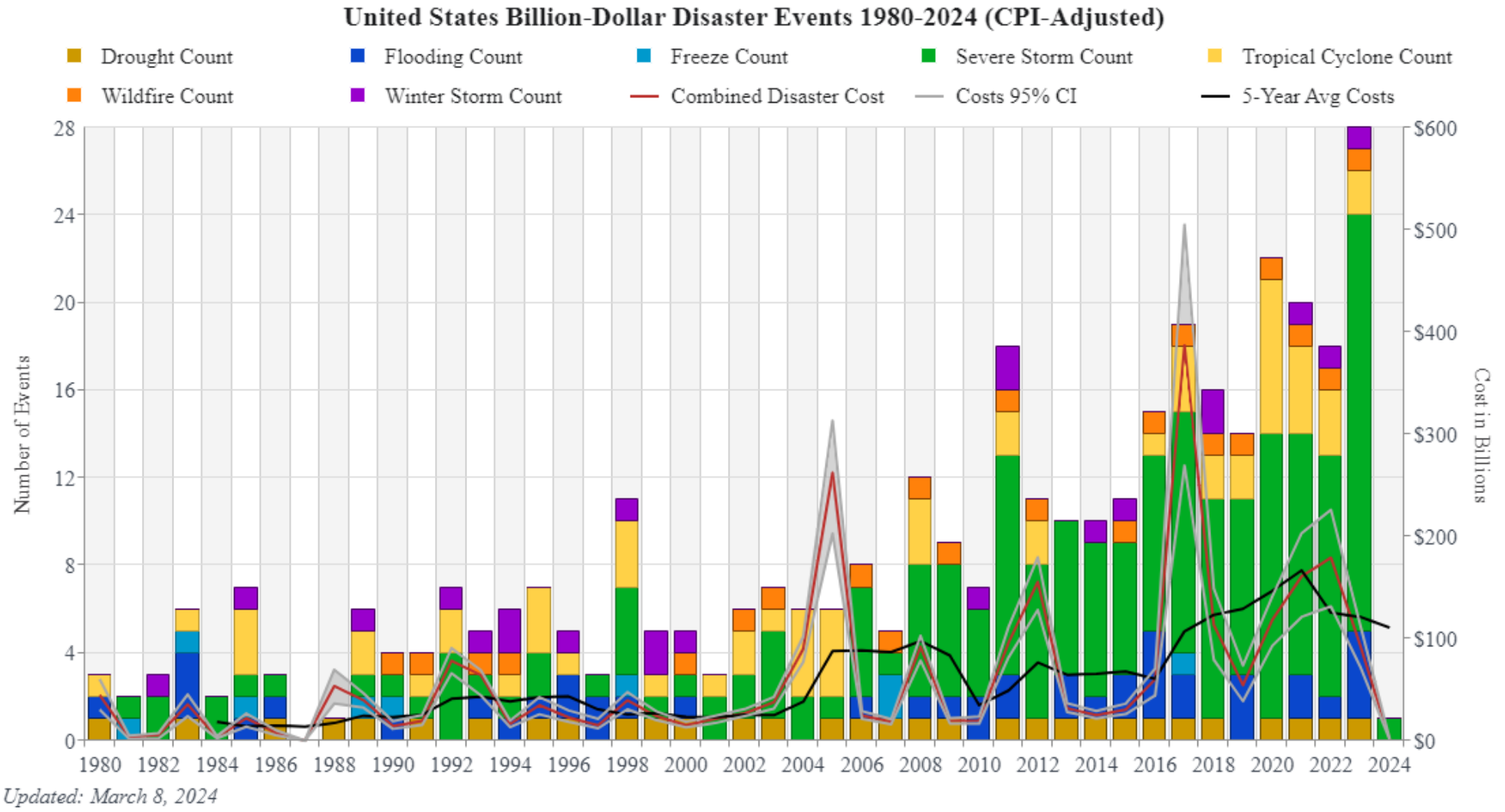
Sea Ice Extent & Multi-Year Arctic Ice





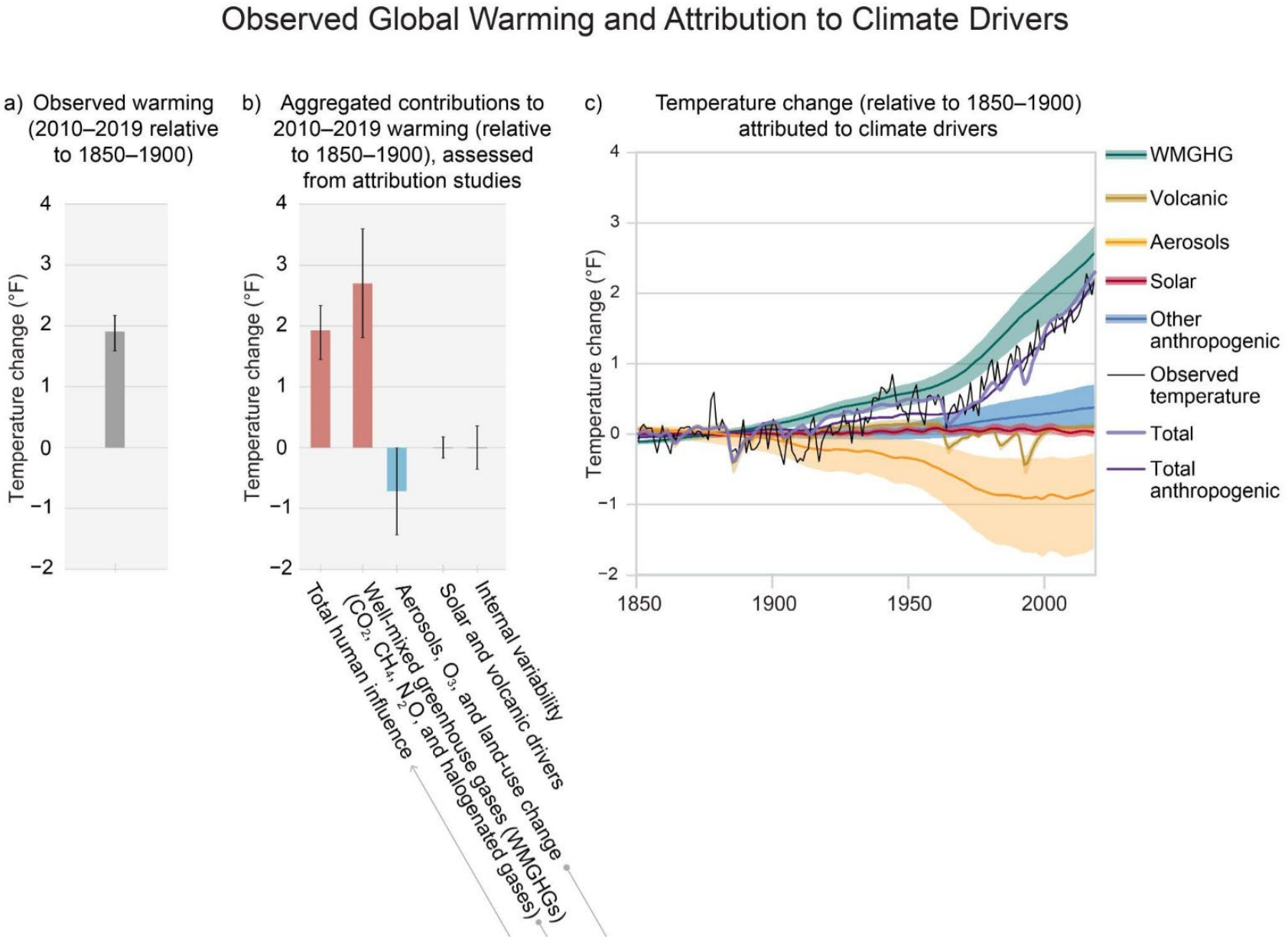
- Left: Sept. (red) Arctic Sea Ice Extent has decreased by about 14% per decade since 1979.
- Right: Multi-year Arctic sea ice extent, showing *"[s]ince 2012, the Arctic has been nearly devoid of the oldest ice (>4 years old)"*
