

Overview of Climate Science and Policy

EES 3310/5310

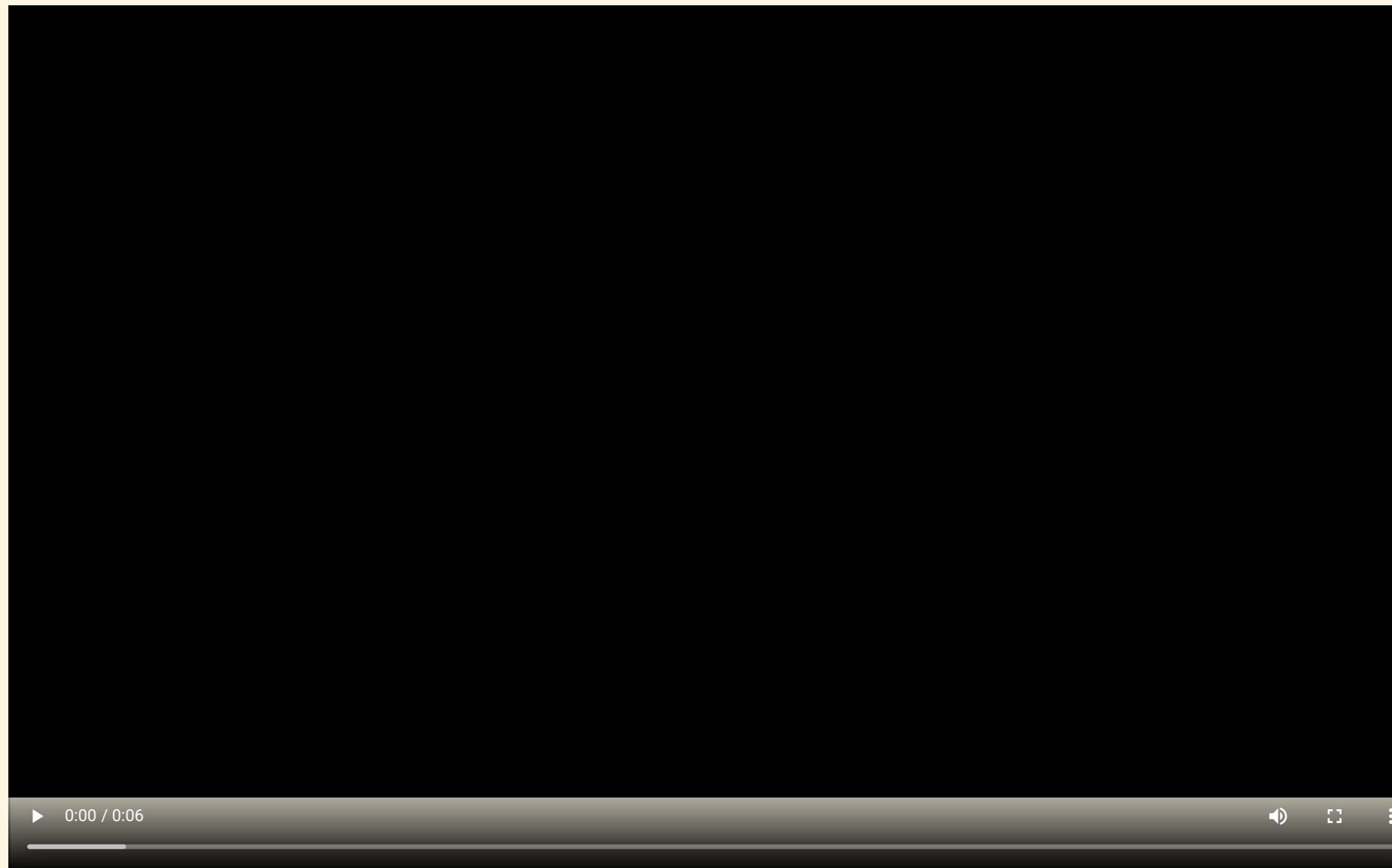
Global Climate Change

Jonathan Gilligan

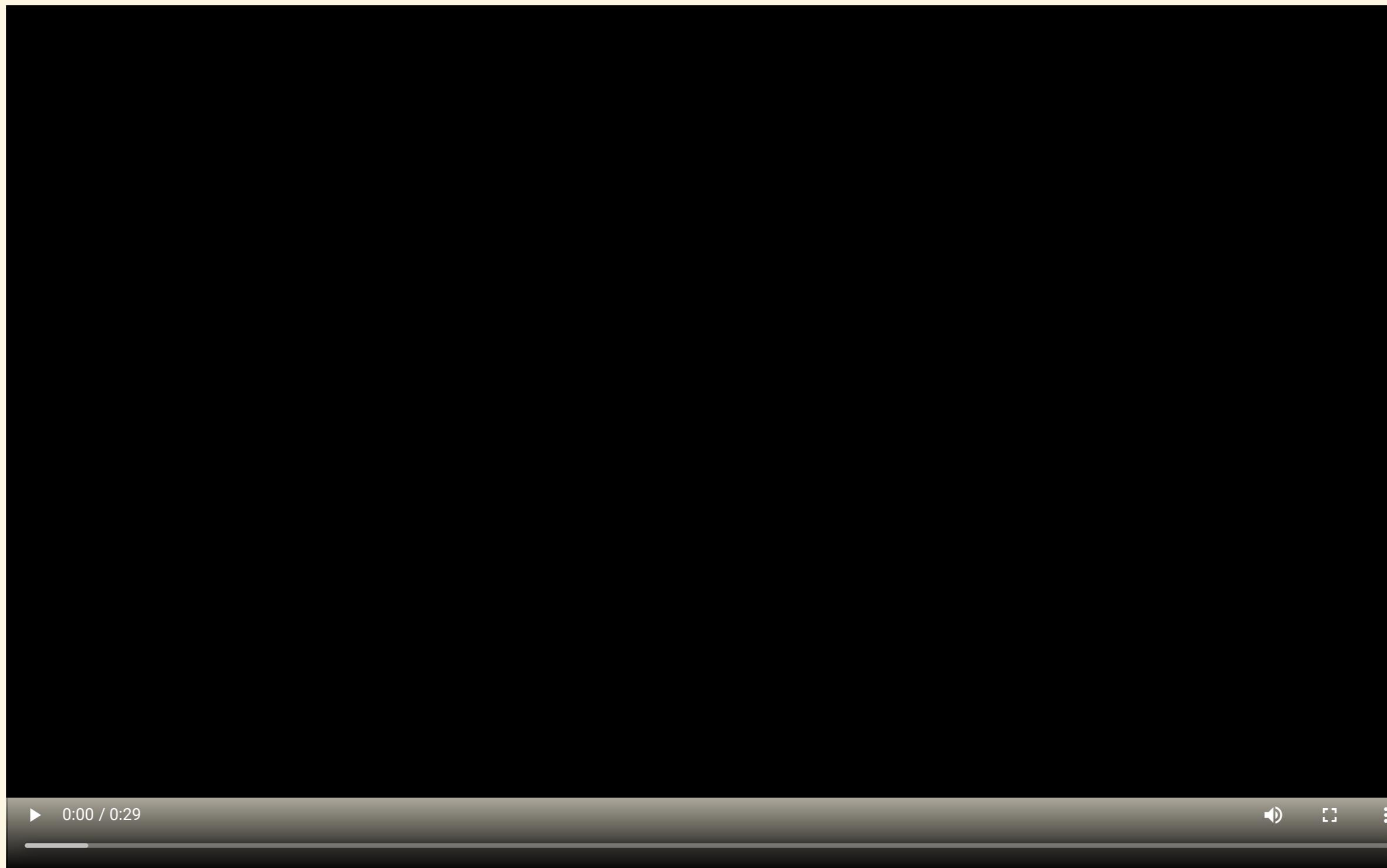
Class #2: Wednesday, January 8 2020

How Politicians Talk about Climate Change

