

Climate change skepticism and denial

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November 28, 2019
How To Lie With Statistics
Climate Week Special

How many people do you think support the following statements: (2008, UK)

“I am uncertain about whether climate change is really happening” **20 %**

“Many leading experts still question if human activity is contributing to climate change” **39 %**

Germany: 5–8% (2013)

L. Whitmarsh, *Glob. Env. Change* **21** (2011), 690–700
A. Engels et al., *Glob. Env. Change* **23** (2013) 1018–1027

Skepticism or denial?

- Constructive/good-faith skepticism is a main factor in thriving scientific advance → positive connotation
- “Pseudoskepticism”: motivated by opinion, ideology, financial interest, self-interest → deniers/contrarians
- Dunlap (2013): Continuum between skepticism and denial, with “*some [...] remaining open to evidence, and others in complete denial mode, their minds made up.*”

Mann and Toles (2017), 1–2
R. Dunlap, *American Behavioral Scientist* **57**, 6 (2013), 691–698

Part 1:

Mechanisms of denial

Manufacturing uncertainty

- Industries have attacked scientific studies since early 1900s (lead)
- Perfected by the tobacco industry (since 1950s): “Doubt is our product” → hired scientists, commissioned research to challenge scientific consensus
- PR strategy (H&K, 1955):
 - “Cause-and-effect relationships not established”/”inconclusive”
 - “Statistical data do not provide the answers”
 - “More research is needed”

Manufacturing uncertainty

Washington Post, December 3, 2002:

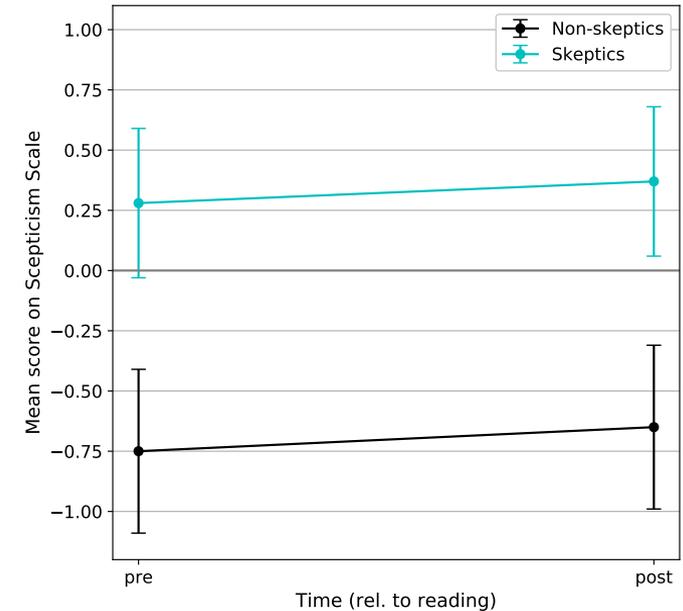
“Numerous uncertainties remain about global warming’s cause and effect”

George W. Bush calls *“for a decade of research before the government commits to anything more than voluntary measures [...]”*

Cited from M. Boykoff and J. Boykoff, *Glob. Env. Change* **14** (2004), 125–136

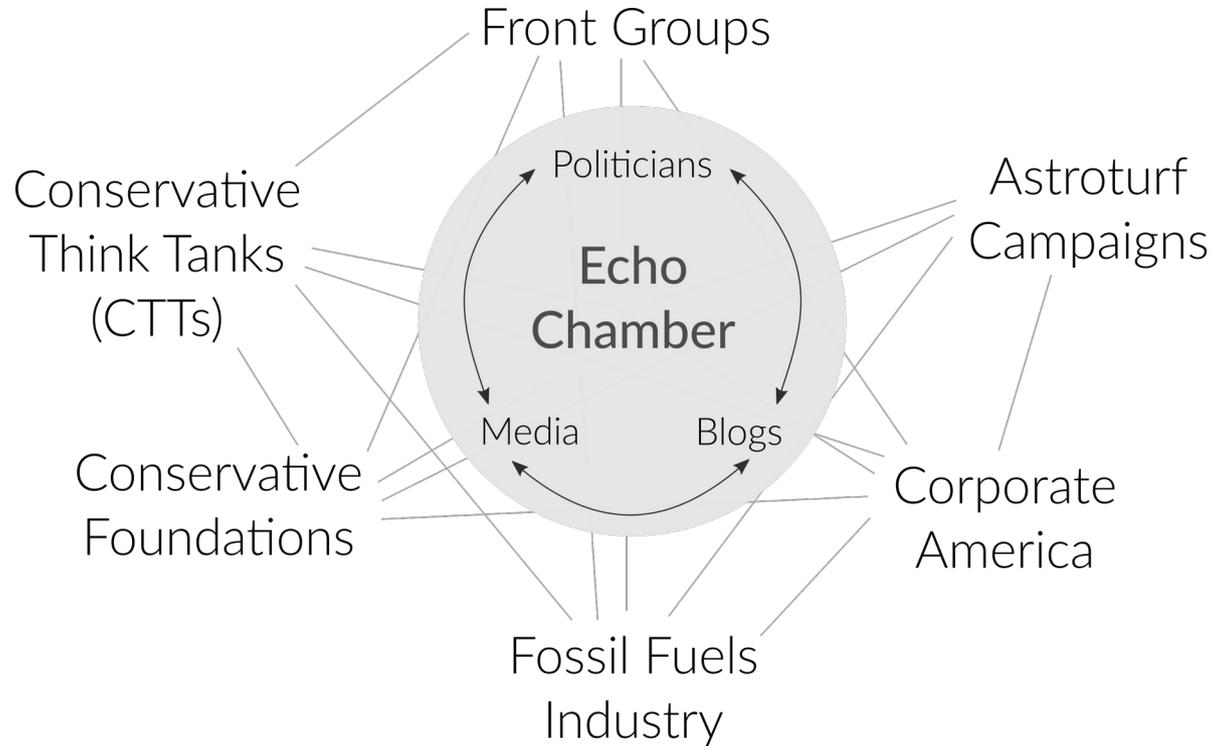
Manufacturing uncertainty

- Study by Corner et al. (2012): Participants become more skeptical after reading “conflicting evidence” (non-skeptical and skeptical editorial)
- No difference in effect between scientific and moral/political uncertainty



