Don’t Panic!

A Critique of Catastrophic Man-Made Global Warming Theory

Warren Meyer, Climate-Skeptic.com

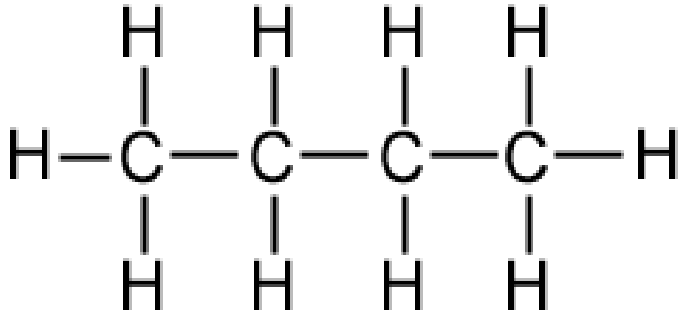
November 10, 2009 in Phoenix, AZ

The Case For Global Warming

- How do greenhouse gasses work?
- How do models arrive at catastrophic temperature forecasts?
- Links between warming and other climate changes

How Does Man Create CO_2?

A Hydrocarbon

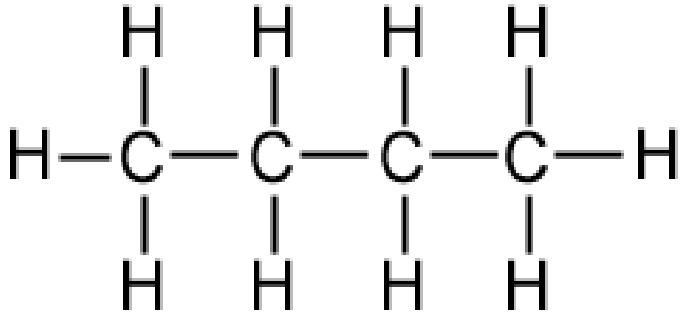


+ Oxygen (O_2) → Water (H_2O) + Carbon Dioxide (CO_2) + Heat

It is the same basic process whether in a power plant furnace or in the human body

How Does Man Create CO_2?

A Hydrocarbon



+ Oxygen (O_2) → Water (H_2O) + Carbon Dioxide (CO_2) + Heat

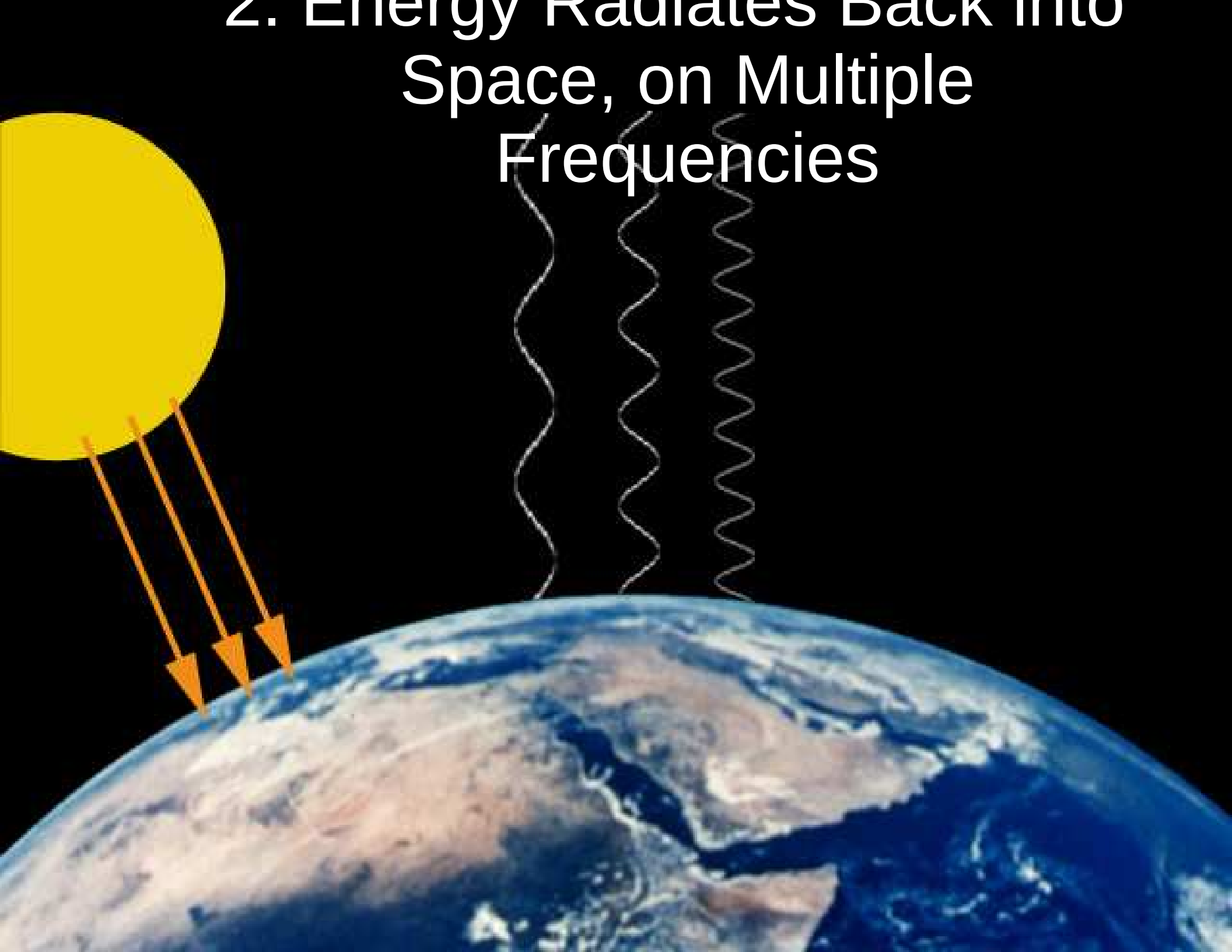
Traditional pollutants were much easier to eliminate