- Figs. 5.11 and 5.12 of BAMS *State of the Climate in 2022*.

U.S. Billion Dollar Weather & Climate Disasters, 1980-2023



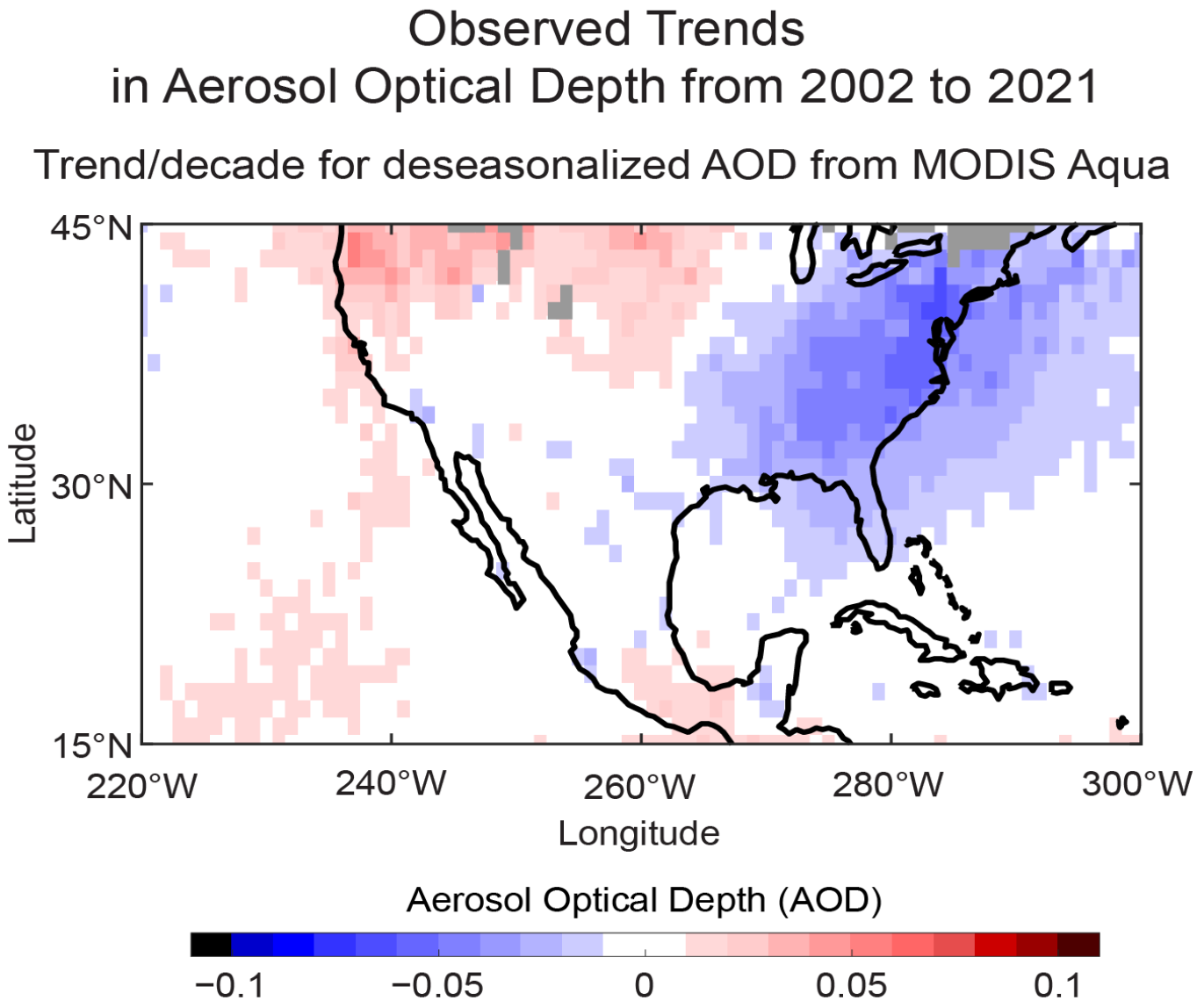
Source: https://www.ncei.noaa.gov/access/billions/

What About Other Potential Explanations for Warming?



