



State of the climate debate

Judith Curry
Climate Forecast Applications Network

Agreement:

- Surface temperatures have increased since 1880
- Humans are adding carbon dioxide to the atmosphere
- Carbon dioxide and other greenhouse gases have a warming effect on the planet

Disagreement:

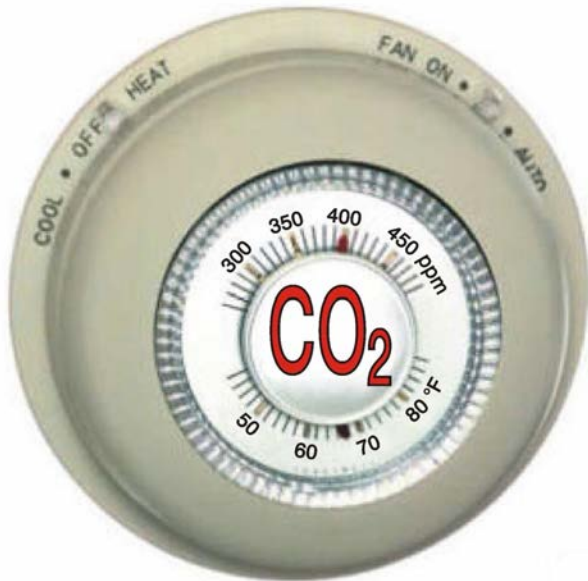
- **Whether the warming since 1950 has been dominated by human causes**
- How much the planet will warm in the 21st century
- Whether warming is 'dangerous'
- **How we should respond to the warming to improve human well being**



Disagreement: causes of recent climate change

Climate is generally stable Change caused by external inputs

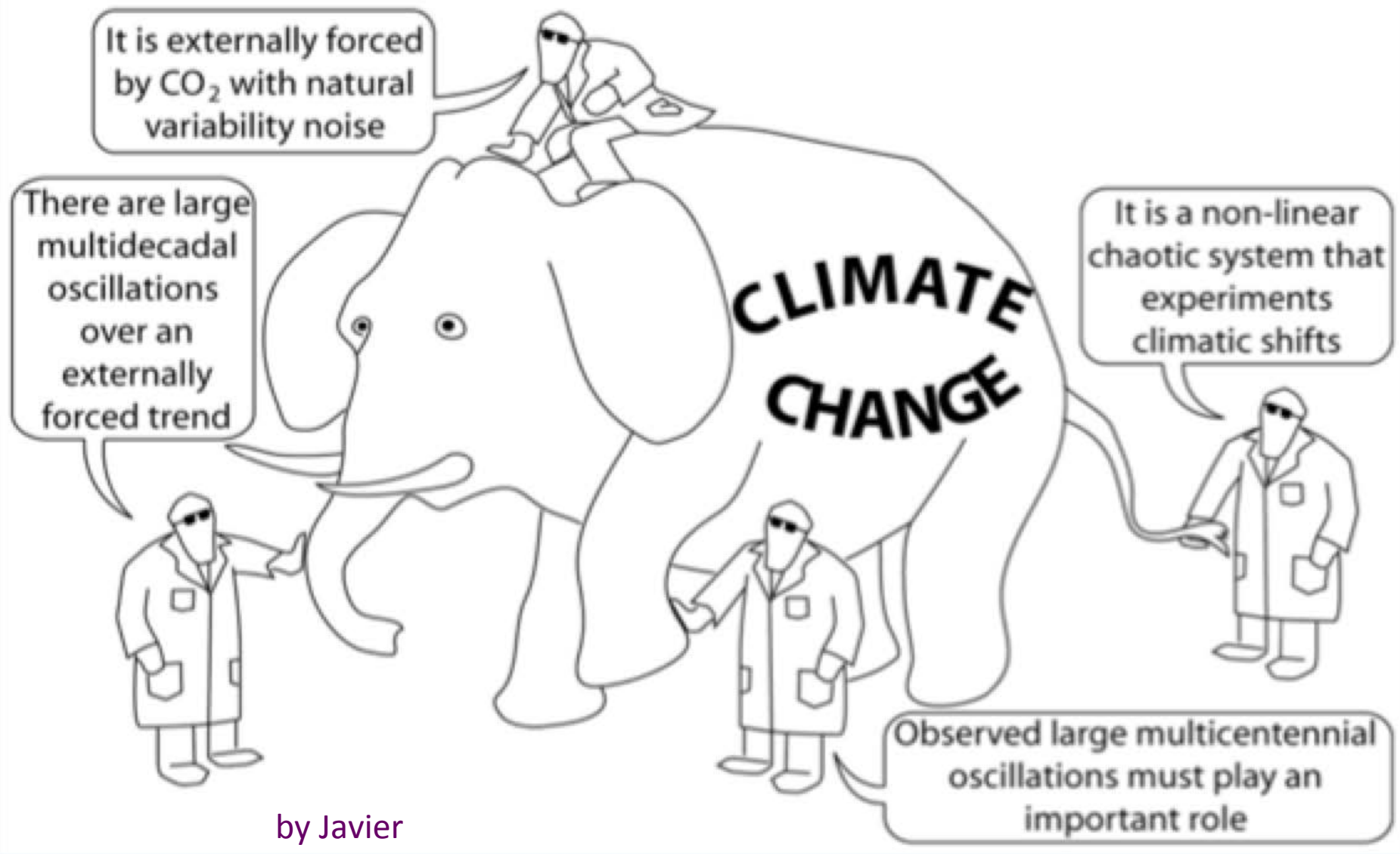
- CO₂ is the primary climate '**control knob**'
- CO₂ warming is amplified by known factors