- Pollutants like sulfates (SOx) reduced by reducing impurities in the fuel and by scrubbing exhaust gasses
- Pollutants like ozone, carbon monoxide, NOx reduced by better combustion
- Pollutants like carbon and ash reduced by filtration

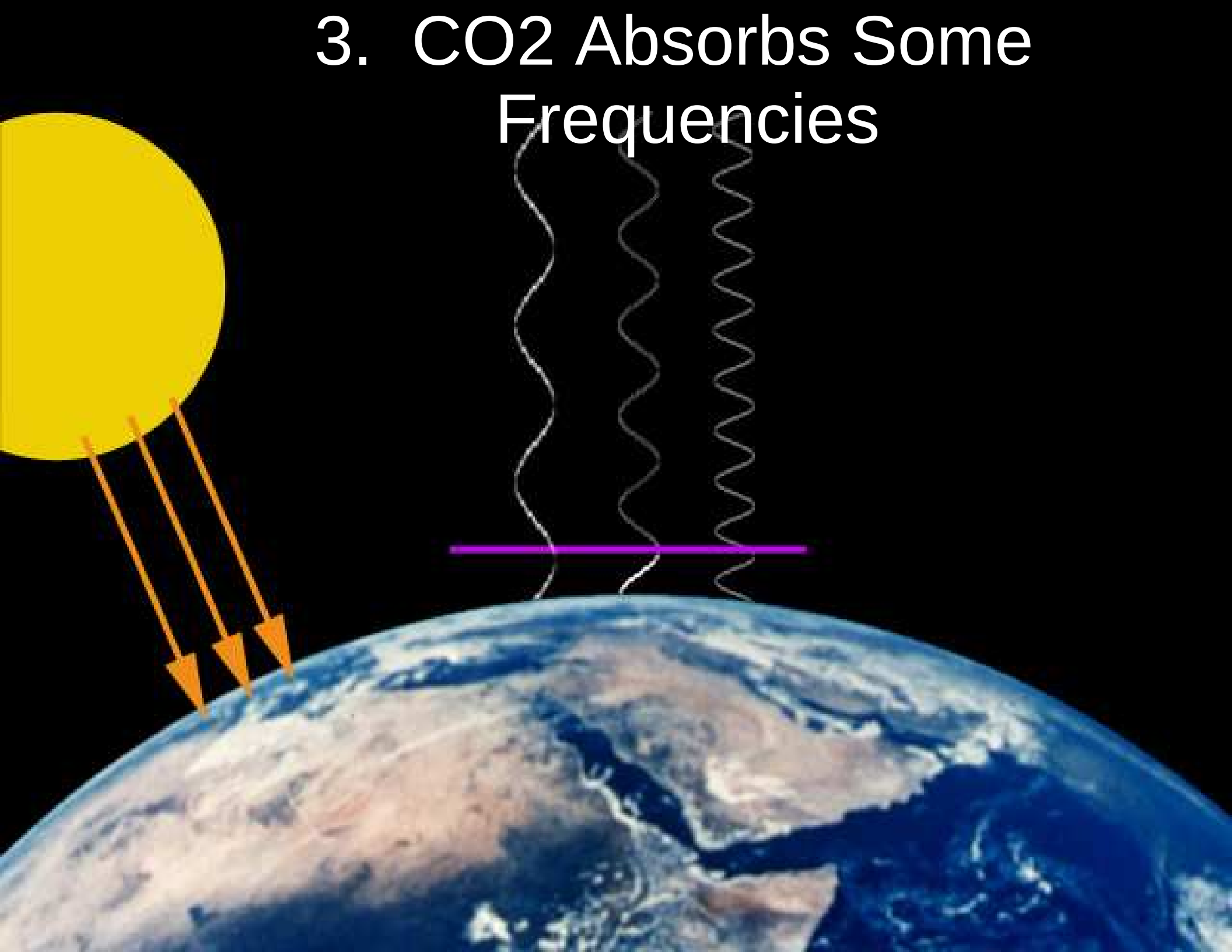
The only way to prevent carbon dioxide in emissions is not to burn fossil fuels - it is fundamental to combustion