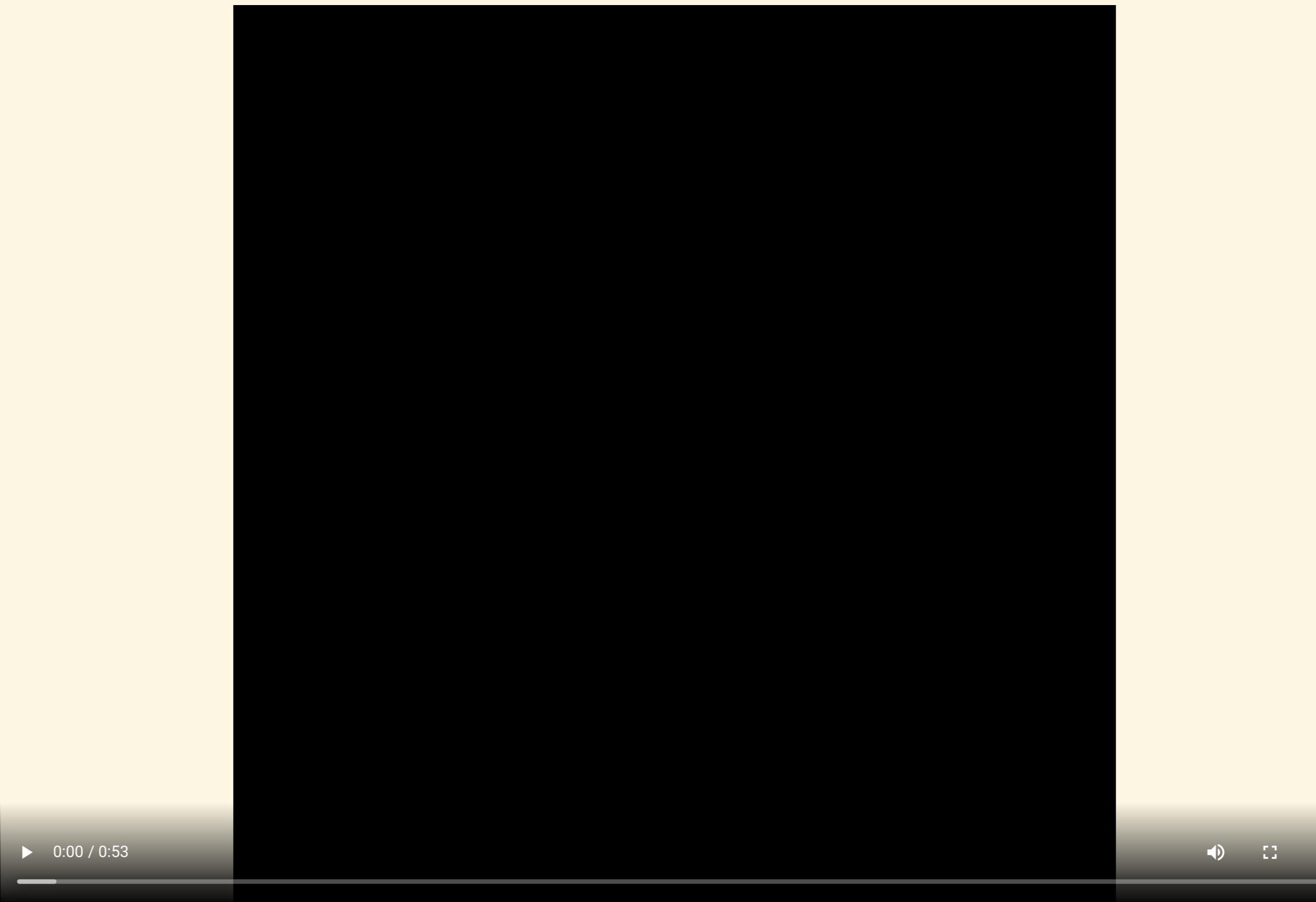
Stereotype of Democrats



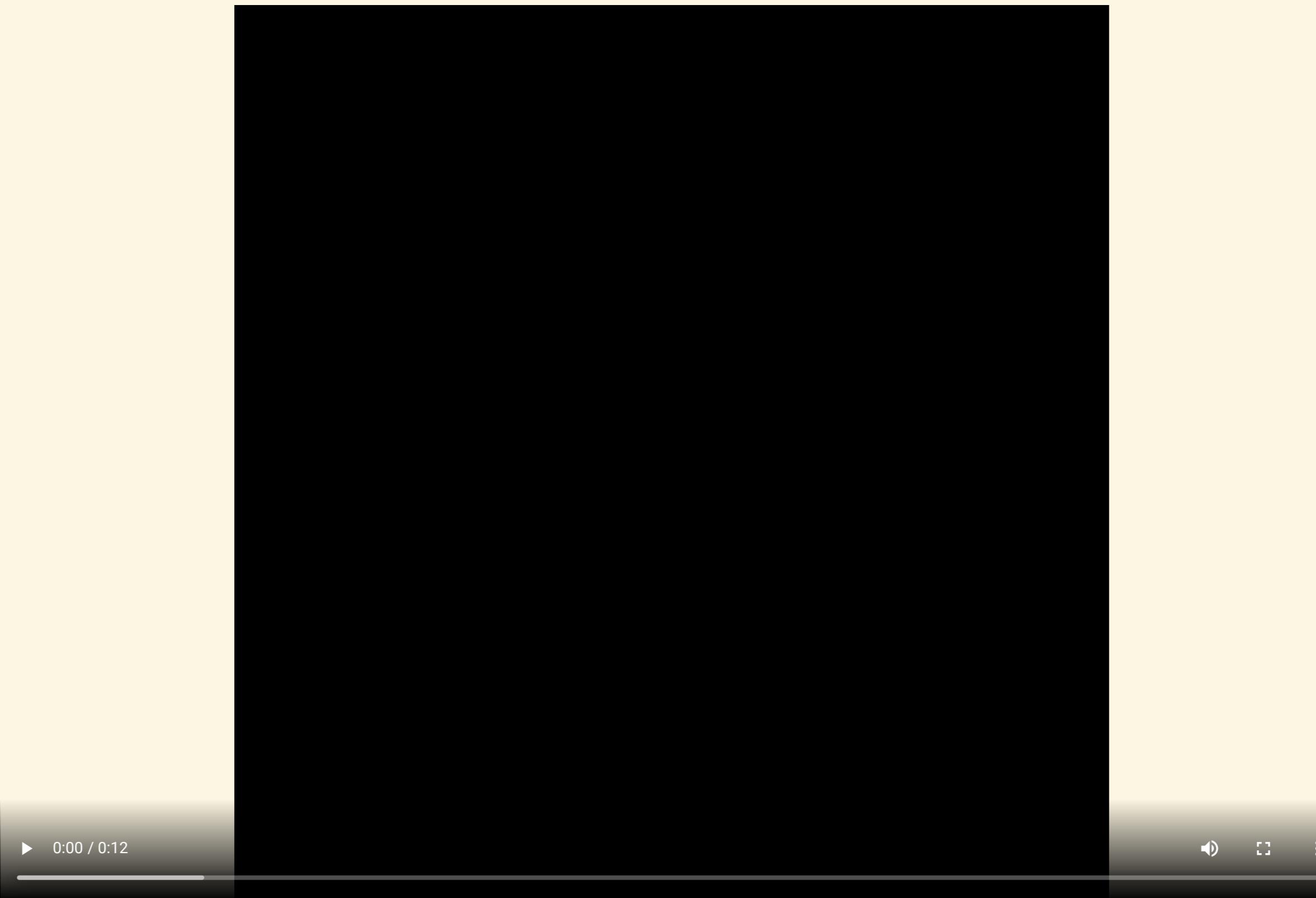
Stereotype of Republicans



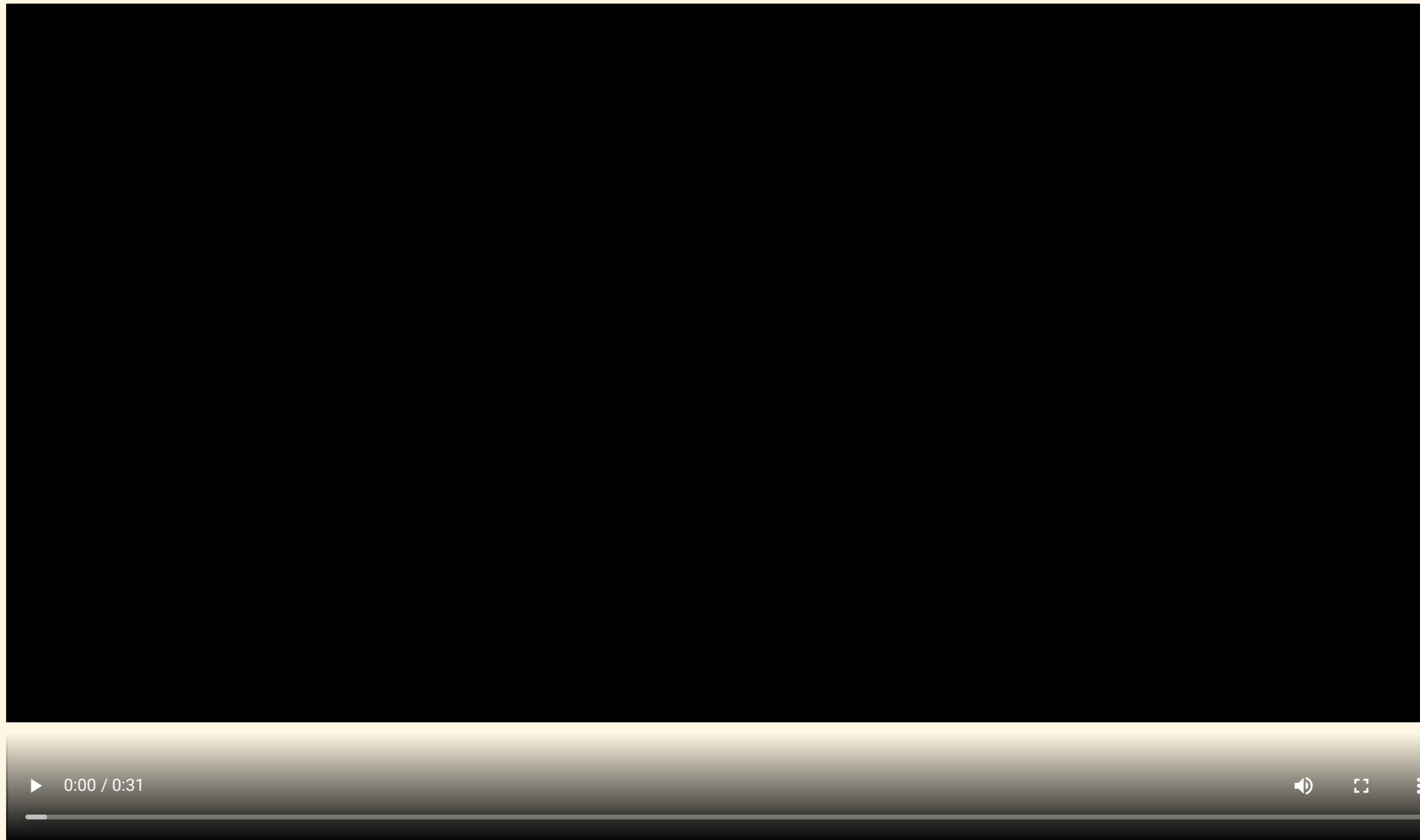
It Wasn't Always Like This



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It Wasn't Always Like This