Climate is dynamic Change primarily occurs naturally

- Highly **complex** dynamical system
- **No** simple cause and effect
- Climate **shifts** naturally in unexpected ways.
- Key driver: large-scale **ocean circulations** and changes in cloudiness





How do the 'free' (internal variability) and 'forced' (e.g. CO₂) aspects of change combine to alter the statistical properties of climate?

Disagreement: cause of recent climate change

Climate is generally stable

Change caused by external inputs

- CO₂ is the primary climate **'control knob'**
- CO₂ warming is amplified by known factors
- Climate can be controlled by controlling atmospheric CO₂

Climate is dynamic

Change primarily occurs naturally

- Highly **complex** nonlinear dynamical system
- No simple cause and effect
- Climate **shifts** naturally in unexpected ways
- Earth's climate is largely uncontrollable

The policy 'cart' before the scientific 'horse'

IPCC FAR 1990: “The size of this warming is broadly consistent with predictions of climate models, but also of the **same magnitude as natural climate variability**”

1992 UNFCCC Treaty

IPCC SAR 1995: “The balance of evidence suggests a **discernible** human influence on global climate.”

1997 Kyoto Protocol

IPCC TAR 2001: “There is new and stronger evidence that **most** of the warming observed over the last 50 years is attributable to human activities.”



You find what you shine a light on . . .