A. Corner et al., *Climatic Change* **114** (2012), 463–478

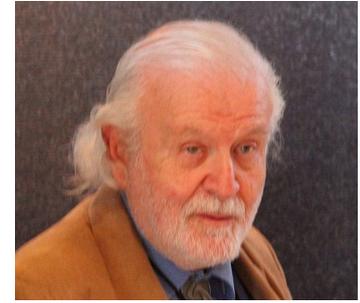
The denial machine



Dunlap and McCright (2011), 147

“Merchants of Doubt”

- Small number of contrarian scientists (e.g., Fred Seitz, Bill Nierenberg, Fred Singer) worked on challenging scientific consensus on tobacco smoke, acid rain, the ozone hole, and climate change
- Strong ties with conservative think tanks
- Used their scientific credentials from cold-war times for lobbying



Oreskes and Conway (2010), 144–160

Pictures: 1. Fremont Davis (Public Domain) <https://w.wiki/CoM>
2. Wikijean, Wikimedia Commons (CC-BY-SA) <https://w.wiki/CoN>
3. Theo Wolters, Delft, Wikimedia Commons (CC-BY-SA) <https://w.wiki/CoP>

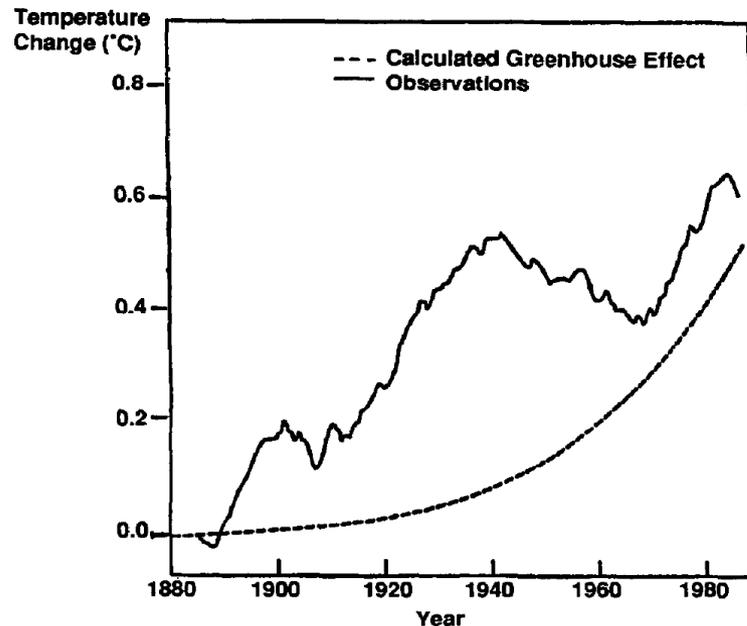
Strategy of climate change denial

- Cherry picking scientific findings

Oreskes and Conway (2010), 144–160
Dunlap and McCright (2011), 145–146
M. Boykoff and J. Boykoff, *Glob. Env. Change* **14** (2004), 125–136

Cherry picking scientific findings

Example: Marshall Institute report by Jastrow, Nierenberg, and Seitz (1989, republished 1991)



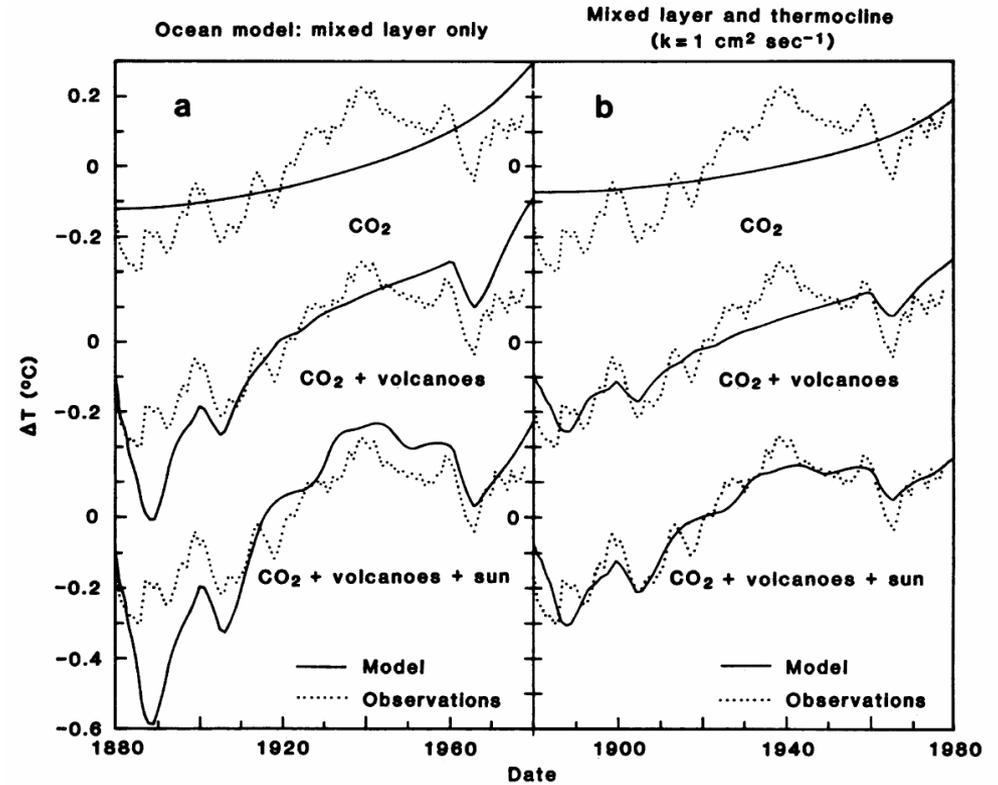
“If the greenhouse effect were an important factor in climate change after the 1940s, global temperatures in that period would have shown a clear and pronounced upward trend.”