Fifth National Climate Assessment. Fig 3.1: https://doi.org/10.7930/NCA5.2023

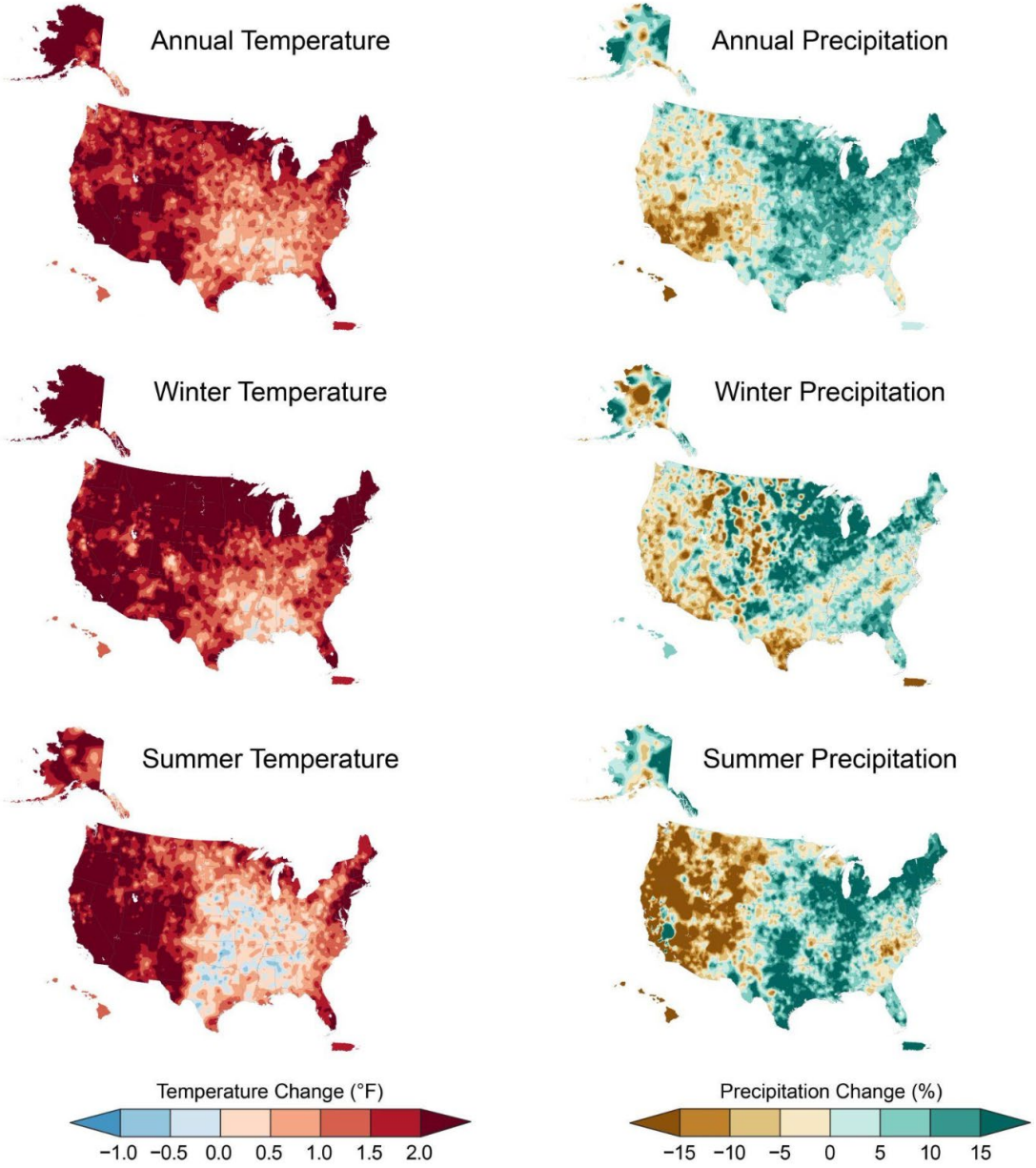
Observed Trends in aerosol optical depth show decreases in aerosol pollution across the eastern United States.



https://nca2023.globalchange.gov/chapter/2/ Fig. 2.2

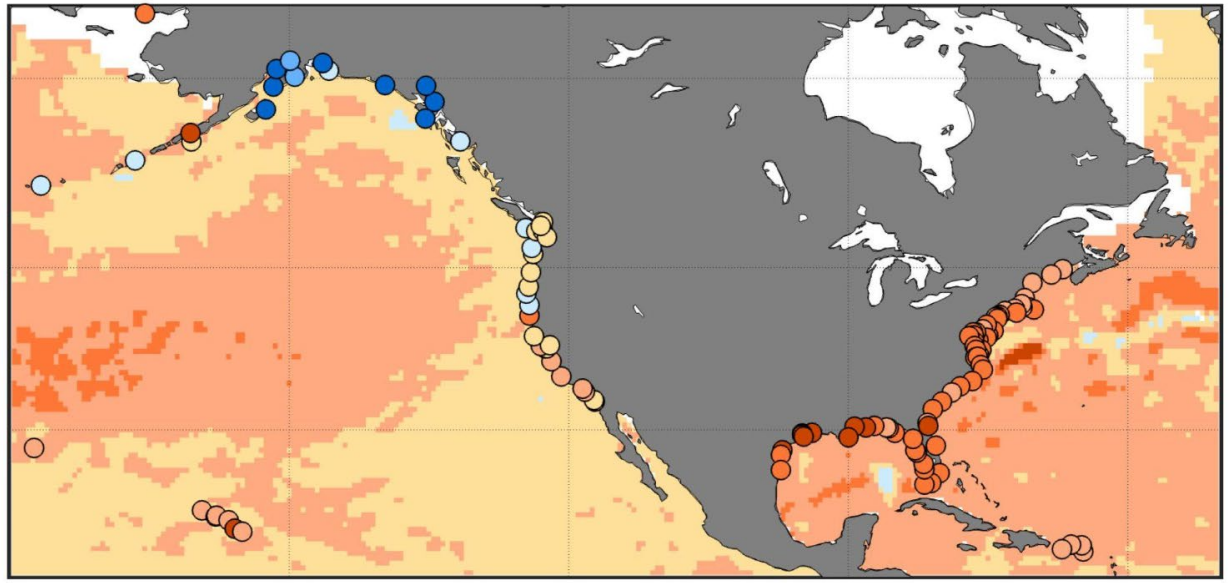
Temperature and precipitation changes over the United States