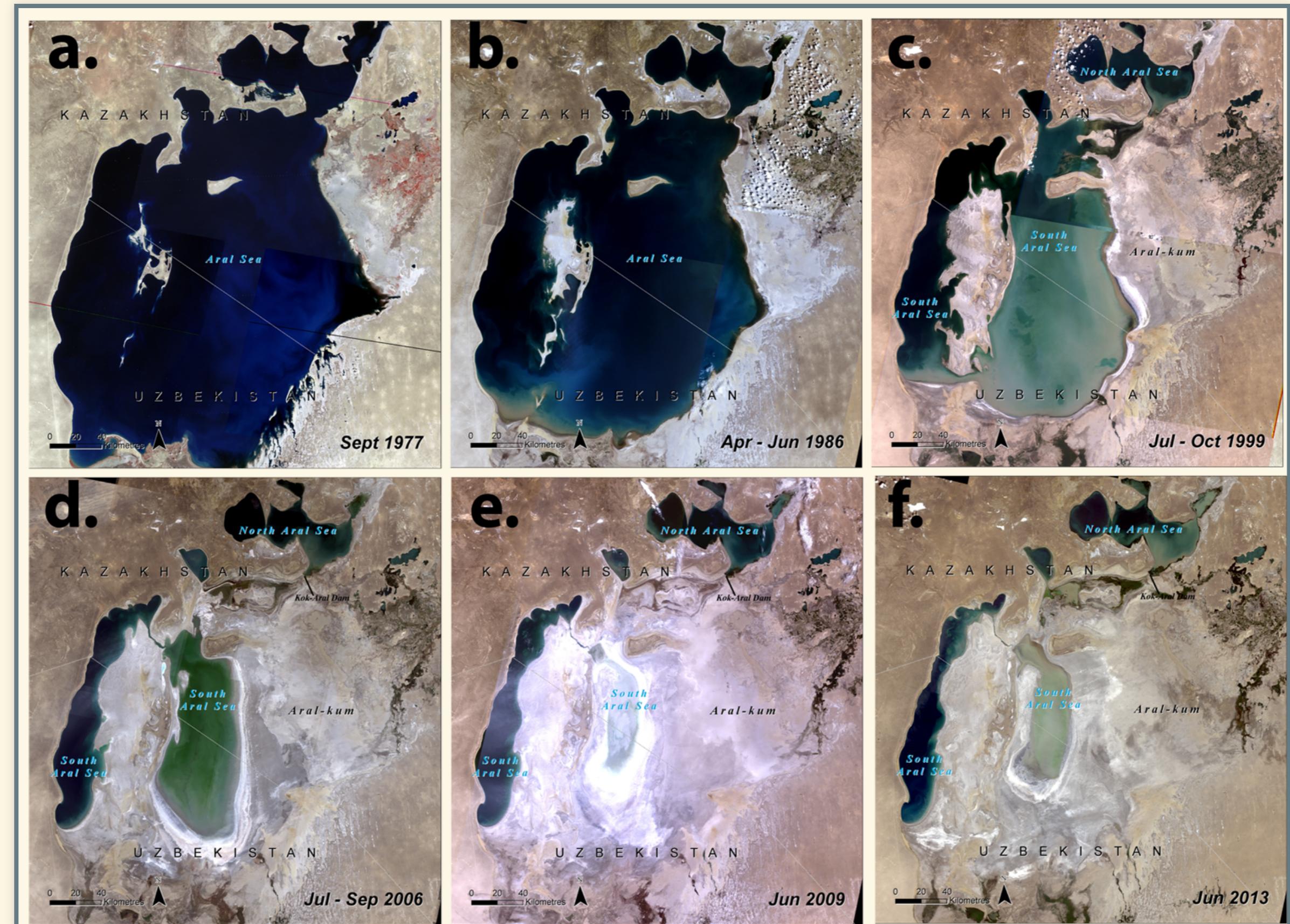


Recent GOP Climate Activists

- Arthur Laffer (Economic Adviser to President Reagan)
- Bob Inglis (Former Republican Congressman from South Carolina)



Aral Sea



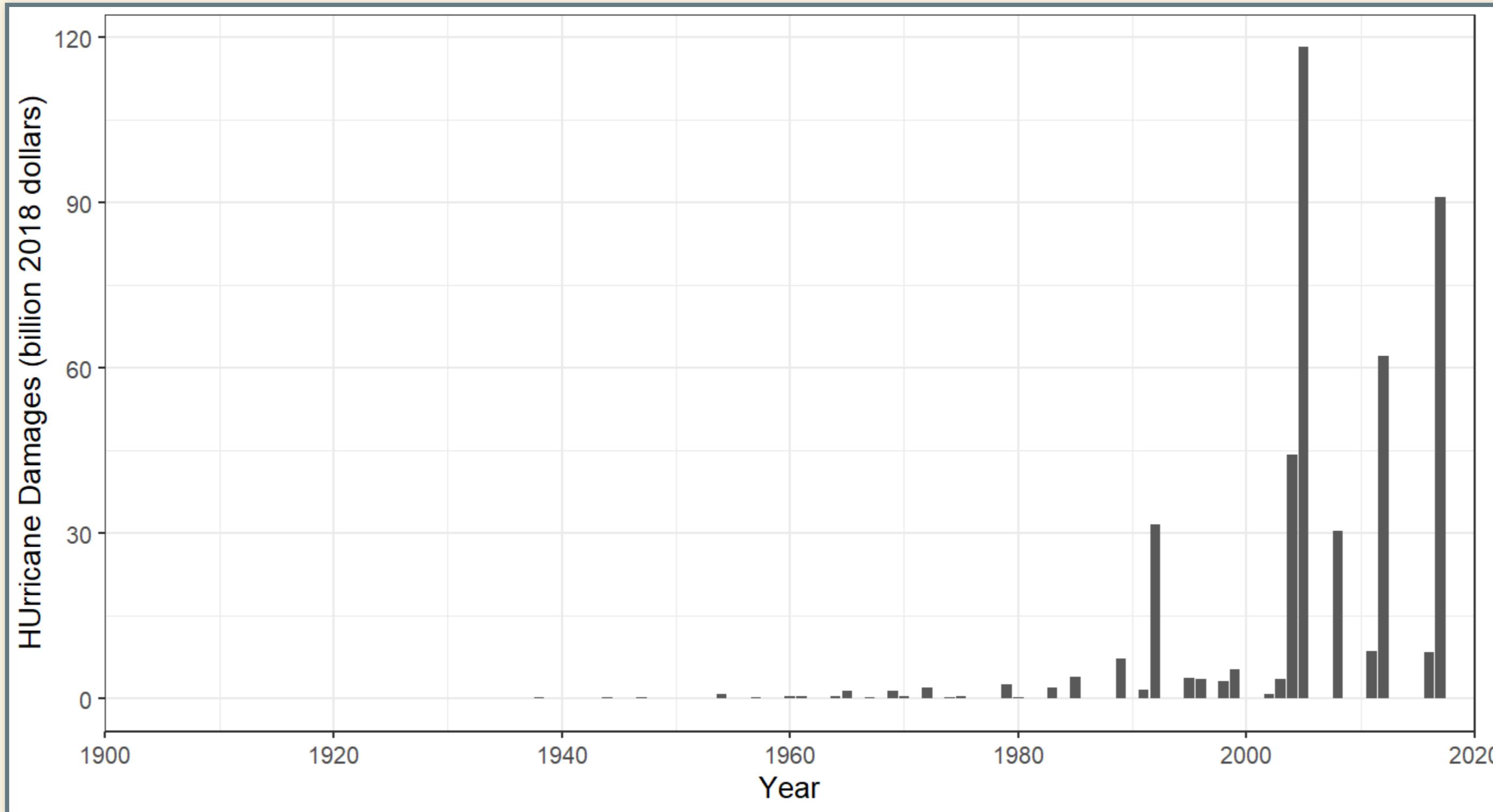
Questions from Reading?