R. Jastrow et al., *Energy* **16** (1991), 1331–1345

Cherry picking scientific findings

Original graph from Hansen et al. (1981):

“Radiative forcing by CO₂ plus volcanoes and forcing by CO₂ plus volcanoes plus the sun both yield a temperature trend with a strong similarity to the observed trend of the past century”



J. Hansen et al., *Science* **213** (1981), 957–966

Strategy of climate change denial

- Cherry picking scientific findings
- Manufacturing uncertainty
 - “Balance as bias”: *prestige press* contributes to distortion of discourse
- Attacking climate science as “junk science”, questioning peer-review process, institutions etc.
- Coordinated, personal attacks on individual scientists

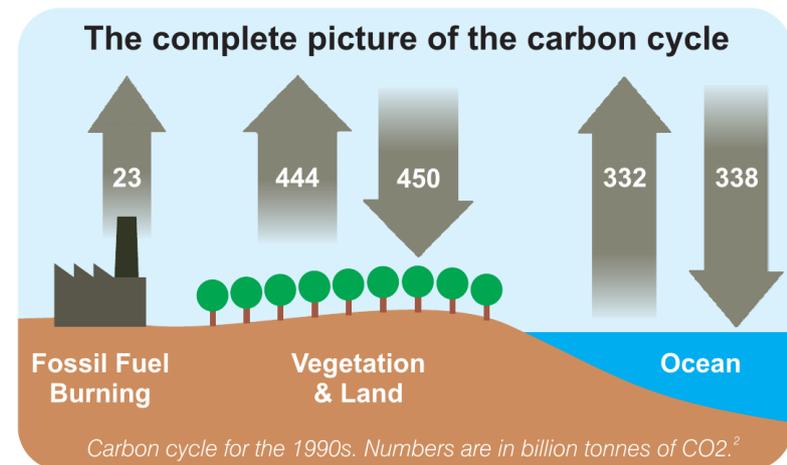
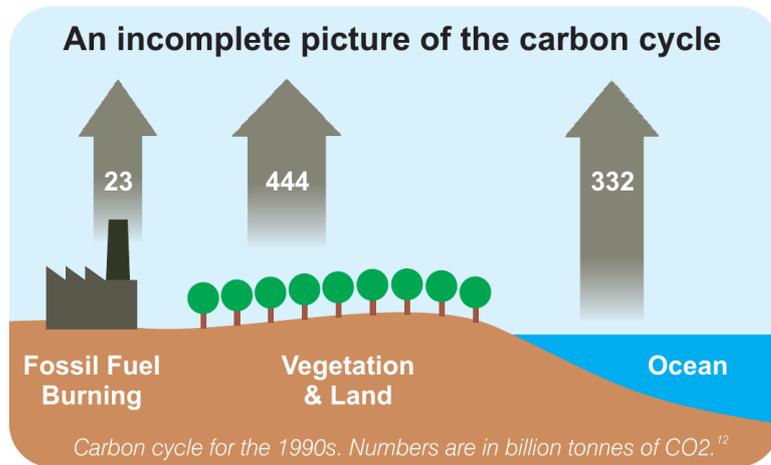
Oreskes and Conway (2010), 144–160
Dunlap and McCright (2011), 145–146
M. Boykoff and J. Boykoff, *Glob. Env. Change* **14** (2004), 125–136

Part 2:

Fallacies behind arguments of deniers and skeptics

Humans are raising CO₂ levels

Skeptics: “Human CO₂ is only 5 percent and natural CO₂ is 95 percent of the CO₂ inflow into the atmosphere.”^{D1}

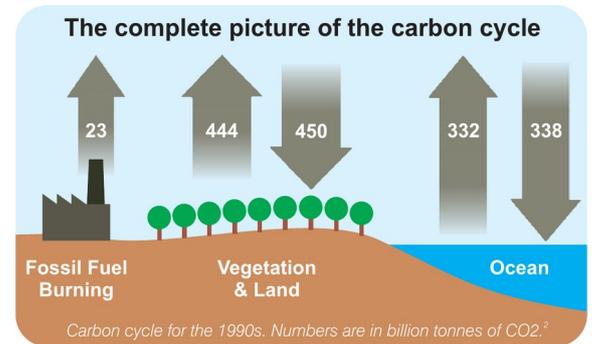
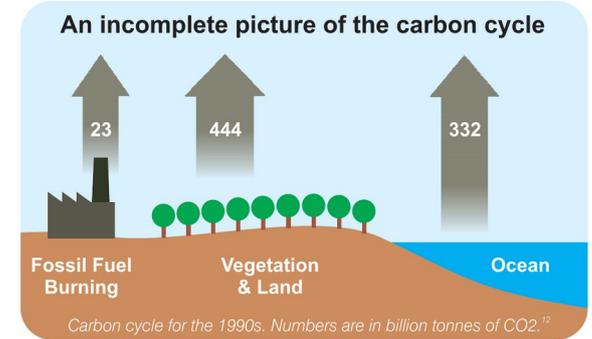


from Cook (2010), p. 2 (licensed under CC-BY-NC)