Present day (2002-21) versus early 20th century (1901-60)



https://nca2023.globalchange.gov/chapter/2/ Fig. 2.4

Sea Level Rise & associated consequences



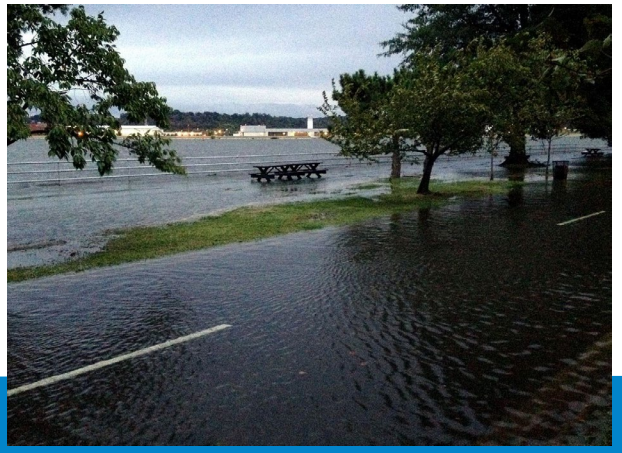
Global average: +1.3 inches/decade
Contiguous US average: +1.8 inches/decade

Observed Sea Level Trends, 1993-2020

https://nca2023.globalchange.gov/chapter/2/ Fig. 2.5

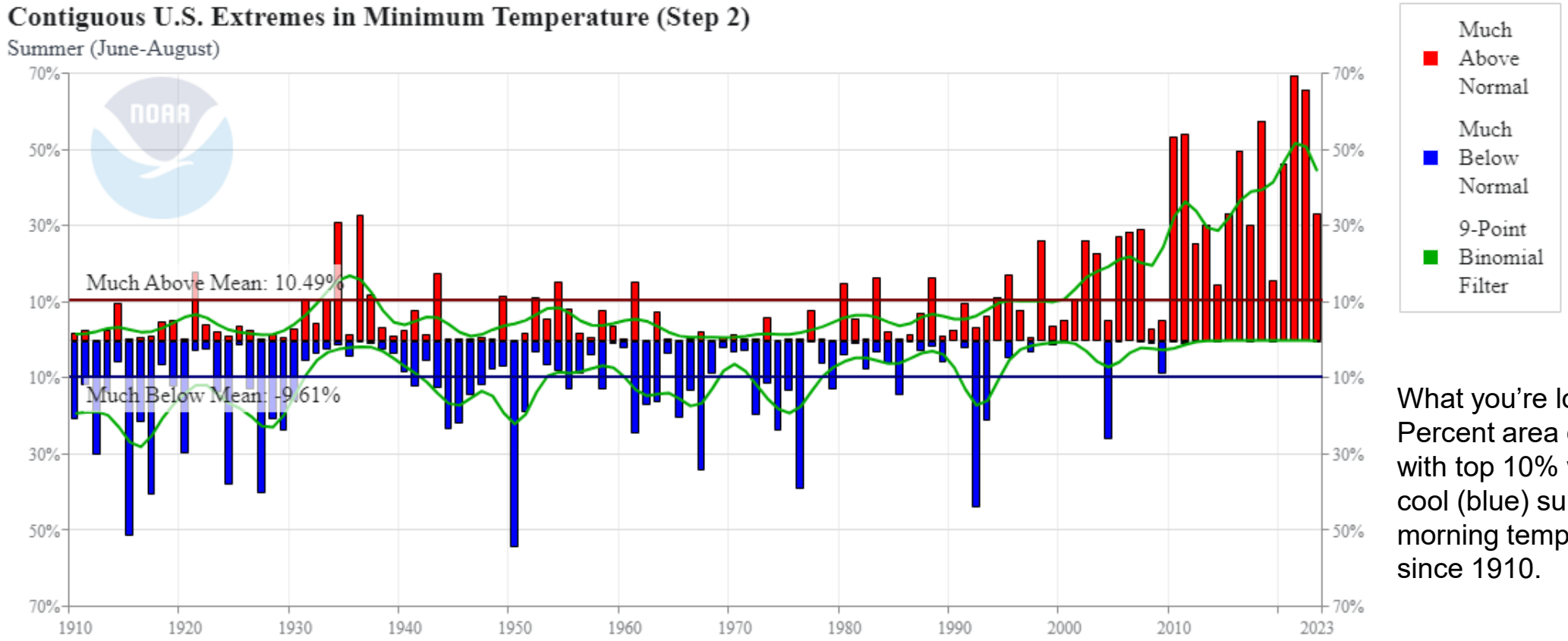
Change, Recurrent Tidal ("Nuisance") Flooding

https://coast.noaa.gov/states/fast-facts/recurrent-tidal-flooding.html



Climate Extremes Index (component 2):