Severe Storms and Disasters

Severe Storms and Disasters

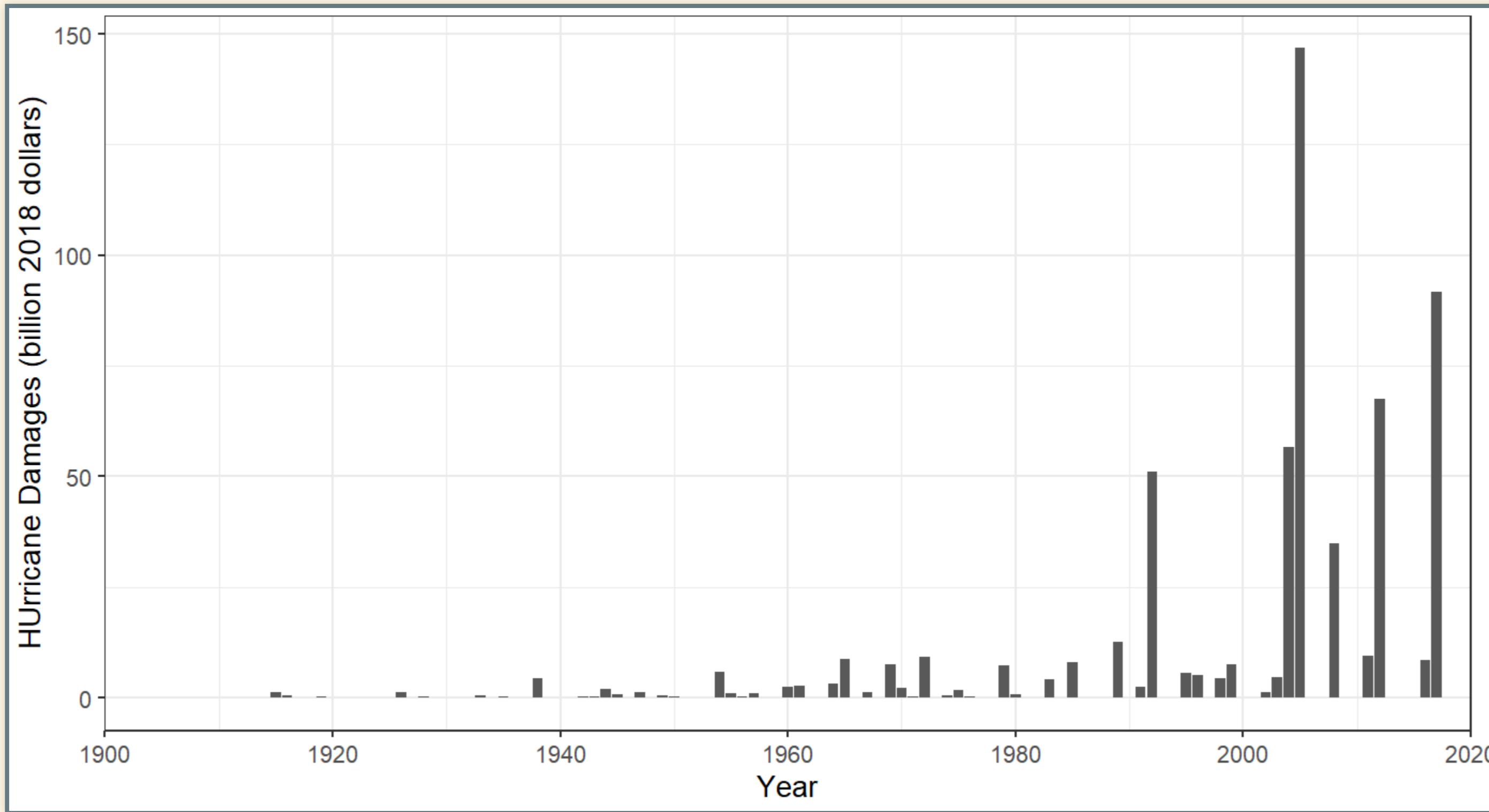
- Are severe storms, such as hurricanes and tornadoes becoming more severe because of climate change?

Hurricane Damages in the Continental U.S.