Humans are raising CO₂ levels

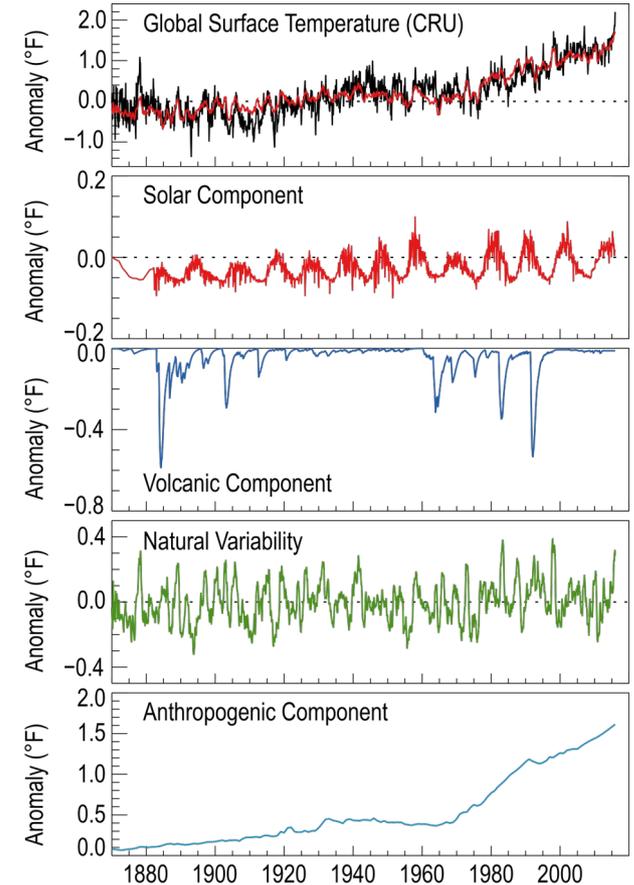
Fallacy: Selective representation, only half of the carbon cycle is looked at

- Natural greenhouse effect is balanced: emission and absorption by biosphere and ocean
- Only some share of anthropogenic CO₂ can be taken up by these sinks
→ Increase by fossil fuel burning



Human fingerprints on climate change

Deniers: “The Earth is getting hotter because the Sun is burning more brightly than at any time during the past 1,000 years”^{D2}

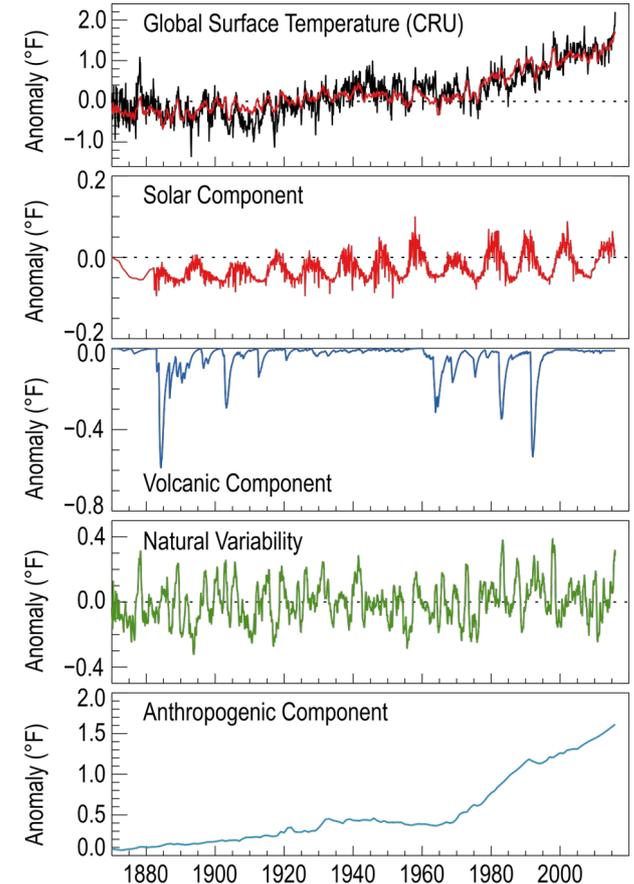


CSSR (2017), Chapter 3: *Detection and Attribution of Climate Change*
<https://science2017.globalchange.gov/chapter/3/>