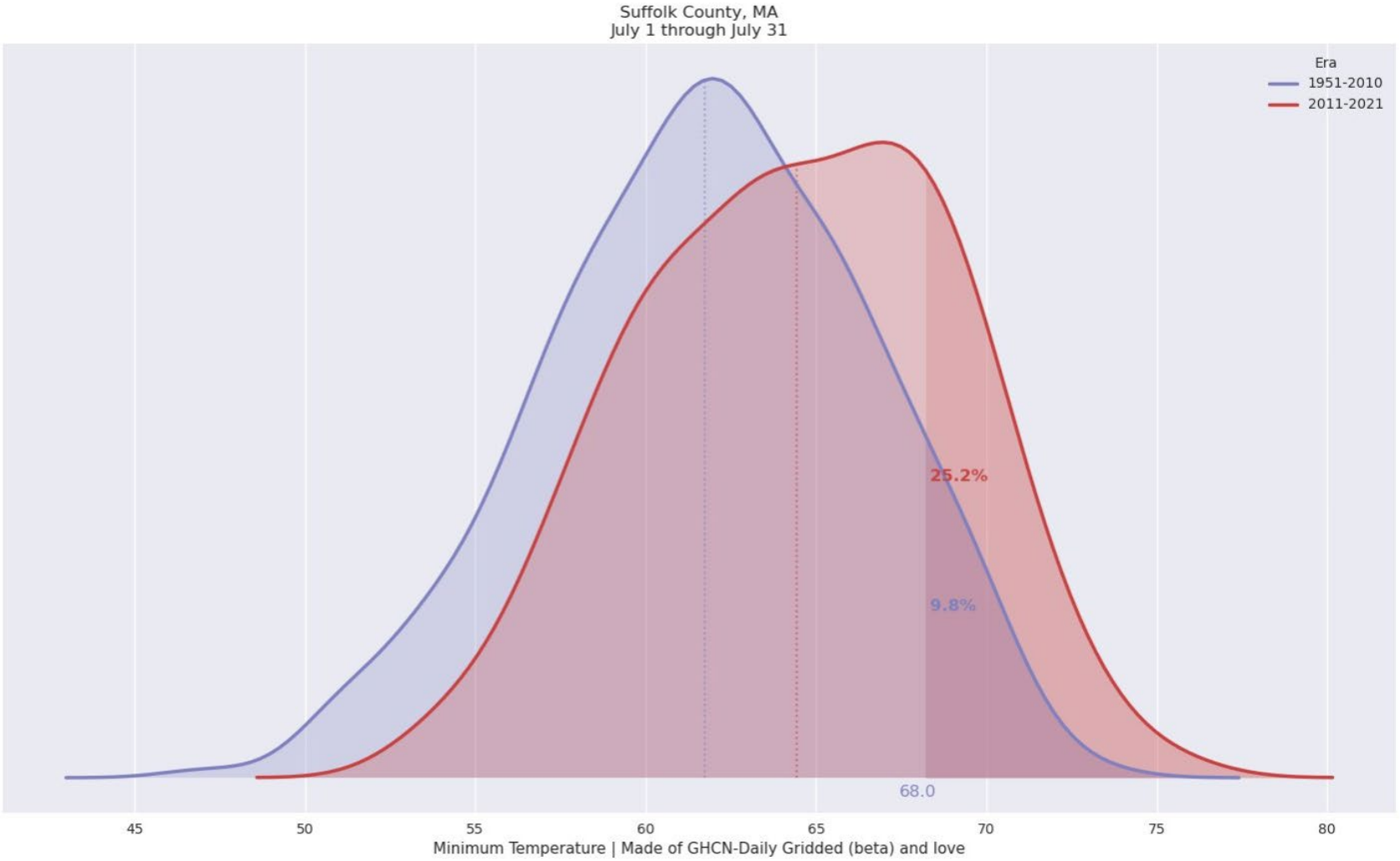
Trends in extremes of summer minimum temperatures (overnight lows)



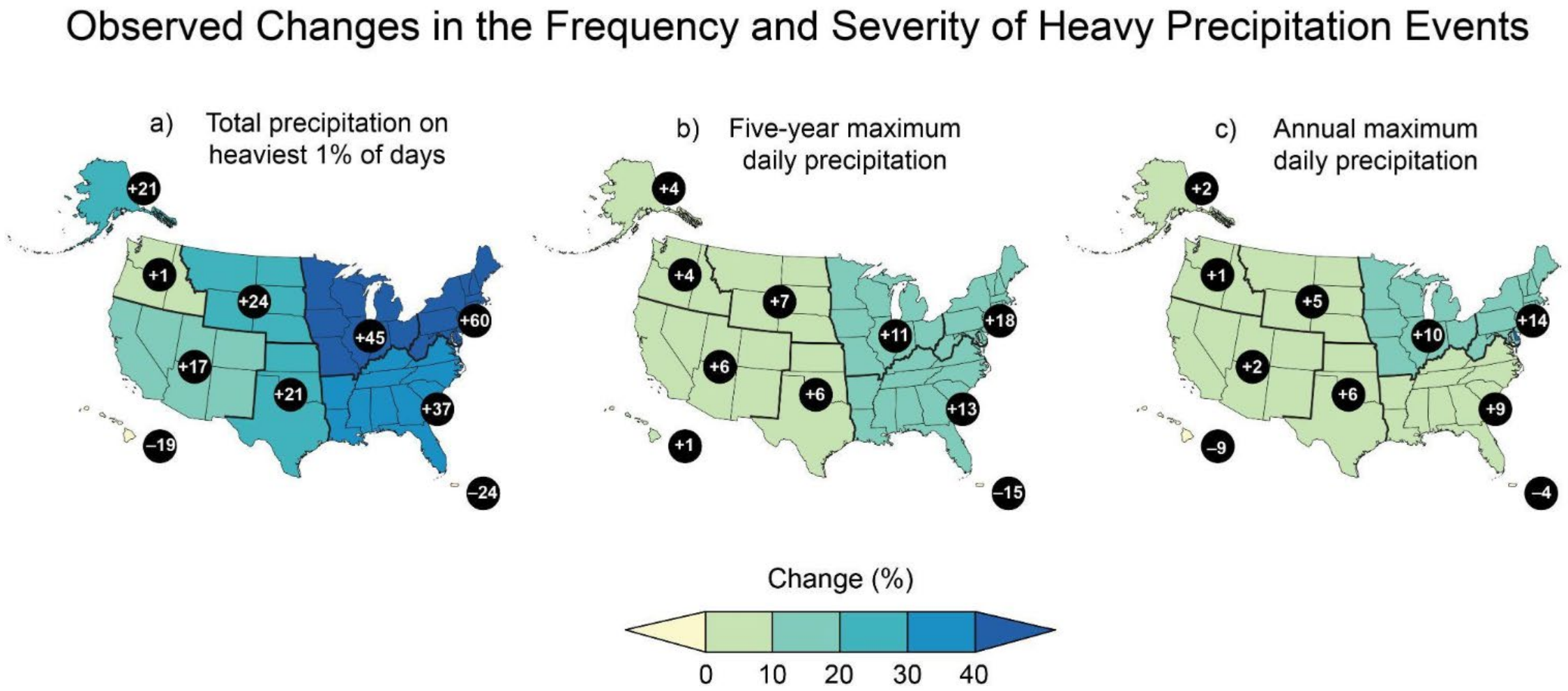
What you're looking at: Percent area of CONUS with top 10% warm (red) or cool (blue) summer morning temperatures, since 1910.