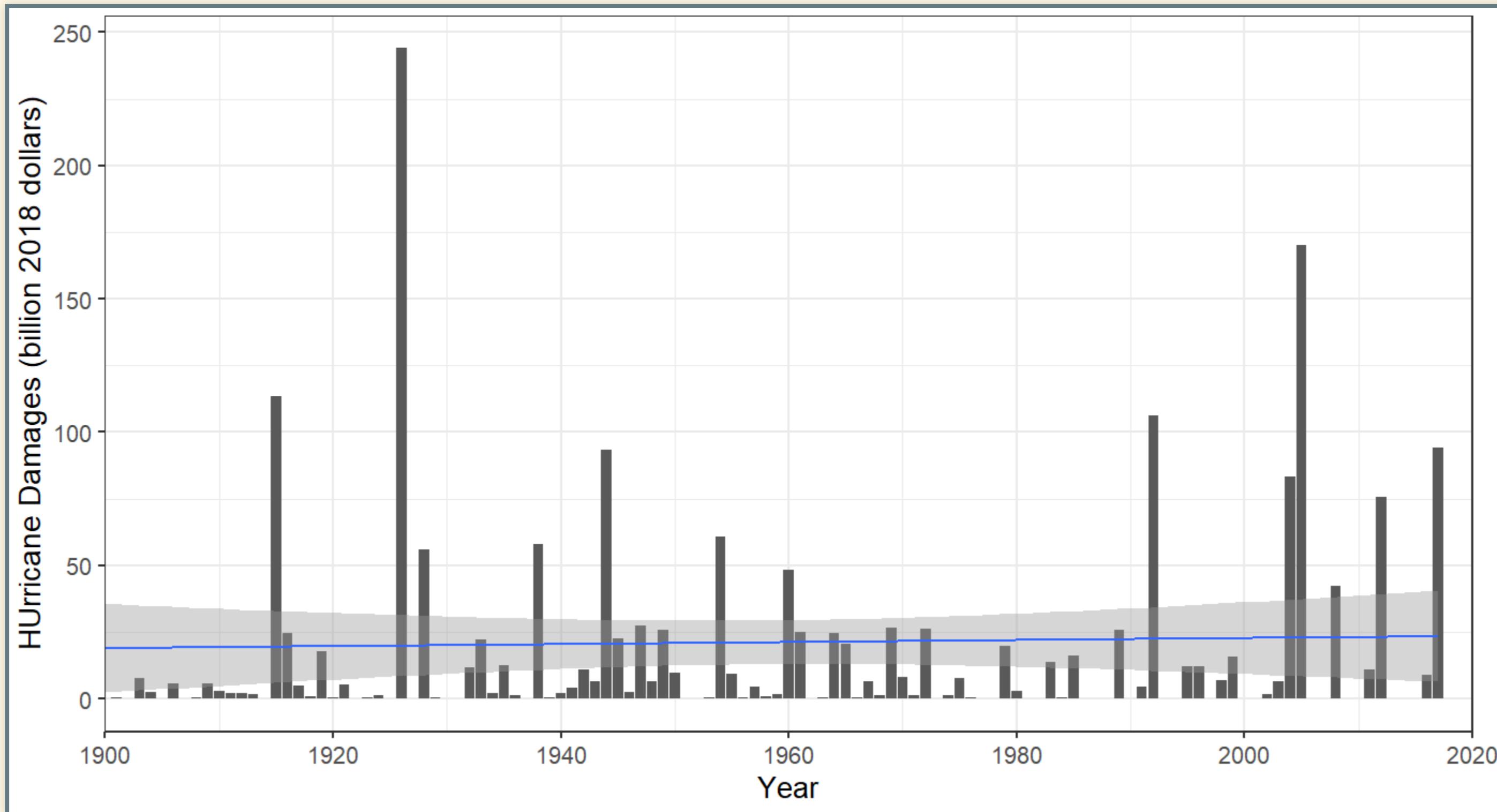


- Correct for inflation

Hurricane Damages in Constant Dollars

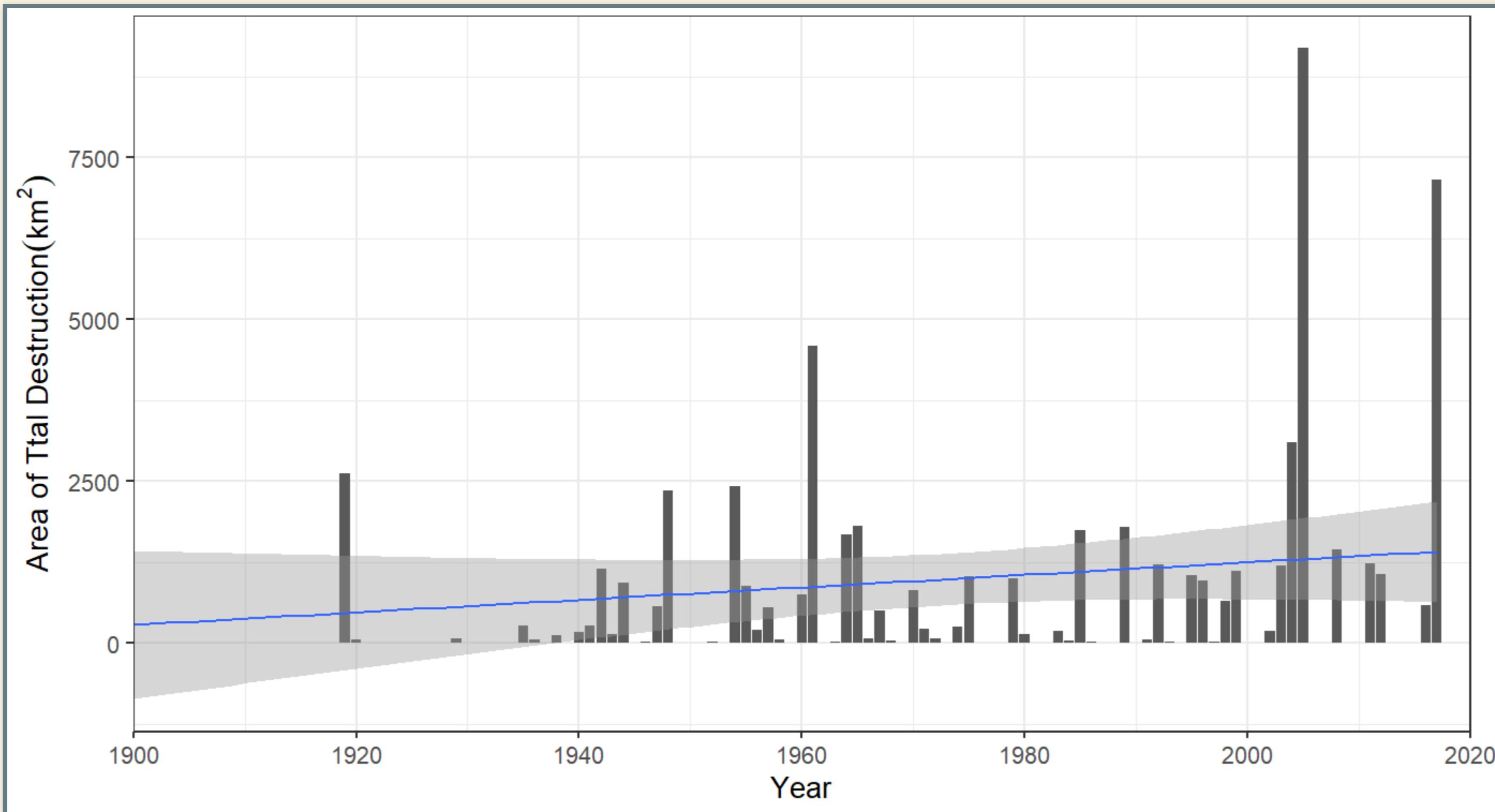


Normalized Damages



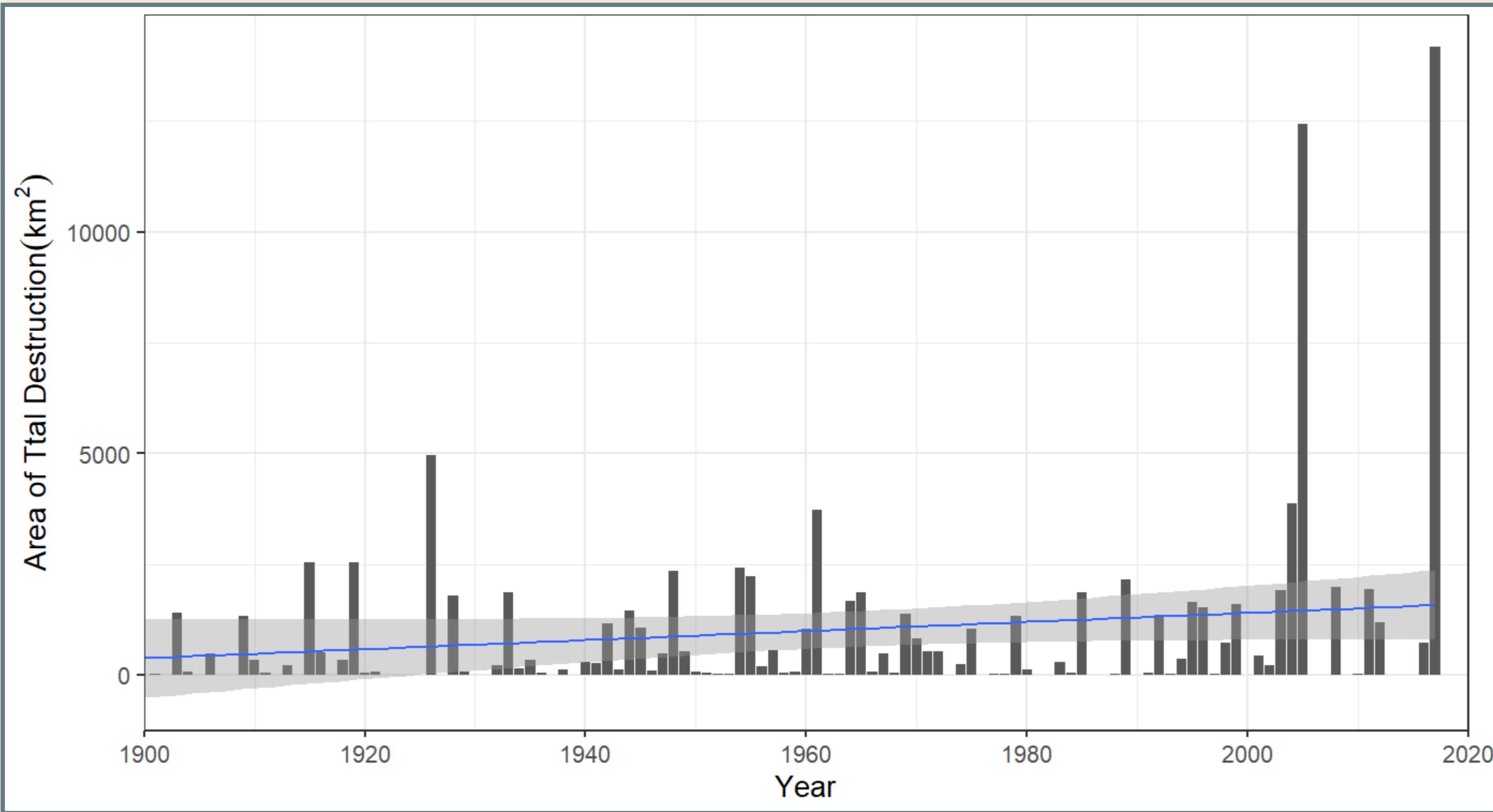
- Account for higher density of valuable property.

Area of Total Destruction



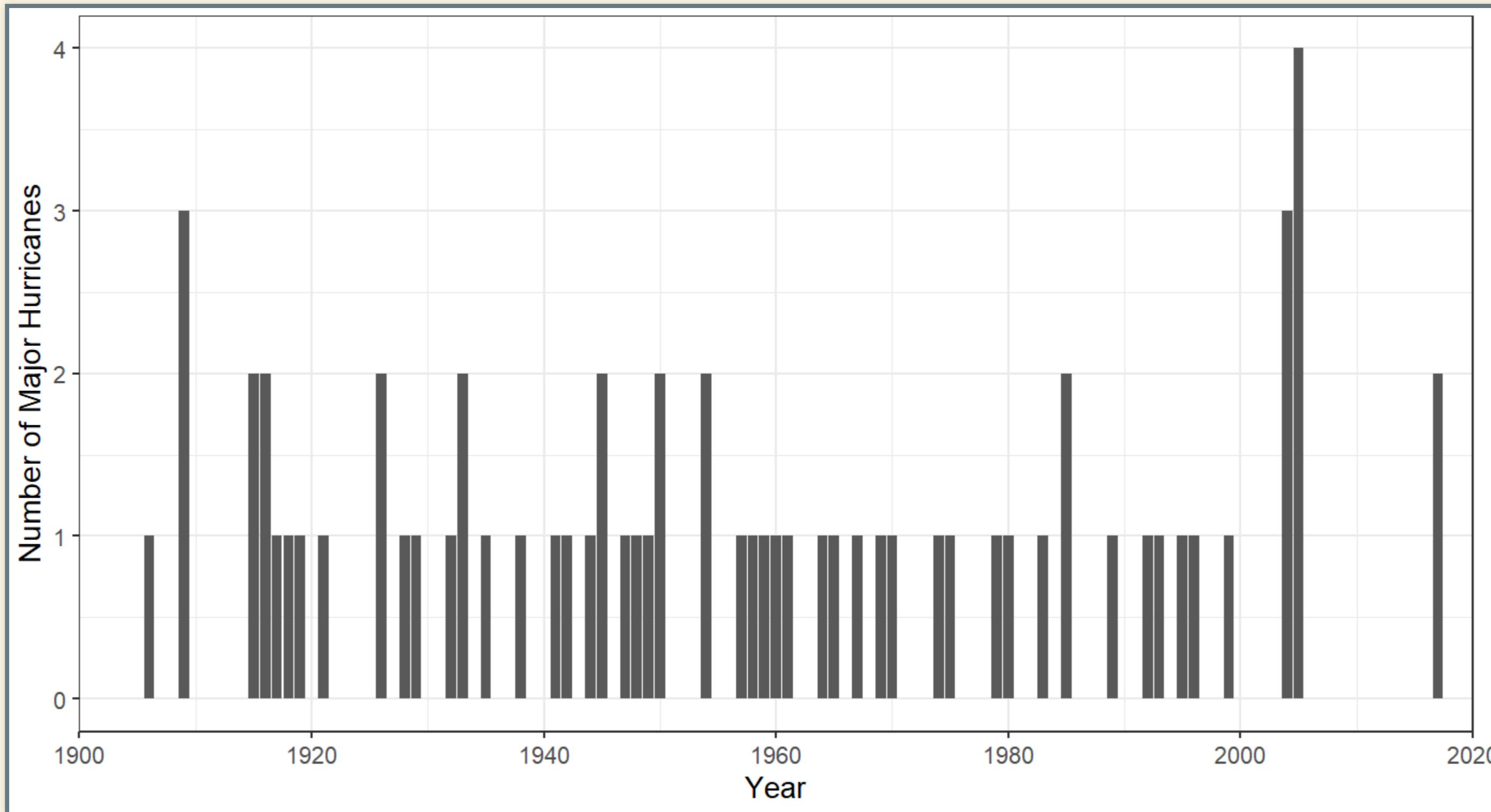
- Normalized damages may under-estimate recent hurricanes by including lots of properties in places that weren't affected by the storm.
- Focus on the size of the area destroyed.