Solar effects

Unknown unknowns

**Long-term ocean
oscillations**

Volcanoes

Greenhouse gases

Underwater volcanoes

Aerosols

Land use

Solar system gravitational
& magnetic interactions

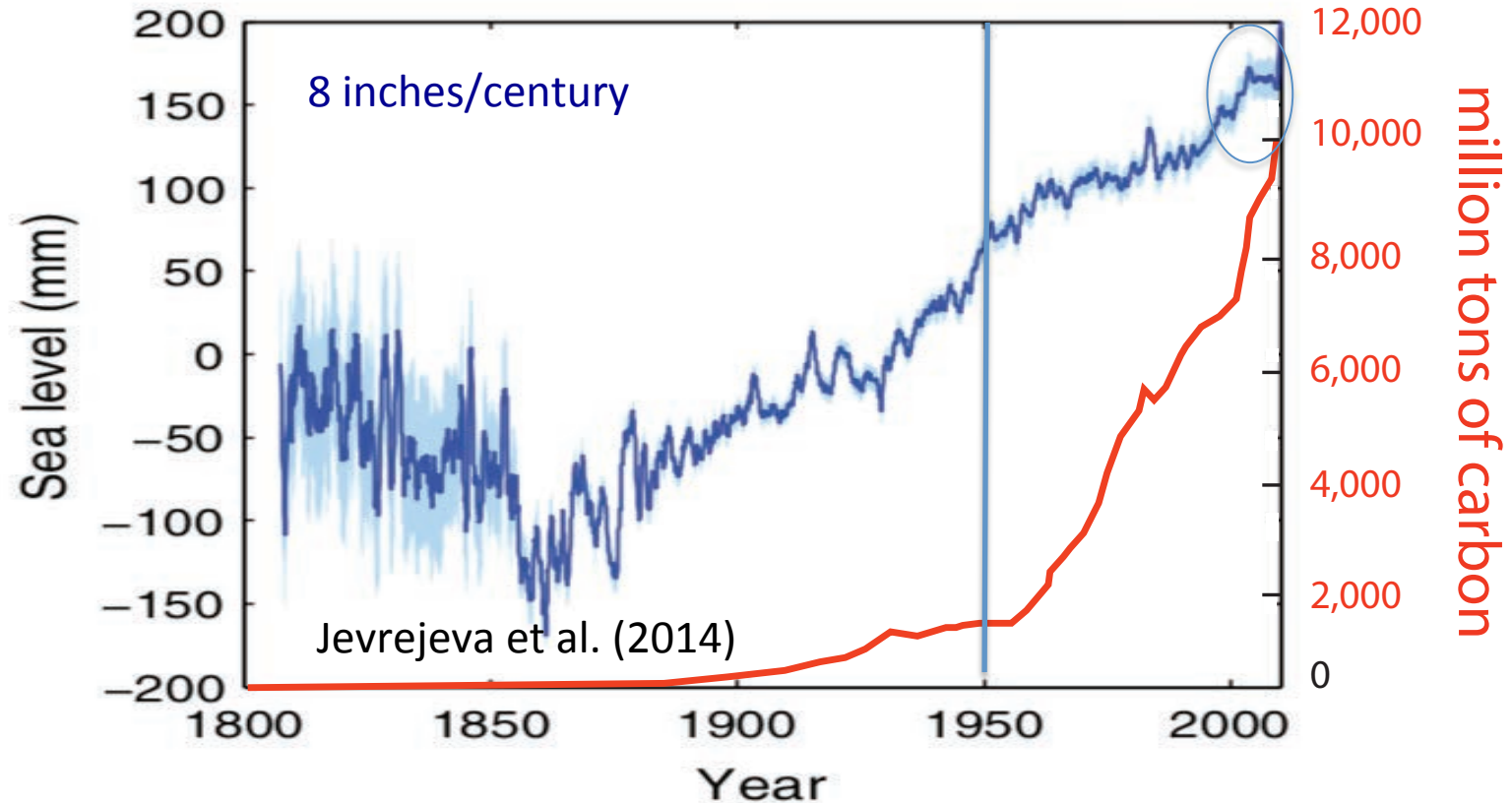