Human fingerprints on climate change

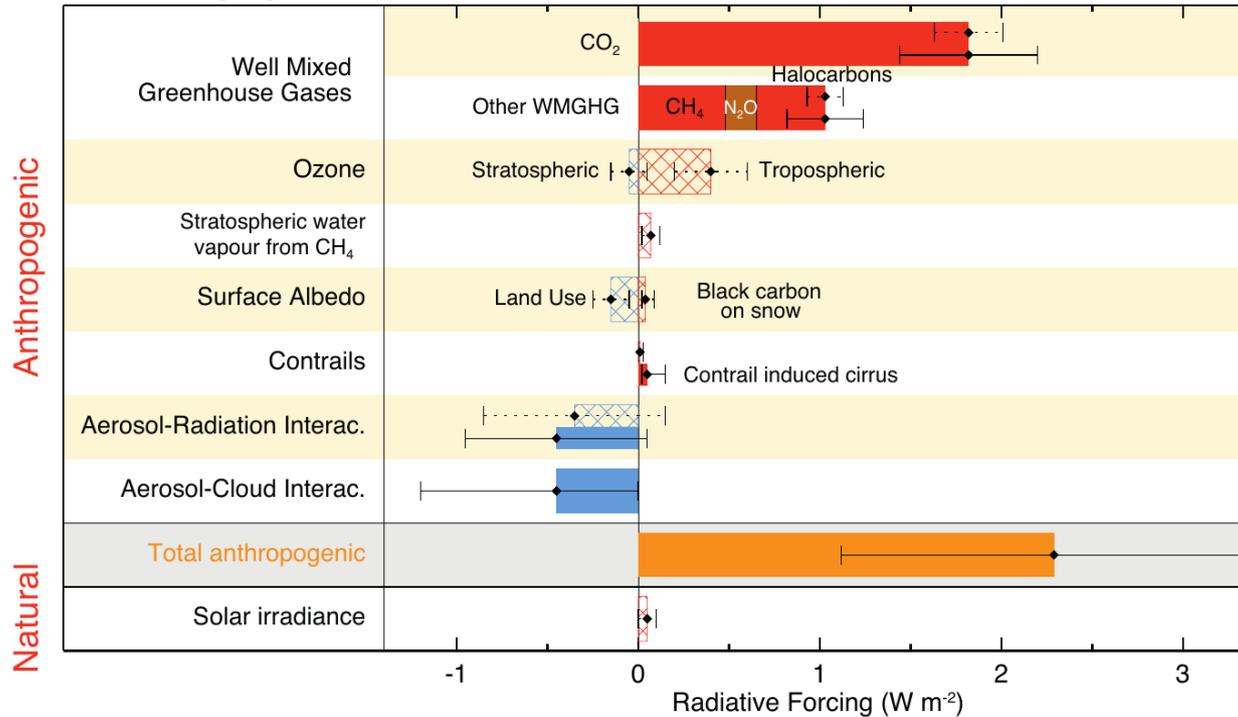
Fallacy: Correlation \neq causation

- Insolation changes were historically driving climate, but on long timescales (Milanković cycles)
- Solar output can only be measured precisely since the satellite era \rightarrow actually very small decrease between 1986 and 2008
- Overall, unimportant compared to anthropogenic forcing



Human fingerprints on climate change

Radiative forcing of climate between 1750 and 2011
 Forcing agent



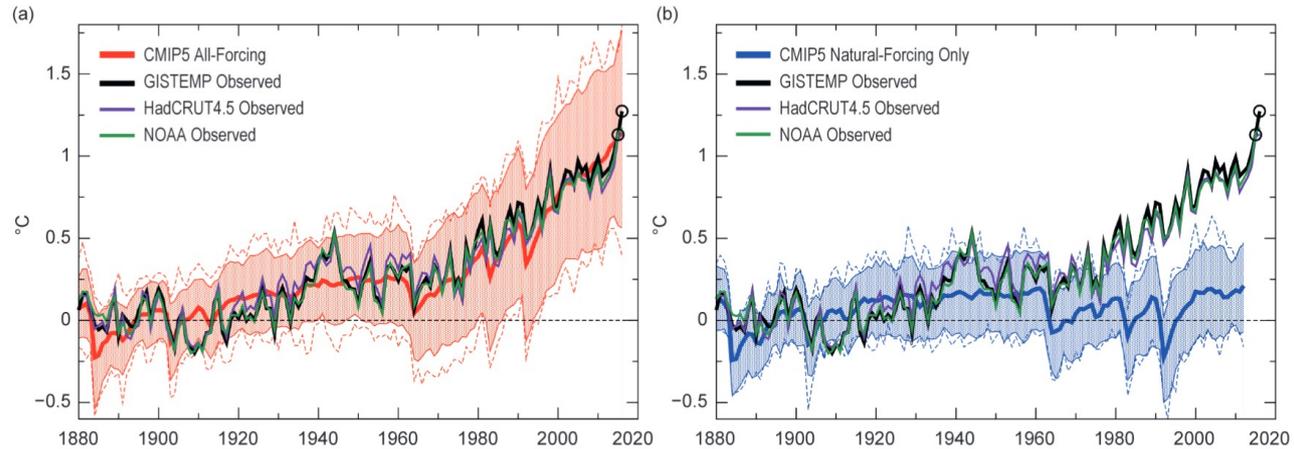
IPCC (2013), Working Group 1: *The Physical Science Basis*, 697

Human fingerprints on climate change

Additional fingerprints:

- Nights warm faster than days
- Ratio of $\delta^{13}\text{C}$ in corals decreasing