1. Sun Warms the Earth

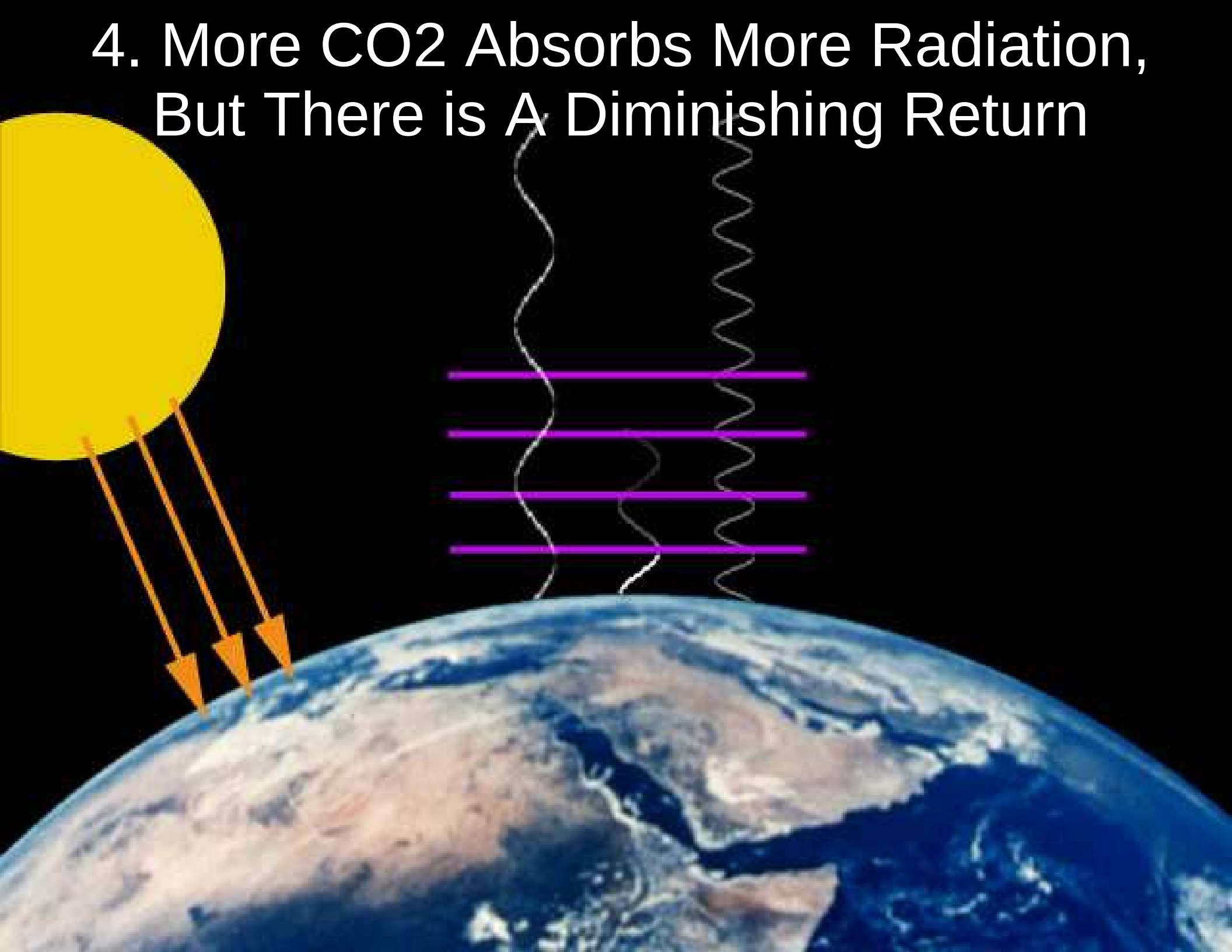
2. Energy Radiates Back into Space, on Multiple Frequencies