Area of Total Destruction with Insurance Industry Data



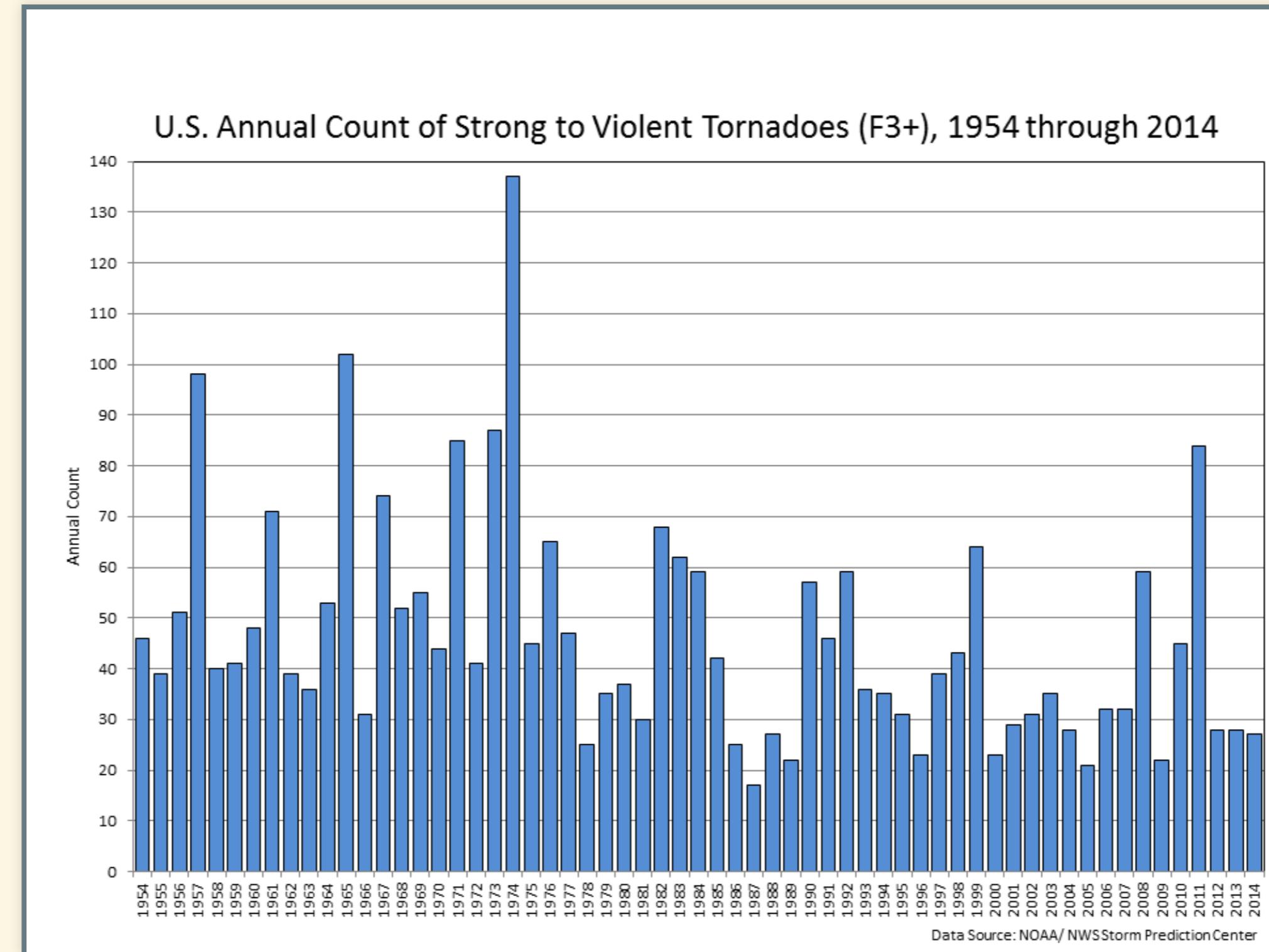
- Use damage & destruction data from International Catastrophe Insurance Managers LLC (ICAT)

Major Hurricane Landfalls on Continental US



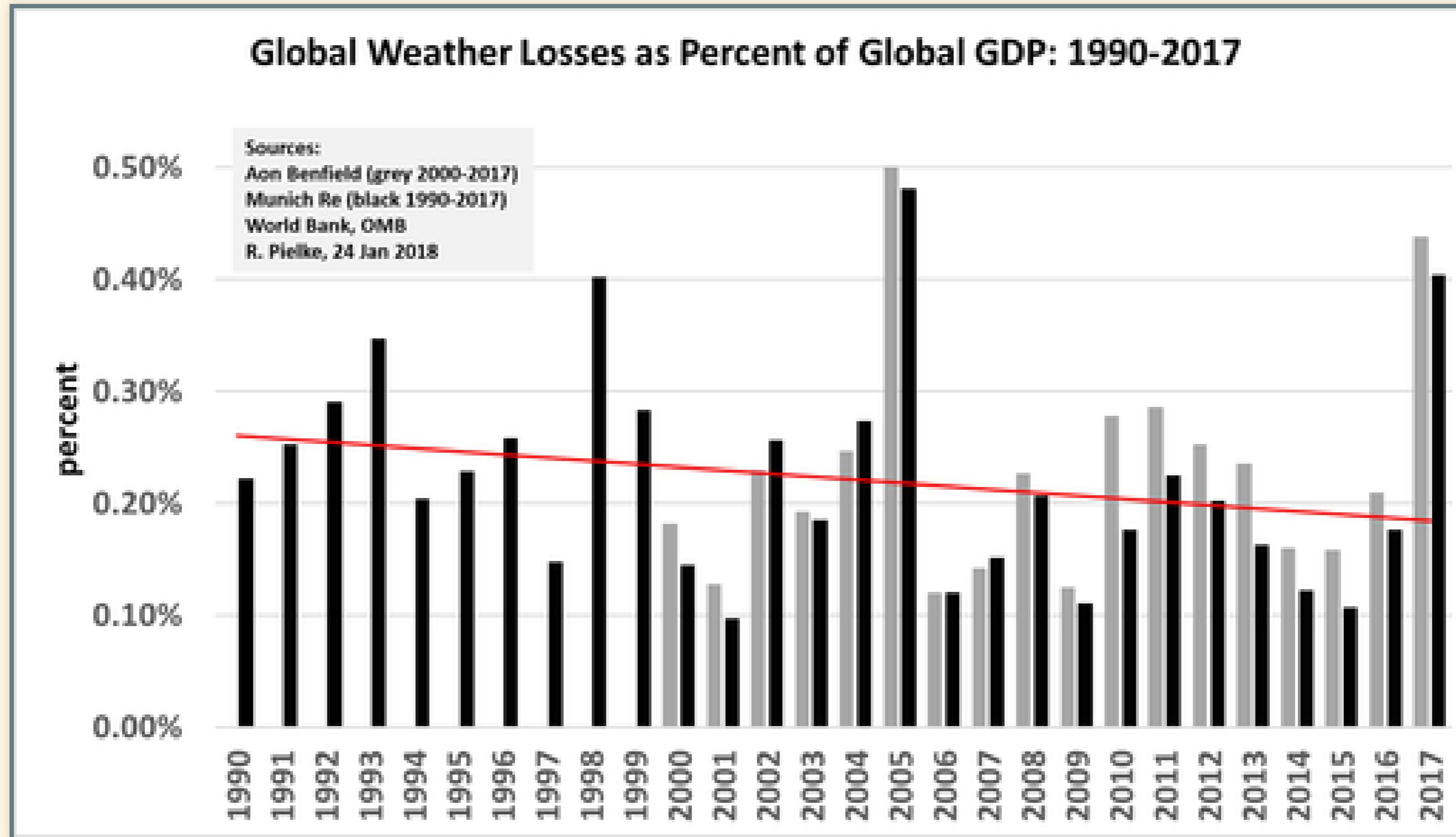
- 2006–2016: Unprecedented gap of 11 years with no major hurricanes.

Severe Tornadoes



- 2018 was the first year on record with no violent tornadoes in the U.S.

All Weather Disasters



Human Impact on Climate System:

Important Concepts:

- What kinds of things can cause the global temperature to change?
 - Energy Balance:
 - Temperature is steady when $\text{Heat}_{\text{in}} = \text{Heat}_{\text{out}}$.
 - What happens when $\text{Heat}_{\text{in}} > \text{Heat}_{\text{out}}$?
 - What kinds of things can cause Heat_{in} to change?
 - What kinds of things can cause Heat_{out} to change?