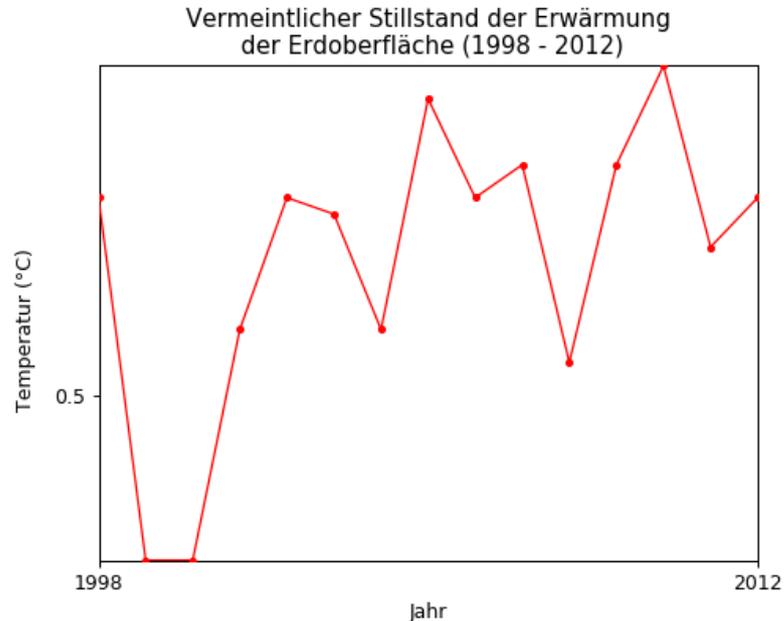
Attribution studies:



T. Knutson et al., *Bull. Am. Met. Soc.* **99** (2018), S11–S17

Global warming *is* happening

Skeptics (ca. 2013): “Climate change seems to be taking a break. We’re facing a puzzle.”^{D2}

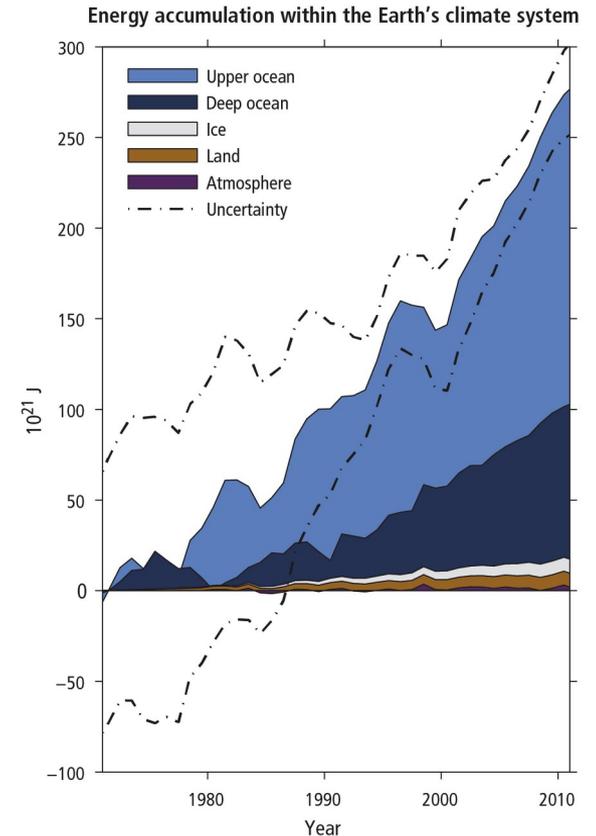


Fjalnes, Wikimedia Commons (CC-BY-SA)
<https://w.wiki/CVp>

Global warming *is* happening

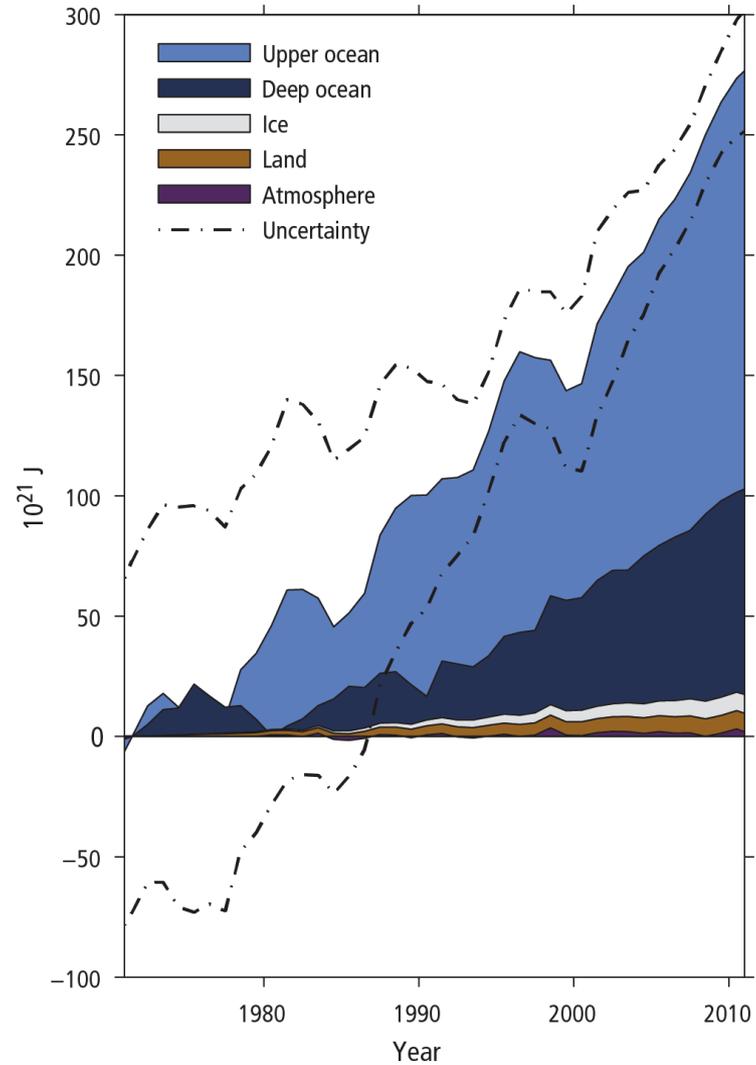
Fallacy: Cherry picking, on three levels:

- Selecting specific end-point years (strong El Niño in 1997–98)
- Temperature records supporting “warming hiatus” don’t cover the entire globe
- Climate system includes the ocean, where warming continues



IPCC (2013), Working Group 1: *The Physical Science Basis*, 264

Energy accumulation within the Earth's climate system



Can we learn from the climate of the past?