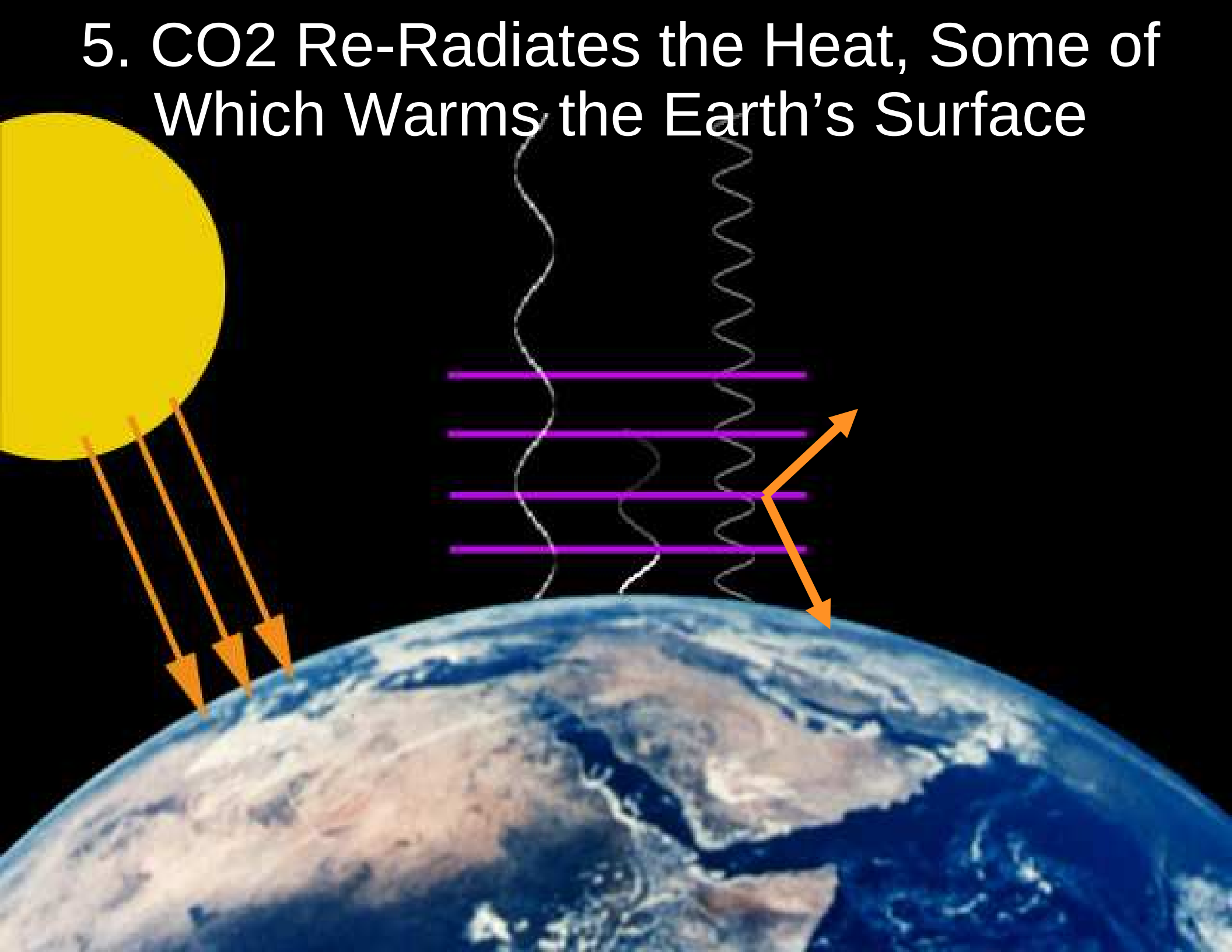
3. CO_2 Absorbs Some Frequencies



4. More CO2 Absorbs More Radiation, But There is A Diminishing Return

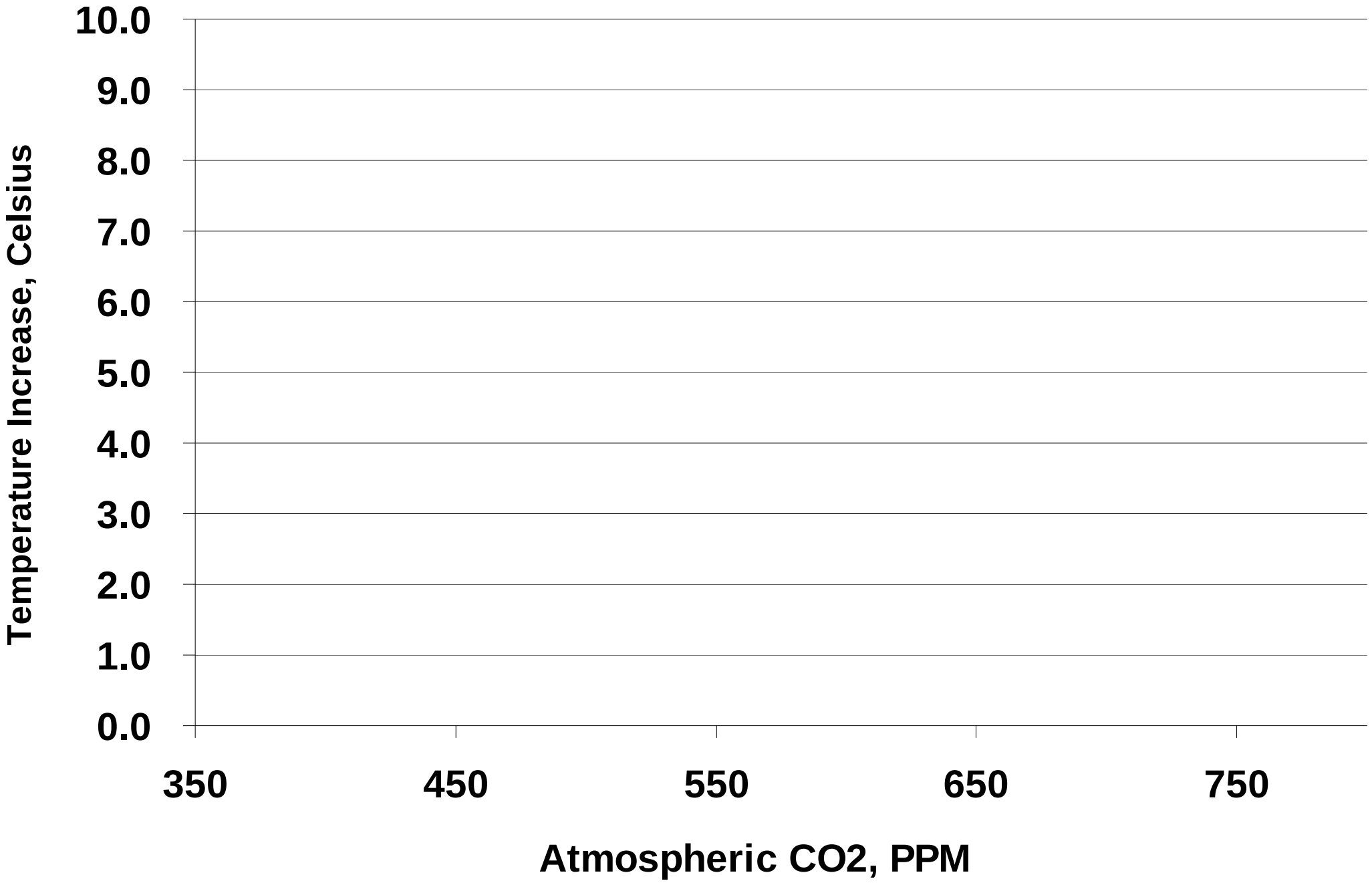


5. CO_2 Re-Radiates the Heat, Some of Which Warms the Earth's Surface



Temperature Projections From CO2

IPCC A2 (no Abatement) Case



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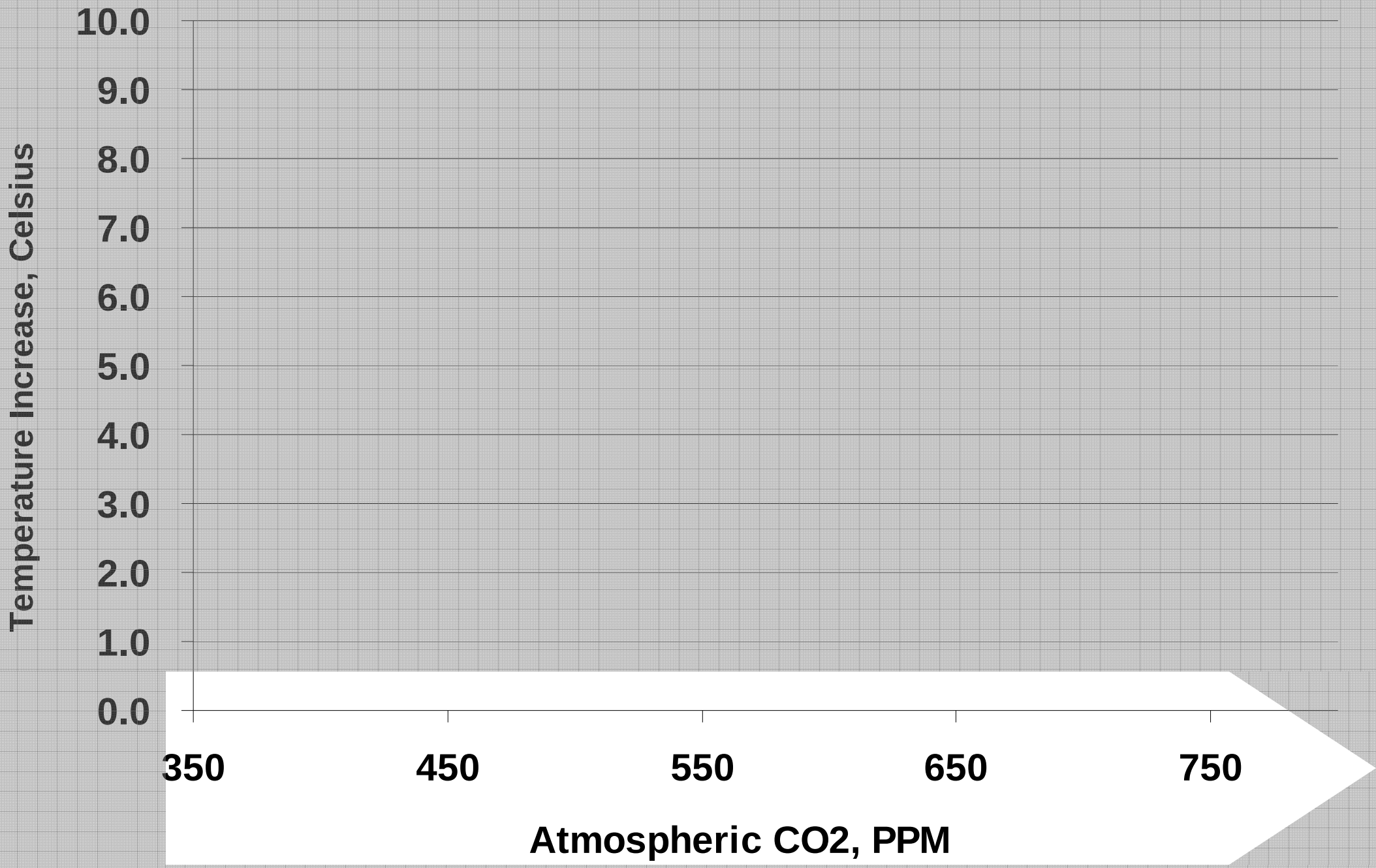