“That’s the big thing – sea-level rise – the planet could become ungovernable.” – Dr. James Hansen, former Director, NASA GISS



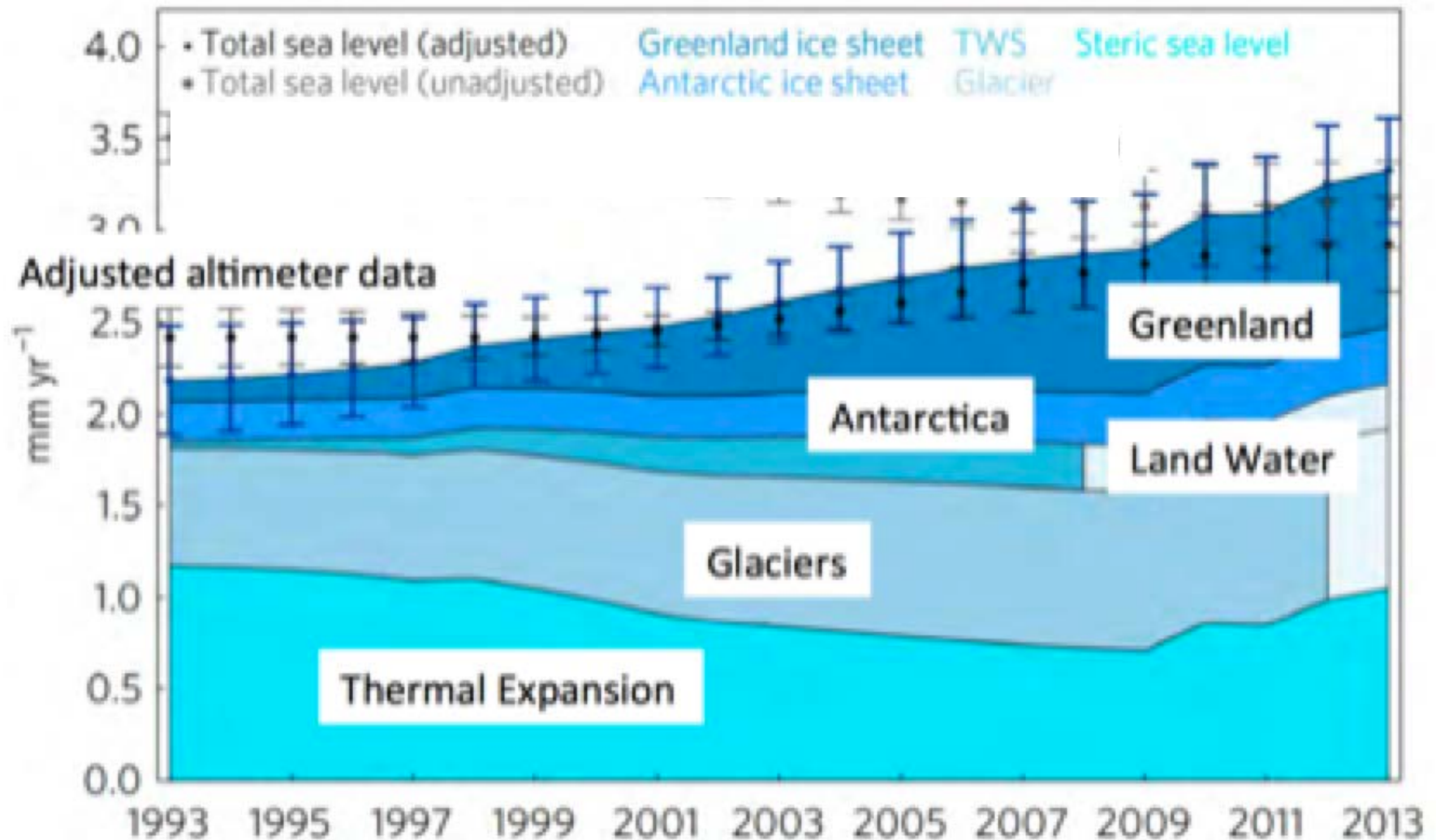
“We’re talking about literally giving up on our coastal cities of the world and moving inland.” – Dr. Michael Mann, Penn State