Source: https://www.ncei.noaa.gov/access/monitoring/cei/

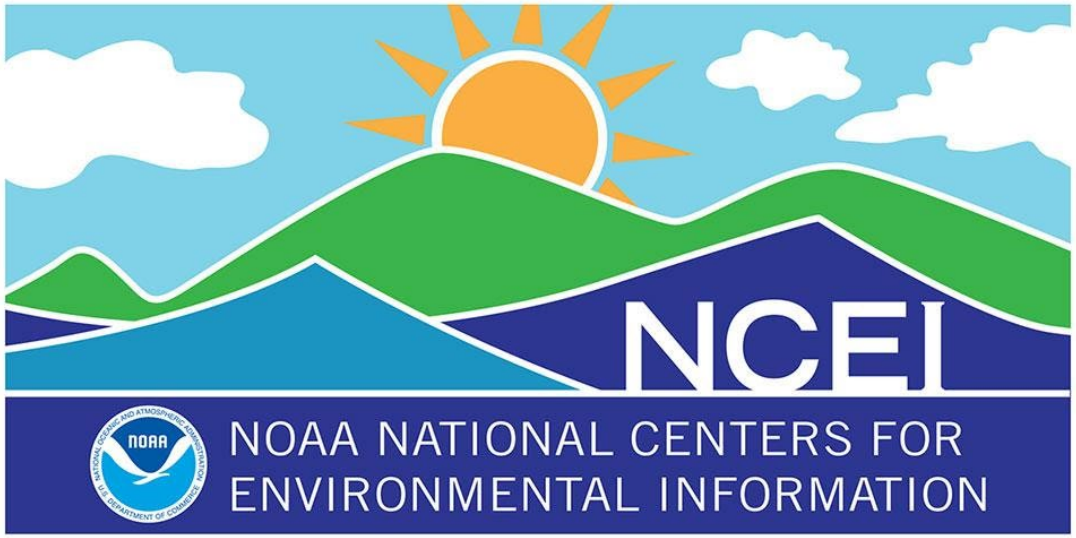
Big Heat generally increasing (mostly at night)