Temperature Change

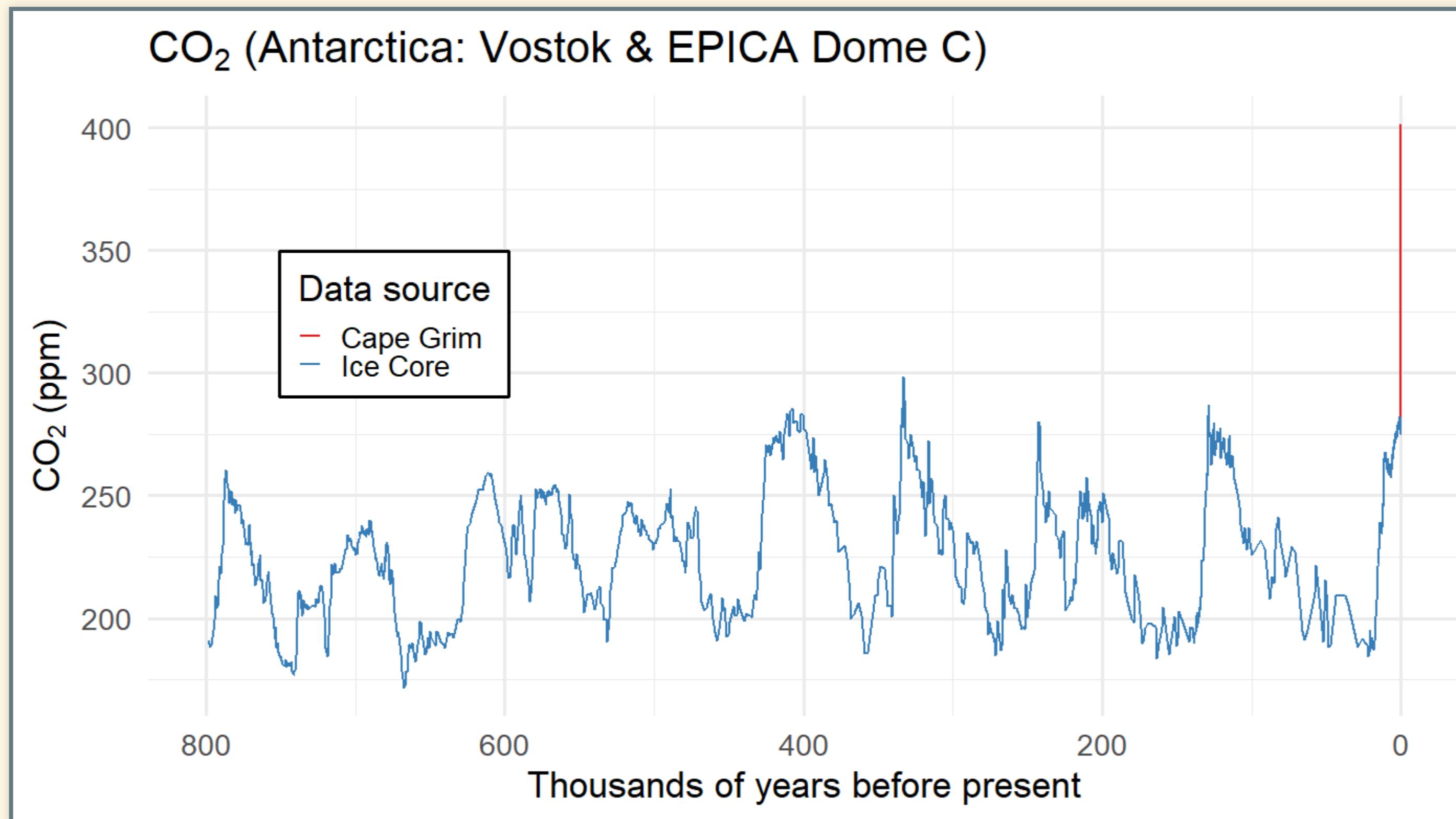
- How much has earth warmed in the last century or so?
 - About 1.0°C (1.8°F)
- If CO_2 emissions keep rising, how much do scientists expect it to warm in the next century?
 - Somewhere around $3\text{--}6^{\circ}\text{C}$ ($5\text{--}11^{\circ}\text{F}$)
- What is the seasonal temperature change in Nashville (winter to summer)?
 - Around 23°C (42°F) 47°F in January, 89°F in August.
- What is the average daily temperature range in Nashville (night to day)?
 - Around 11°C (20°F)
 - **So why do people worry about global warming?**

Predictions

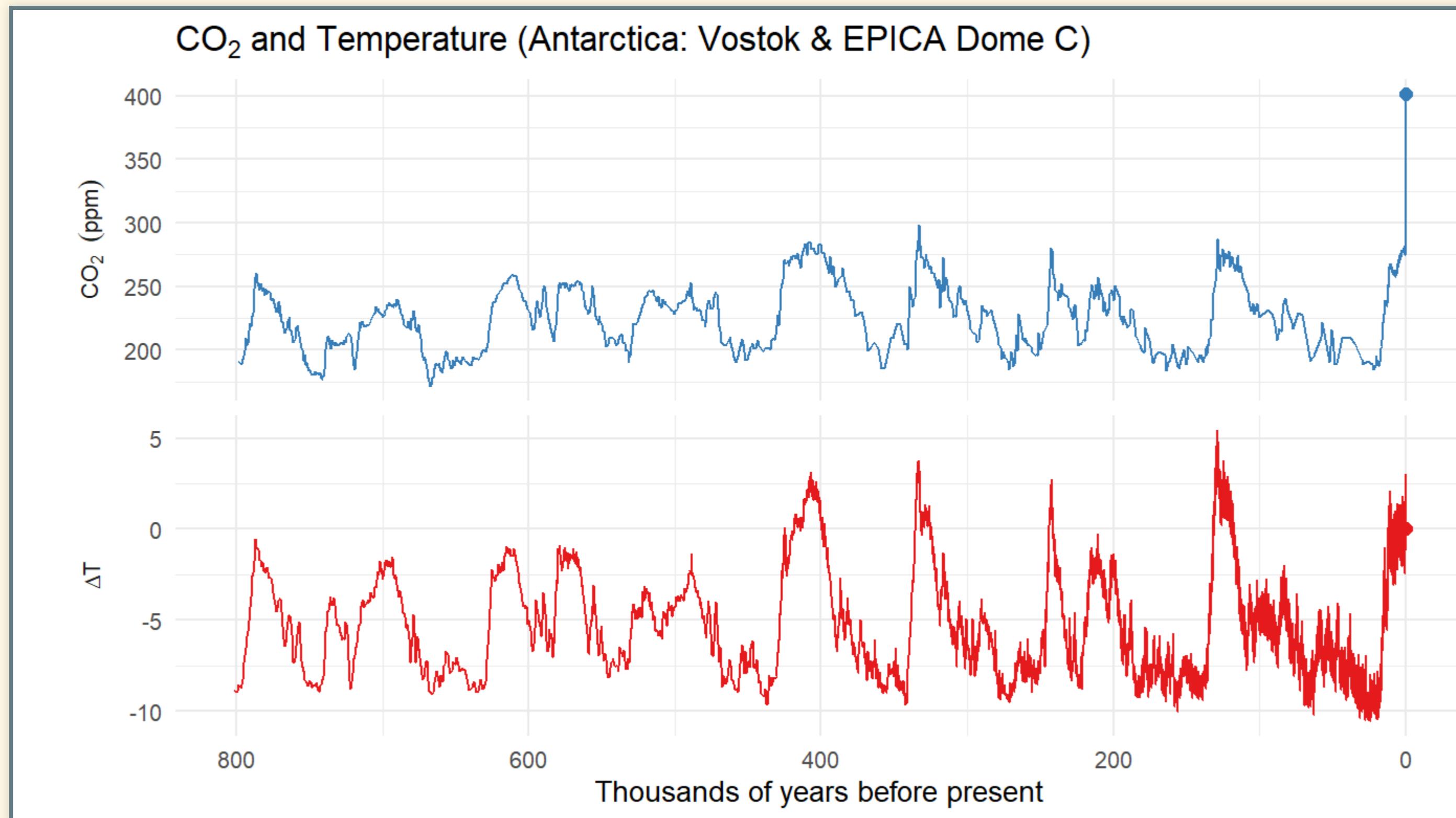
- Meteorologists can't predict whether it will rain three weeks from today with any confidence.
- So how can I trust predictions about the climate 100 years from now?