Skeptics: “The climate has always been changing and will continue to change”^{D4}



The image shows a screenshot of a news article header from RP ONLINE. The top navigation bar includes 'RP ONLINE' and categories like 'NRW POLITIK SPORT PANORAMA KULTUR WIRTSCHAFT DIGI'. Below this is a yellow breadcrumb trail: 'Panorama / Wissen / Als Grönland noch grün war: Ein stabiles Klima gibt es nicht'. The main title of the article is 'Ein stabiles Klima gibt es nicht', with a sub-headline 'Als Grönland noch grün war'. At the bottom of the header, it says '15. Februar 2007 um 15:15 Uhr | Lesedauer: 2 Minuten'.

RP Online, 15.02.2007:
“When Greenland was
still green”

https://rp-online.de/panorama/wissen/ein-stabiles-klima-gibt-es-nicht_aid-11340231

Can we learn from the climate of the past?

Fallacy: Illogical reasoning

"This argument is like saying 'forest fires have happened naturally in the past so any recent forest fires can't be caused by humans'" (Cook 2010, p. 7)

- It was quite warm around 1000 AD, but “Green”land was mostly marketing by the Nordic settlers in a very variable climate
- Global pattern of warming today shows coherent warming all over the globe, Medieval Warm Period doesn't.

Neukom et al., *Nature* **571** (2019), 550–554

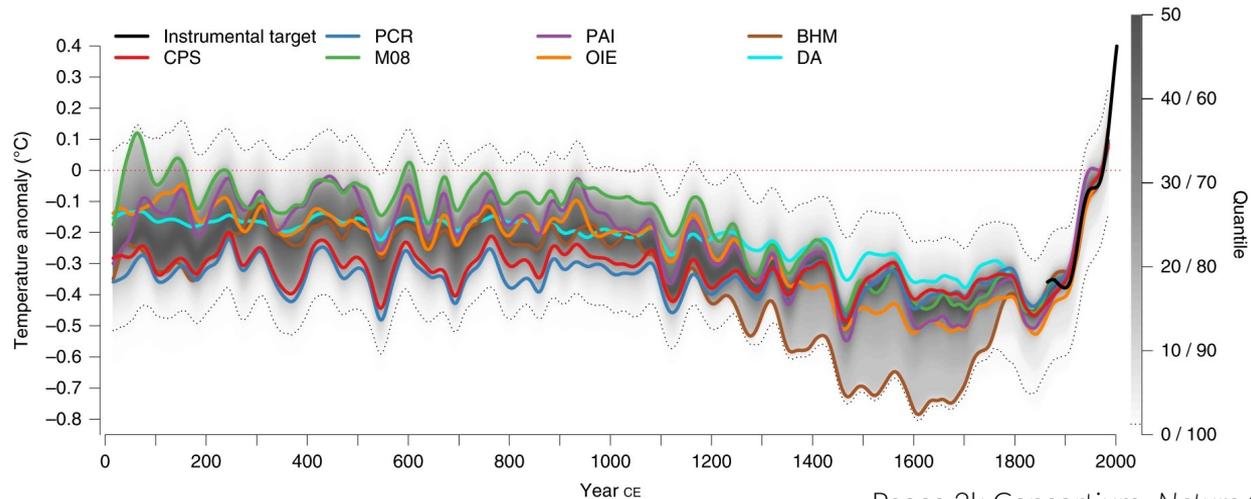
R. Westman (2015), *The “Grapes Grew in Greenland” Myth*.

<http://www.centralcoastclimatescience.org/uploads/5/3/8/1/53812733/misperception-06.pdf>

Can we learn from the climate of the past?

What can we actually learn?