Big Rain is generally getting Bigger



Thank you for your time



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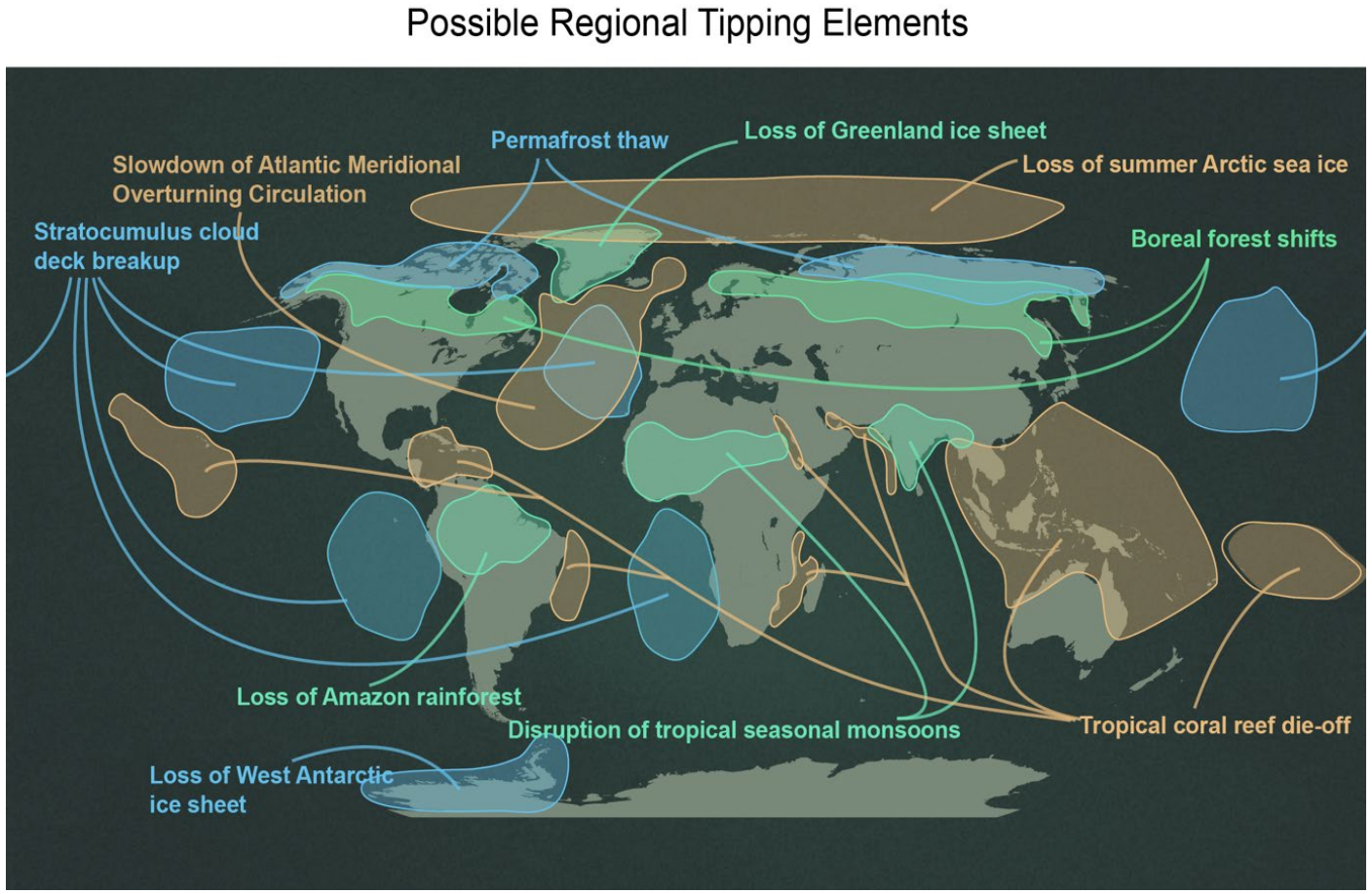
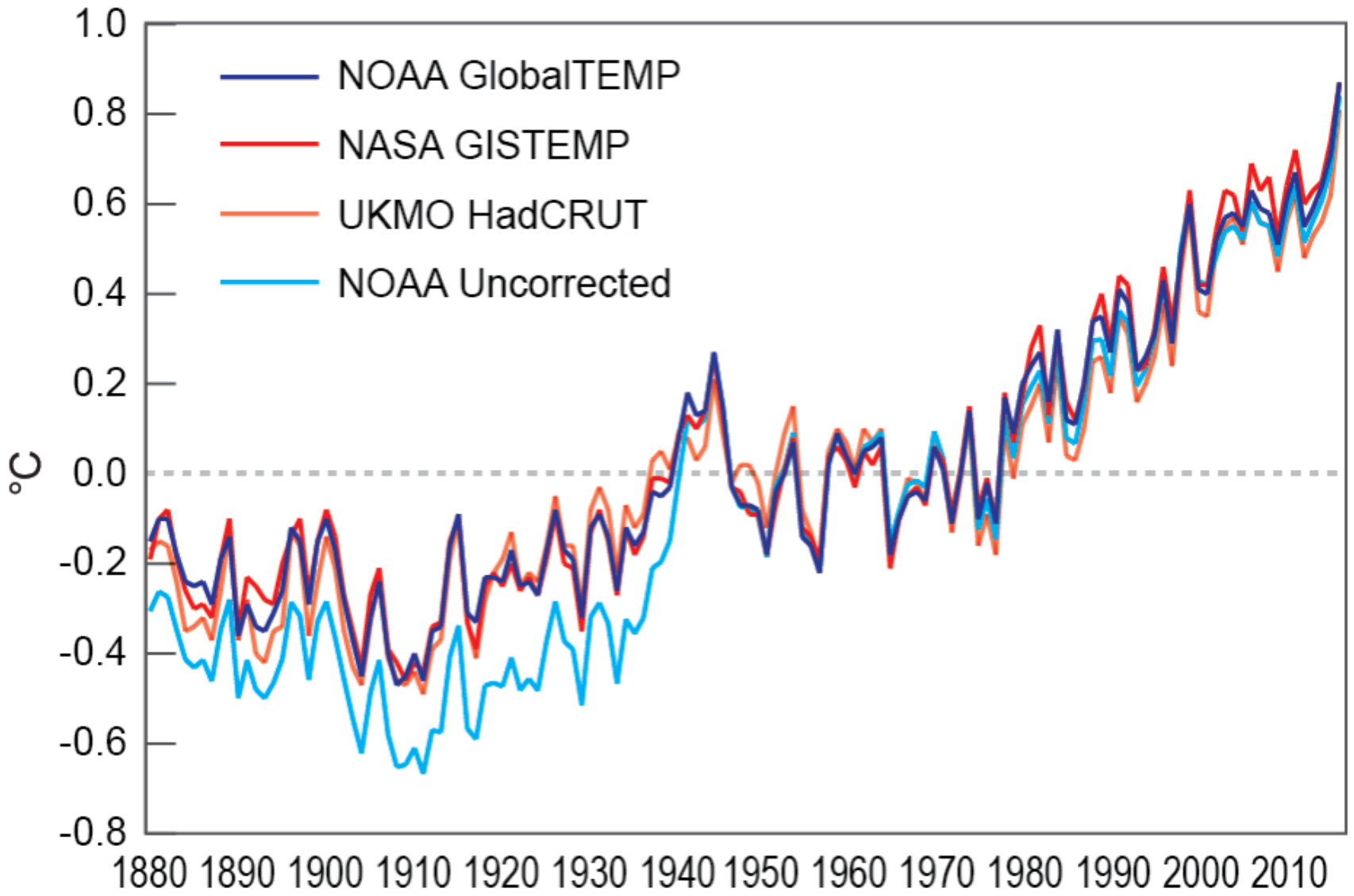