What Earth's History Tells Us

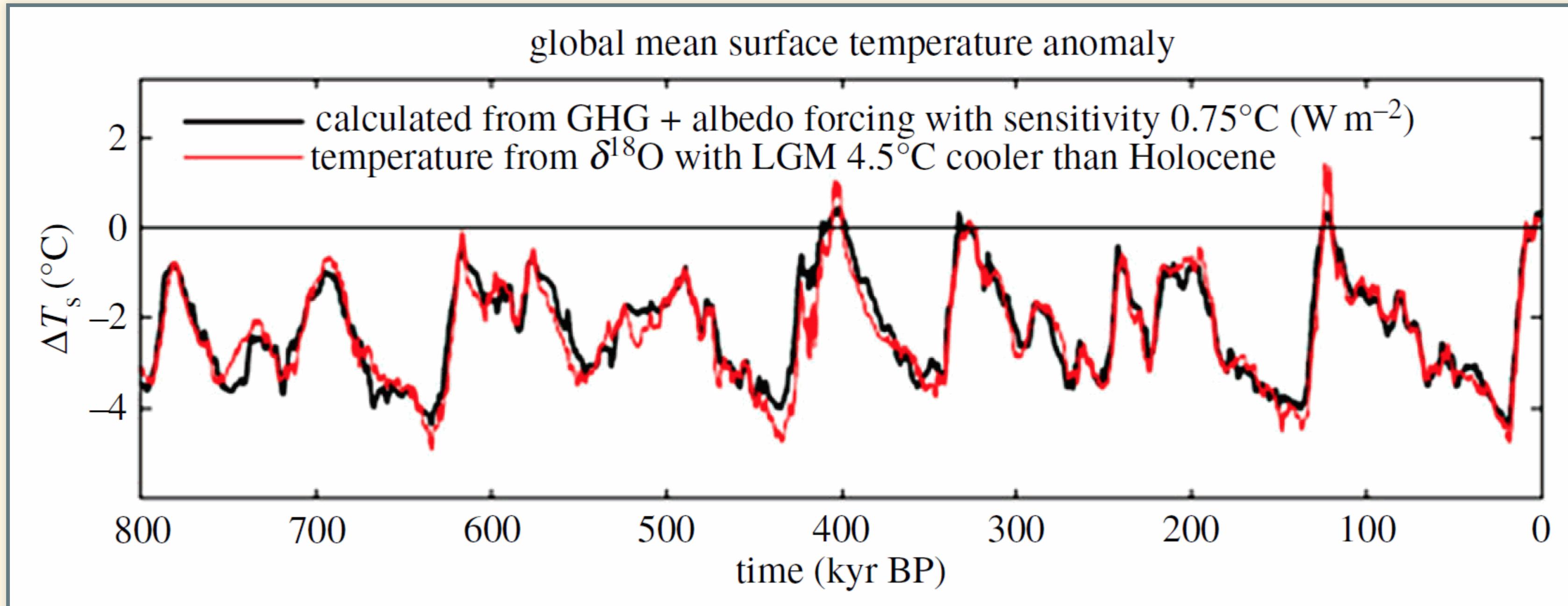
800,000 years of CO₂



800,000 years of CO₂ and Temperature



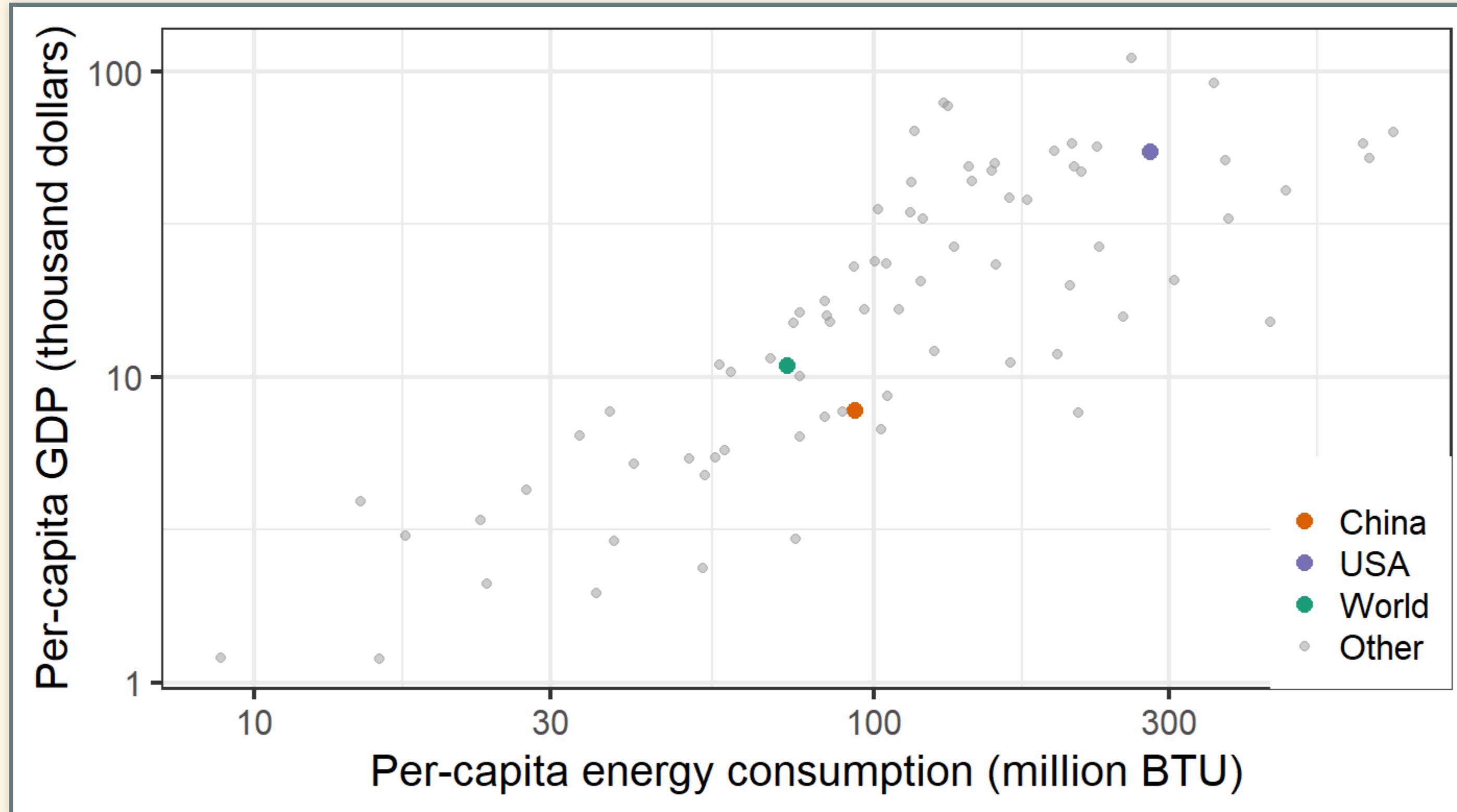
Using Past Climates to Test Theory



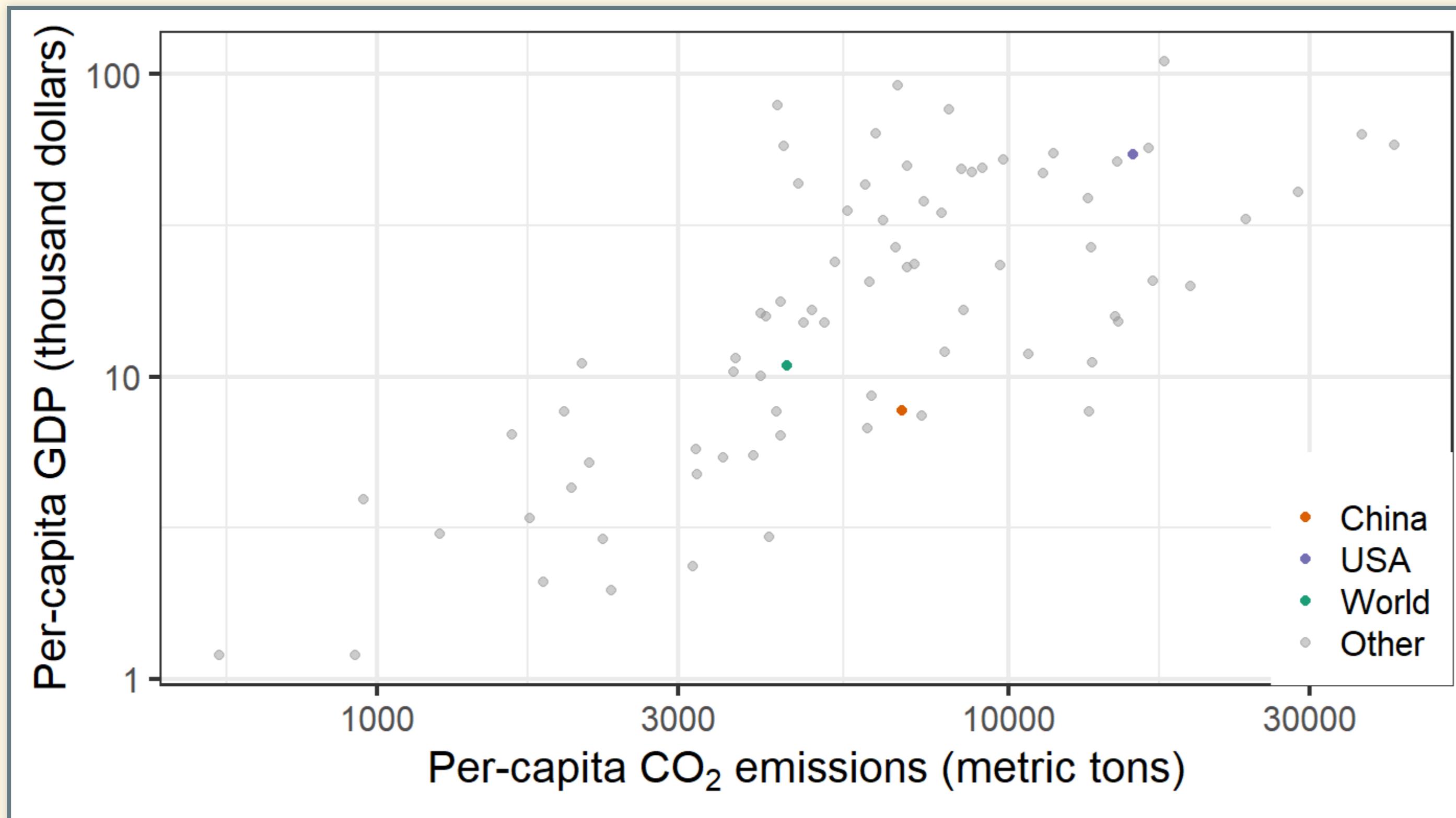
Source: J. Hansen et al., Phil. Trans. Roy. Soc. A **371**, 20120394 (2013).

Economy-Energy-Environment

Wealth & Energy Use



Wealth & CO₂ Emissions



Economics, Policy, Climate

- Why don't markets manage greenhouse gas emissions well?
 - Pollution is an **externality**
- How does Nordhaus propose to fix this problem?
 - Ronald H. Coase (1920–2013):
 - Solve externality problems by assigning property rights
 - Cap-and-trade: Permits
 - Emissions tax: Put price on emissions

Economics and Vulnerability

- For an economist, what are the big dangers associated with climate change?
 - **Managed vs. unmanaged, unmanageable resources**