- Feedback mechanisms
- Perspective on current climate and emissions

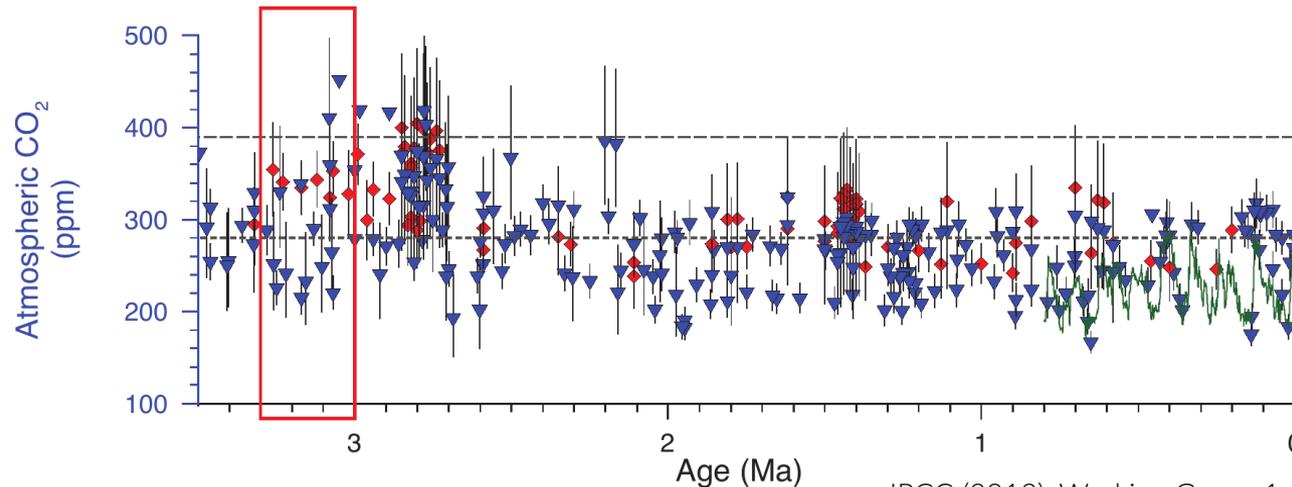


Pages 2k Consortium, *Nature Geoscience* **12** (2019), 643–649

Can we learn from the climate of the past?

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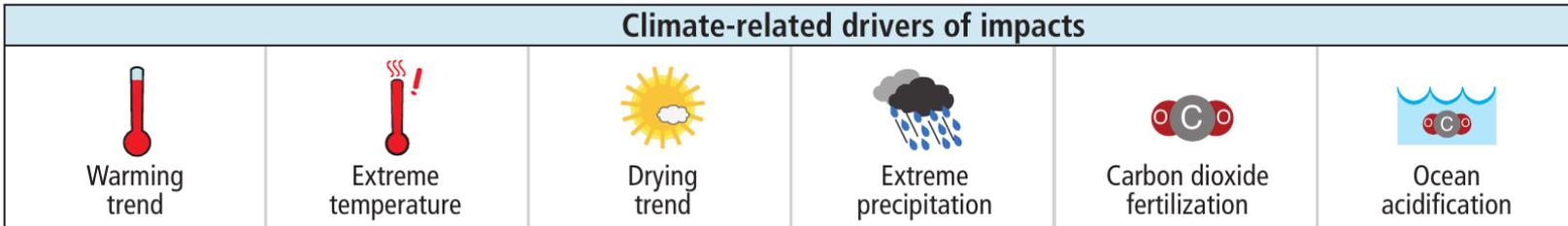


IPCC (2013), Working Group 1: *The Physical Science Basis*, 395

Impacts of global warming

Deniers: “CO₂ makes the Earth greener – and the government tries to prevent that”^{D4}

Fallacy: Selectively looking at the (very little) positive side-effects, but not at the negative impacts



IPCC (2013), Working Group 2: *Impacts, Adaptation, and Vulnerability*, Part A, 519

Impacts of global warming

Fallacy: Selectively looking at the (very little) positive side-effects, but not at the negative impacts

- Species extinction
- Reduced growth of corals, shellfish
- Water scarcity, increasing competition for water
- Displacement due to extreme events
- Mortality from heat waves

There is scientific consensus

Video:

<https://www.youtube.com/watch?v=cjuGCJJUGsg>

J. Cook et al., *Environ. Res. Lett.* **11** (2016) 048002

Bibliography and further reading

Part 1:

N. Oreskes and E. M. Conway: *Merchants of Doubt. How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. (New York: Bloomsbury Press, 2010).

M. E. Mann and T. Toles: *The Madhouse Effect. How climate change denial is threatening our planet, destroying our politics, and driving us crazy*. (New York: Columbia University Press, 2016).

R. E. Dunlap and A. M. McCright: *Organized Climate Change Denial*. In: J. S. Dryzek et al. (eds.): *The Oxford Handbook of Climate Change and Society*. (Oxford University Press, 2011, pp. 144–160).

Part 2:

J. Cook: *The Scientific Guide to Global Warming Skepticism*. Skeptical Science (2015),
<https://skepticalscience.com/The-Scientific-Guide-to-Global-Warming-Skepticism.html>

Intergovernmental Panel for Climate Change (IPCC): *Climate Change 2014: Synthesis report* (2014),
<https://www.ipcc.ch/report/ar5/syr/synthesis-report/>

IPCC, Working Group 1: *Climate Change 2013: The Physical Science Basis* (2013),
<https://www.ipcc.ch/report/ar5/wg1/>

Skeptics and denier sources

[D1] E. X. Berry: *Human CO₂ Emissions Have Little Effect on Atmospheric CO₂*, uploaded on Researchgate, July 2019, https://www.researchgate.net/publication/334413385_Human_CO_2_Emissions_Have_Little_Effect_on_Atmospheric_CO_2

[D2] M. Leidig and R. Nikkhah: *The truth about global warming - it's the Sun that's to blame*. Daily Telegraph, 18.07.2004, <https://www.telegraph.co.uk/news/science/science-news/3325679/The-truth-about-global-warming-its-the-Sun-that-s-to-blame.html>

[D3] The “global warming hiatus” hypothesis has also been received widely within the scientific community, as evidenced by this interview with Hans von Storch: O. Stampf and G. Traufetter: *Why Is Global Warming Stagnating?* Spiegel Online, 20.06.2013, <https://www.spiegel.de/international/world/interview-hans-von-storch-on-problems-with-climate-change-models-a-906721.html>

[D4] F. Grobe: *Studie [sic!] der AfD RTK – Fakten statt Fake News – 2. Teil*. AfD Kreisverband Rheingau-Taunus, 06.05.2018, <https://rtk.afd-hessen.org/studie-der-afd-rtk-fakten-statt-fake-news-2-teil/> and <https://rtk.afd-hessen.org/wp-content/uploads/2018/05/18-05-05-Neue-Folien-zum-Zustand-Deutschlands-Teil-2.pdf>