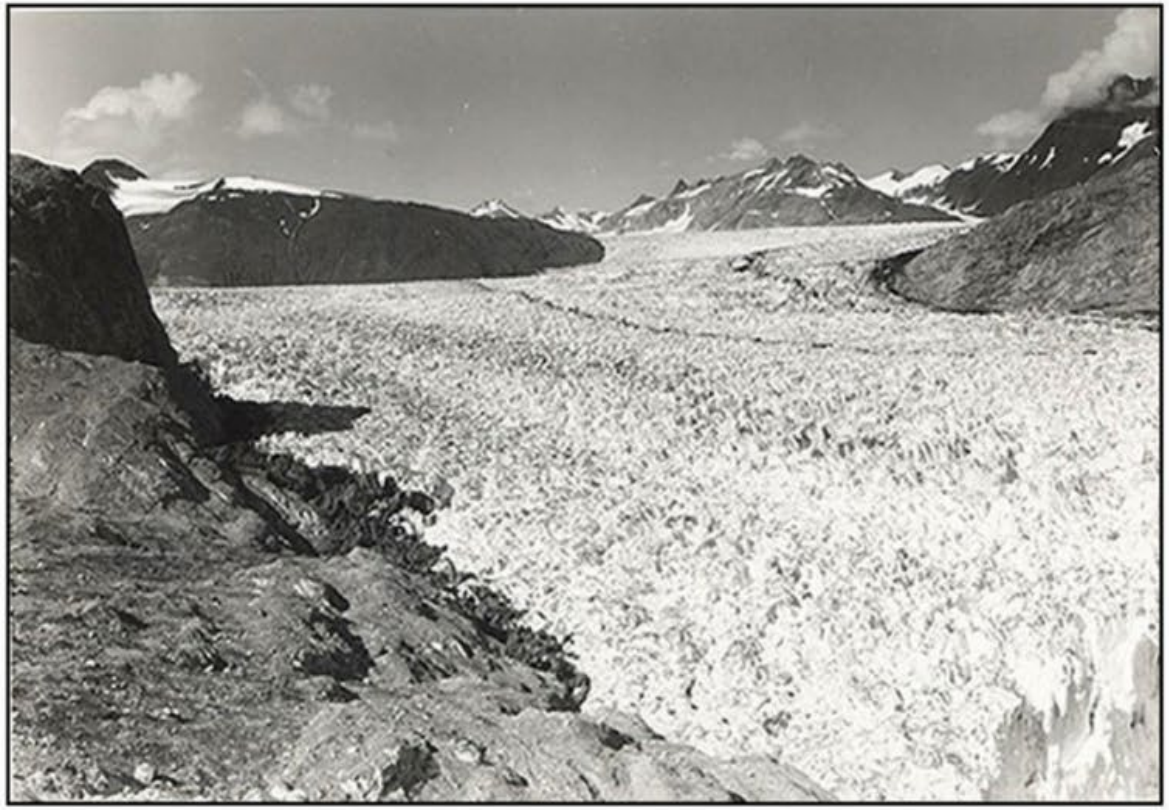
Figure 2.15. Continued warming could push some aspects of the Earth system past tipping points.

The rest of the story: adjustments *reduce* the warming rate



Datasets shown relative to a common 1951-80 base period for comparison

Glacier Decline: Muir Glacier, Alaska



August 13, 1941

August 31, 2004

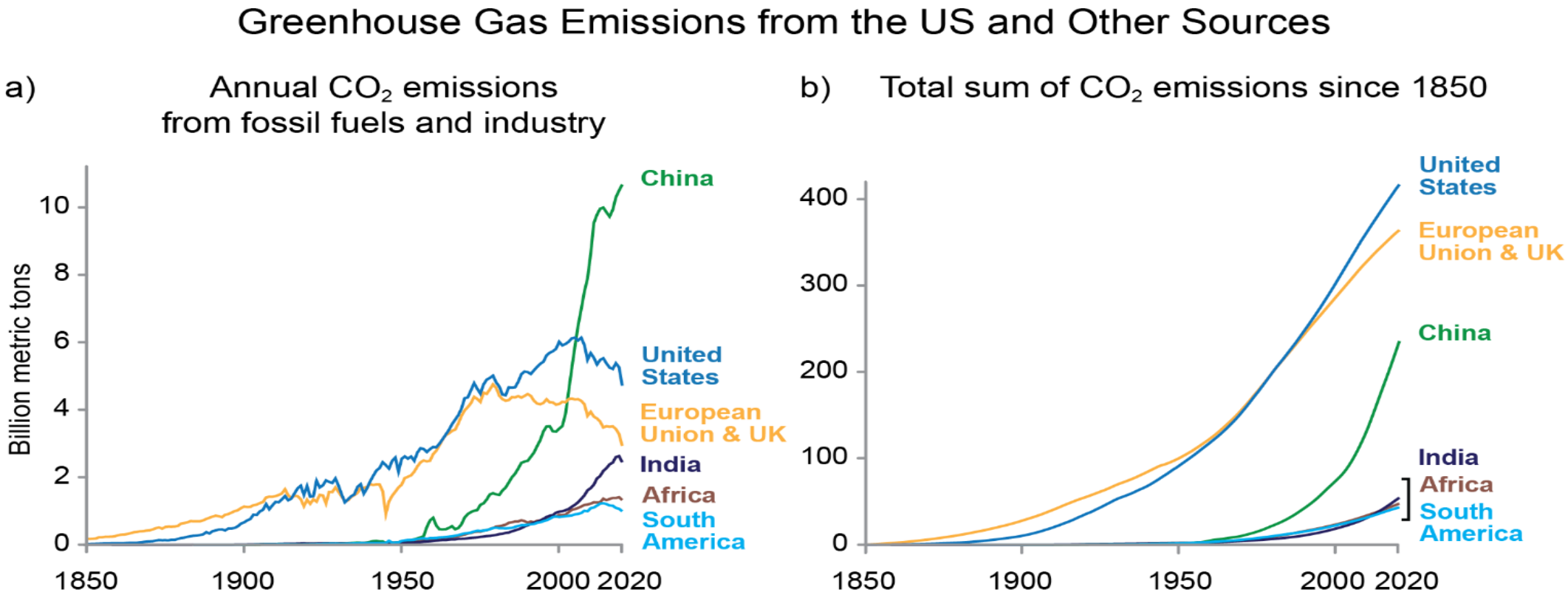


Figure 2.1. China is now the largest single-country emitter of carbon dioxide on an annual basis. The United States and Europe have emitted the majority of cumulative carbon dioxide.

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