Getting a Feel For Parts per Million

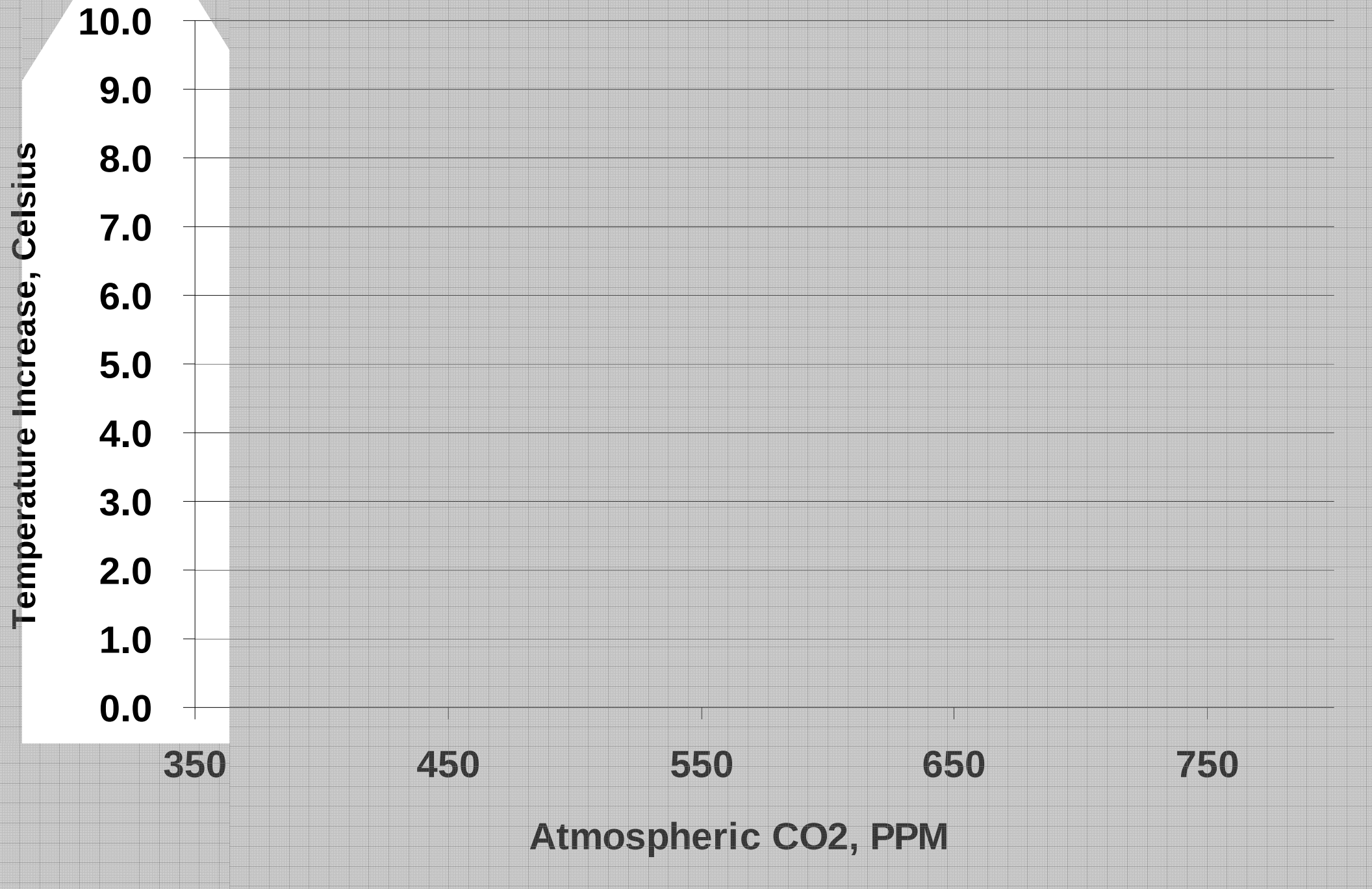
- Current CO_2 concentration in the atmosphere is about 385 ppm
- Riddle: When flying from Los Angeles to New York, if you have traveled the equivalent of 385 ppm of the entire trip, where would your airplane be?