Is CO₂ the 'control knob' for global sea level rise?

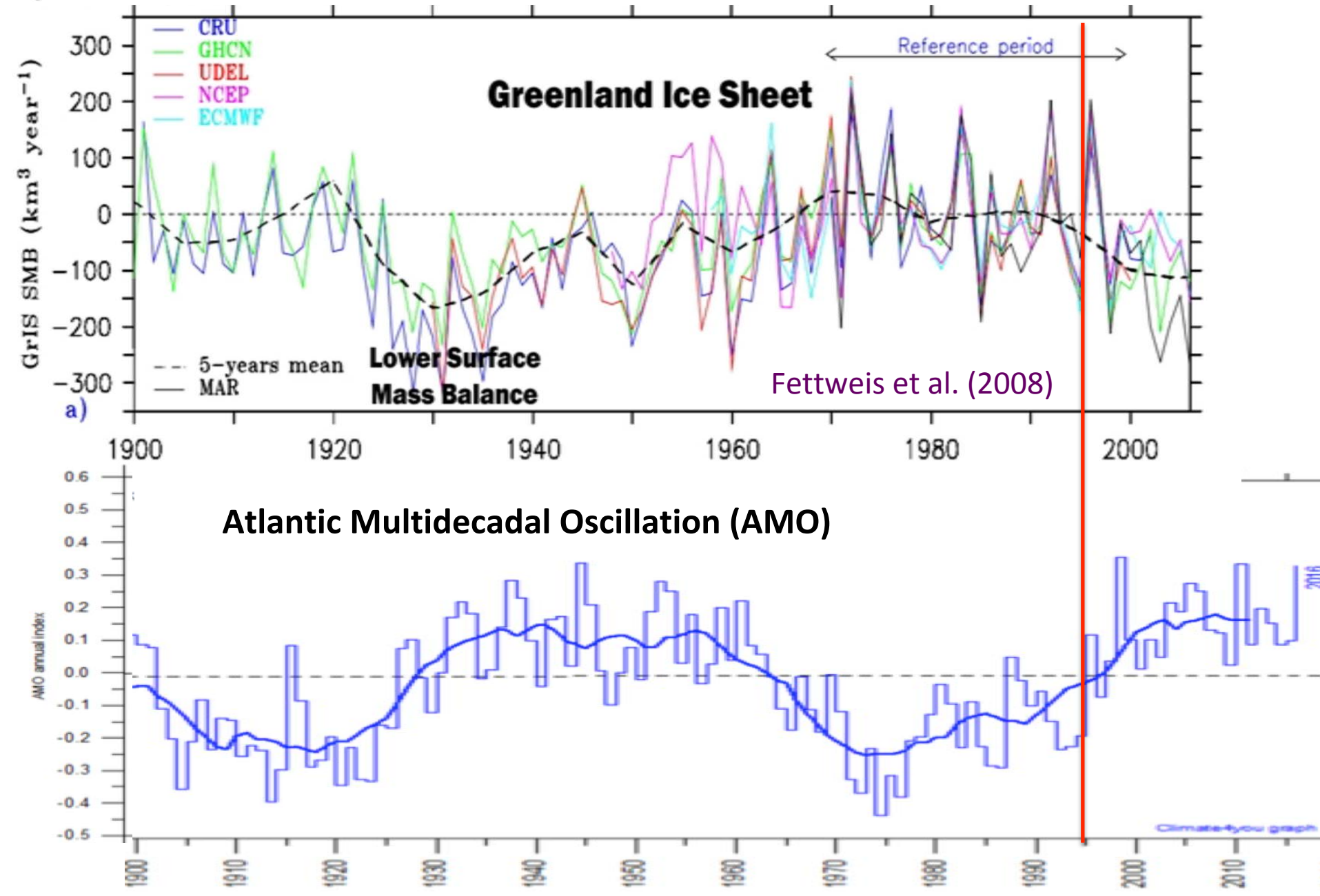


- Global sea level rise started ~1860, well before fossil carbon emissions became significant
- Steep increase in emissions 1950 – 1980 is associated with little sea level rise

What is causing recent sea level rise?



Variations in Greenland glacier mass balance



IPCC AR5 quotes on sea level rise

“It is likely that similarly high rates of global averaged sea level rise occurred **between 1920 and 1950.**”

“ . . . continuous mass loss from glaciers after about 1850. Most notable is the rapid loss from Greenland glaciers during the **1930s.**”

“Over Greenland, temperature has risen significantly since the early 1990s, reaching values similar to those in the **1930s.**”

“As a consequence, the **detection** of the impact of climate change in observed changes in regional sea level **remains challenging.**”

To what extent are man-made CO₂ emissions contributing to climate change?

We don't know. We don't know how to disentangle natural internal variability from the effects of CO₂ – driven warming

The IPCC AR5 says '*extremely likely*' to be '*more than half*.'
Climate models imply 100%.

Given the IPCC's neglect of multi-decadal and longer time scales of natural internal variability, **extreme confidence is unjustified**

JC's response: Man-made CO₂ emissions are *as likely as not* to contribute *less than 50%* of the recent warming

Should we reduce emissions to prevent warming?

Yes

- Reducing CO₂ emissions are critical for preventing future dangerous warming of the climate
- Precautionary Principle
- Renewable energy is preferred, particularly solar and wind

No

- Any reduction in warming would be minimal and at high cost
- The 'cure' could be worse than the 'disease'
- Best to focus on resilience: keeping economies strong and making sure everyone has access to energy

Climate Pragmatism

- Accelerate energy **innovation**
- Build **resilience** to extreme weather
- **No regrets** pollution reduction

Benefits:

- near-term socioeconomic & environmental **benefits**
- supports climate mitigation & adaptation
- justifications **independent** of climate mitigation & adaptation

Avoids:

- political gridlock
- costly policies with minimal impacts on climate
- policies with adverse, unintended consequences

Does **not** require:

- agreement about climate science
- agreement about risks of uncontrolled greenhouse gases

The 'Madhouse Effect' caused by climate scientists

- Rampant overconfidence in simplistic theory of climate change
- Enforcement of a politically-motivated, manufactured 'consensus'
- Attempts to stifle scientific and policy debates
- Activism and advocacy for their preferred politics and policy
- Self-promotion and 'cashing in' (publicity agent, etc.)
- Violation of the traditional norms of science: disinterestedness, organized skepticism
- **Public attacks on other scientists that do not support the 'consensus'**
- Institutional rewards for 'madhouse scientists'



Personal statement

My **job as a scientist**: to critically evaluate evidence and challenge and reassess conclusions drawn from the evidence.

A year ago I **resigned my tenured faculty position** because of academic political pressures that interfered with doing my job -- 'science madhouse effect'

President of **Climate Forecast Applications Network**: providing weather & climate forecast information to businesses www.cfanclimate.net



I am proprietor of the blog **Climate Etc.** – broadening the discussion on climate science and policy judithcurry.com

Climate Etc.