Getting a Feel For Parts per Million

- Current CO_2 concentration in the atmosphere is about 385 ppm
- Riddle: When flying from Los Angeles to New York, if you have traveled the equivalent of 385 ppm of the entire trip, where would your airplane be?
- Answer: Less than halfway down the runway at LAX.
- Man is thought to have increased CO_2 from about 270 to 385 ppm. That is a 0.011% change in the mix of atmospheric gasses

Temperature Projections From CO2

IPCC A2 (no Abatement) Case



Temperature Projections From CO2

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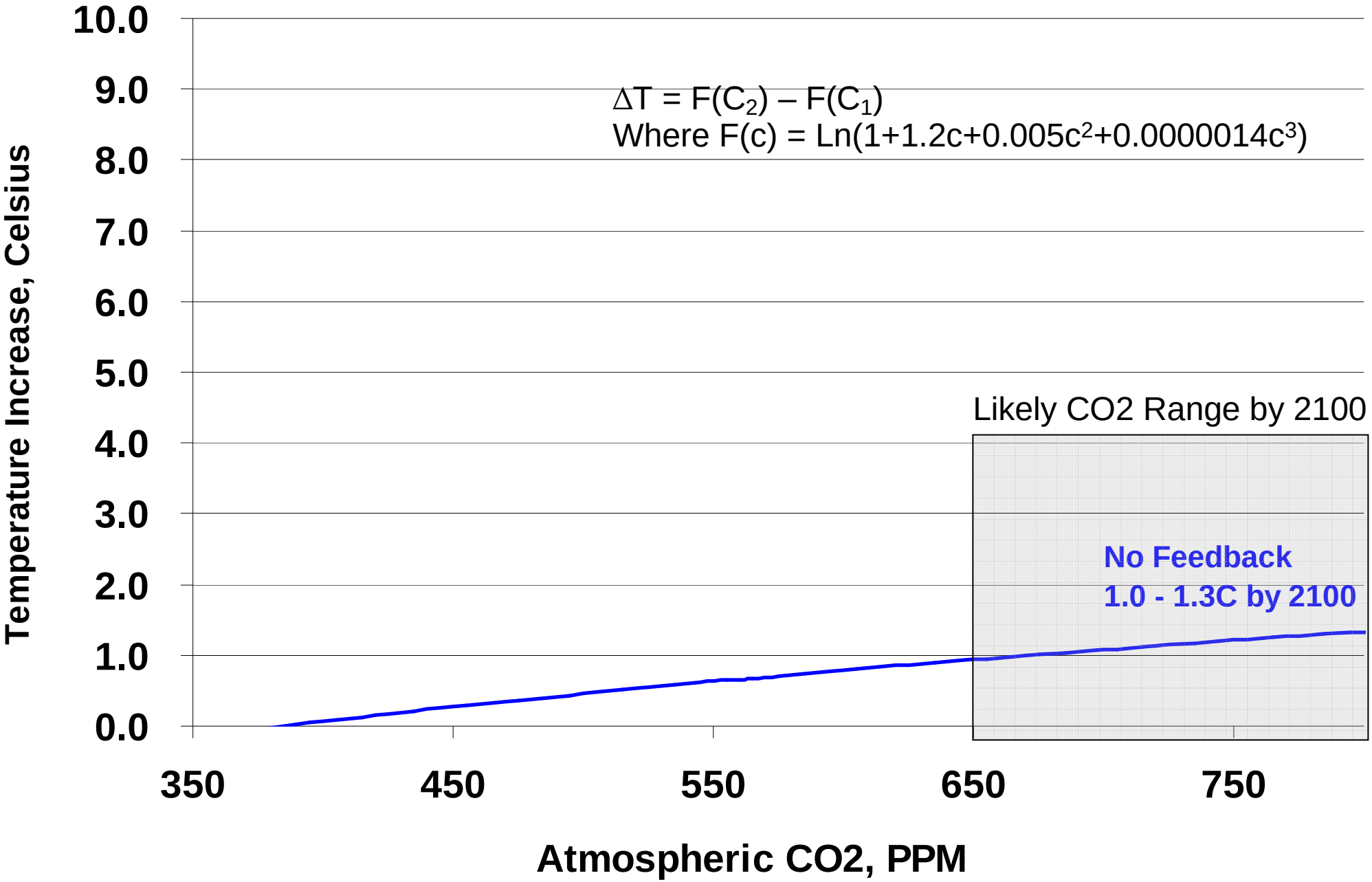
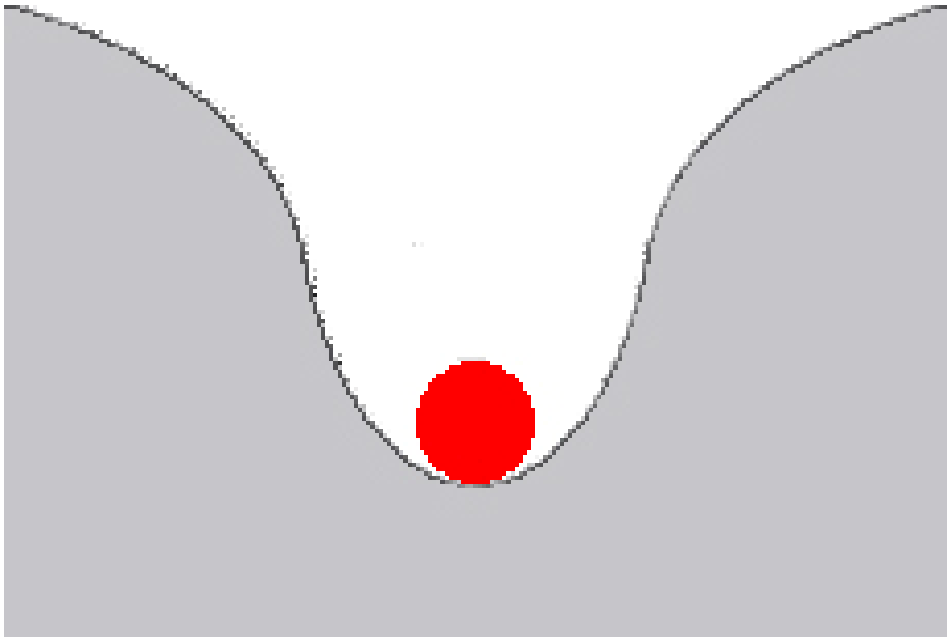


One Degree? We Must Be Missing Something.

- The Answer is Feedback

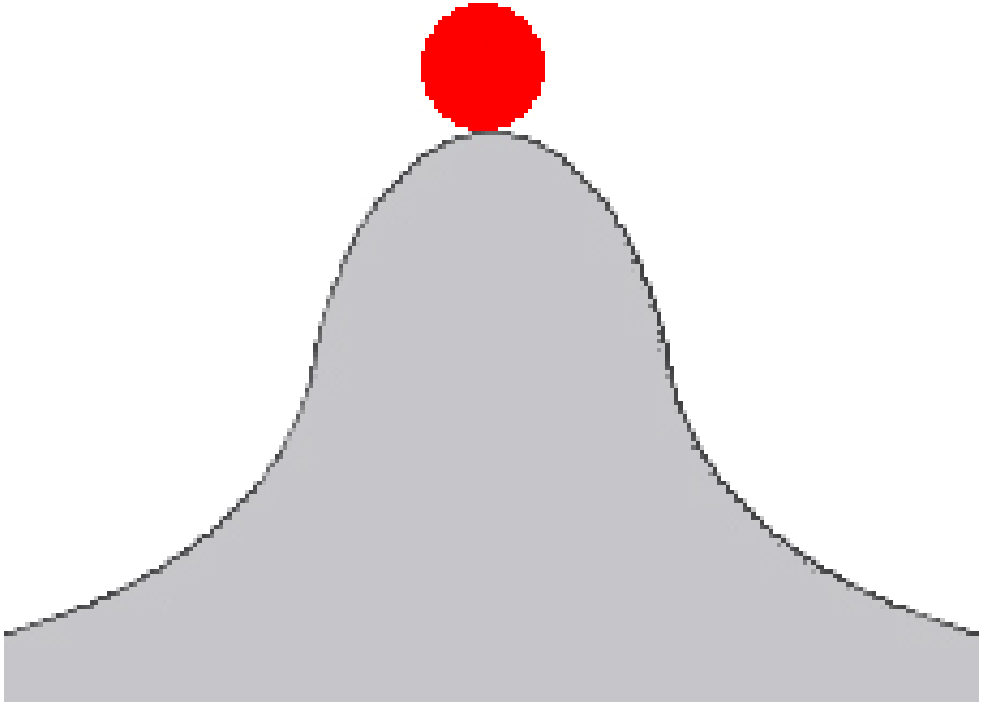
Feedback Multiplies or Reduces An Initial Disturbance

Negative Feedback



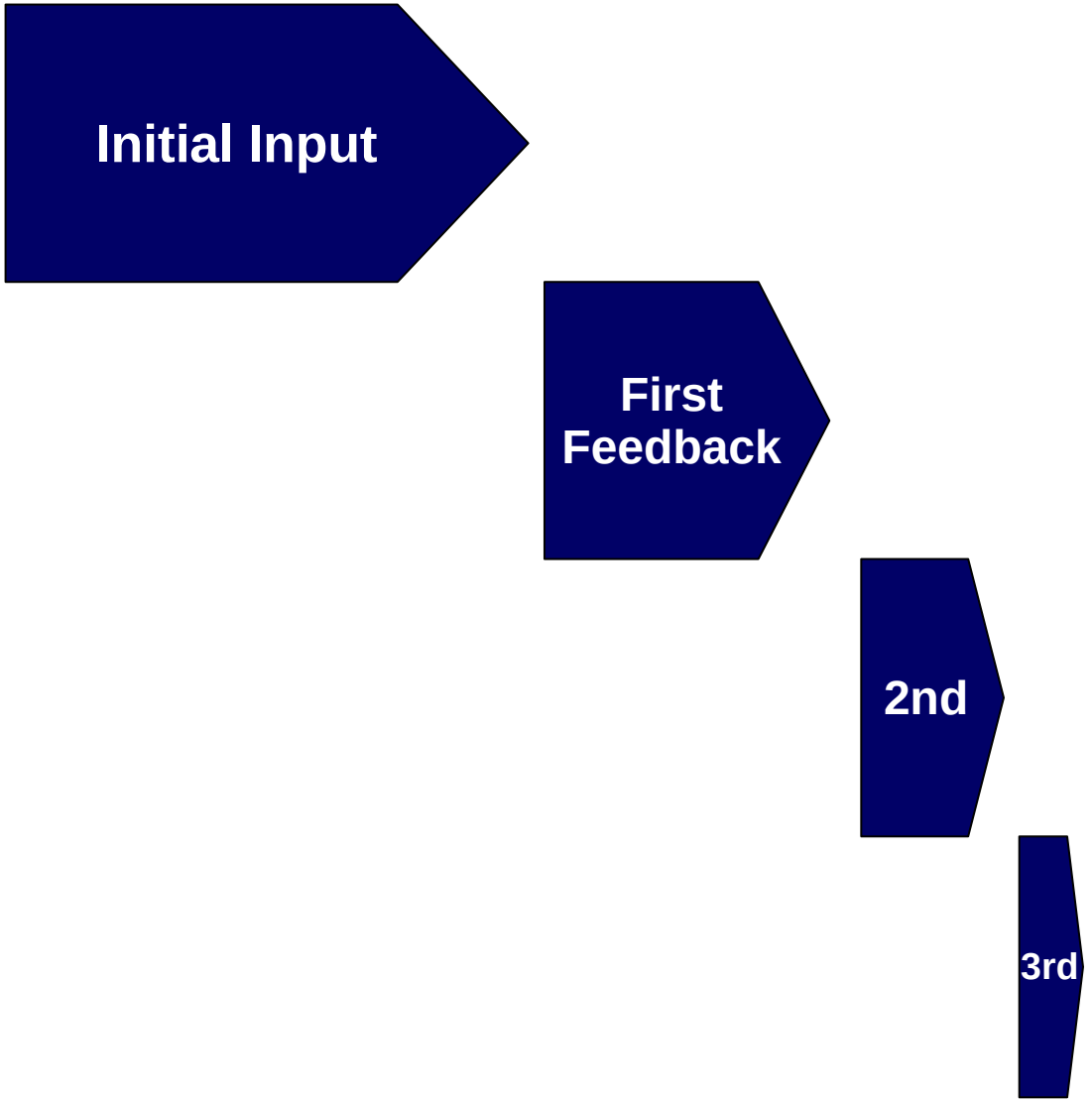
- **Disturbances are damped**
- **System remains near its starting point, though it can oscillate**

Positive Feedback



- **Disturbances are amplified**
- **System may end up far from its starting point**

Positive Feedback Example 50% Positive Feedback Fraction



There is some initial perturbation to the system, such as a temperature change

The system adds to the initial perturbation, in this example by 50% of the initial input

But now the system will add even more, equal to 50% of the first feedback

Etc...

Final Value is 1/(1-f) times Initial Input, so Final Value is double the Initial Input when f=50%

One Degree? We Must Be Missing Something.

- The Answer is Feedback
- Catastrophic forecasts assume that positive feedbacks multiply the warming by 3-8x
- Example positive feedback assumptions of high-warming models
  - Increase in atmospheric water content (relative humidity constant with rising temps = more H2O)
  - Increase in methane releases from northern tundra
  - Increase high cirrus clouds
  - Decrease in albedo from melting ice
  - Release of CO2 from warmer oceans
- High enough feedback leads to tipping points and runaway processes

Temperature Projections From CO2

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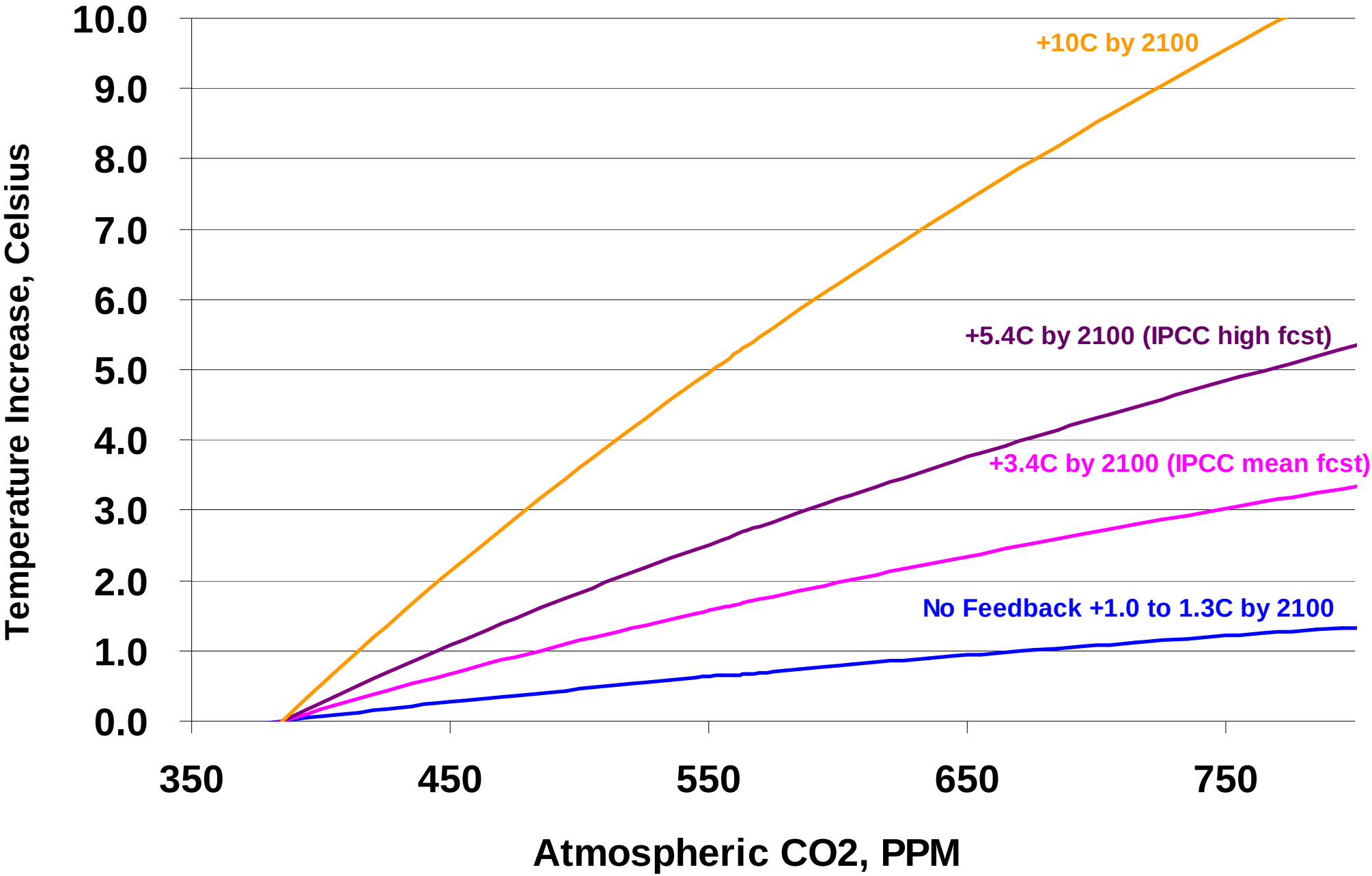
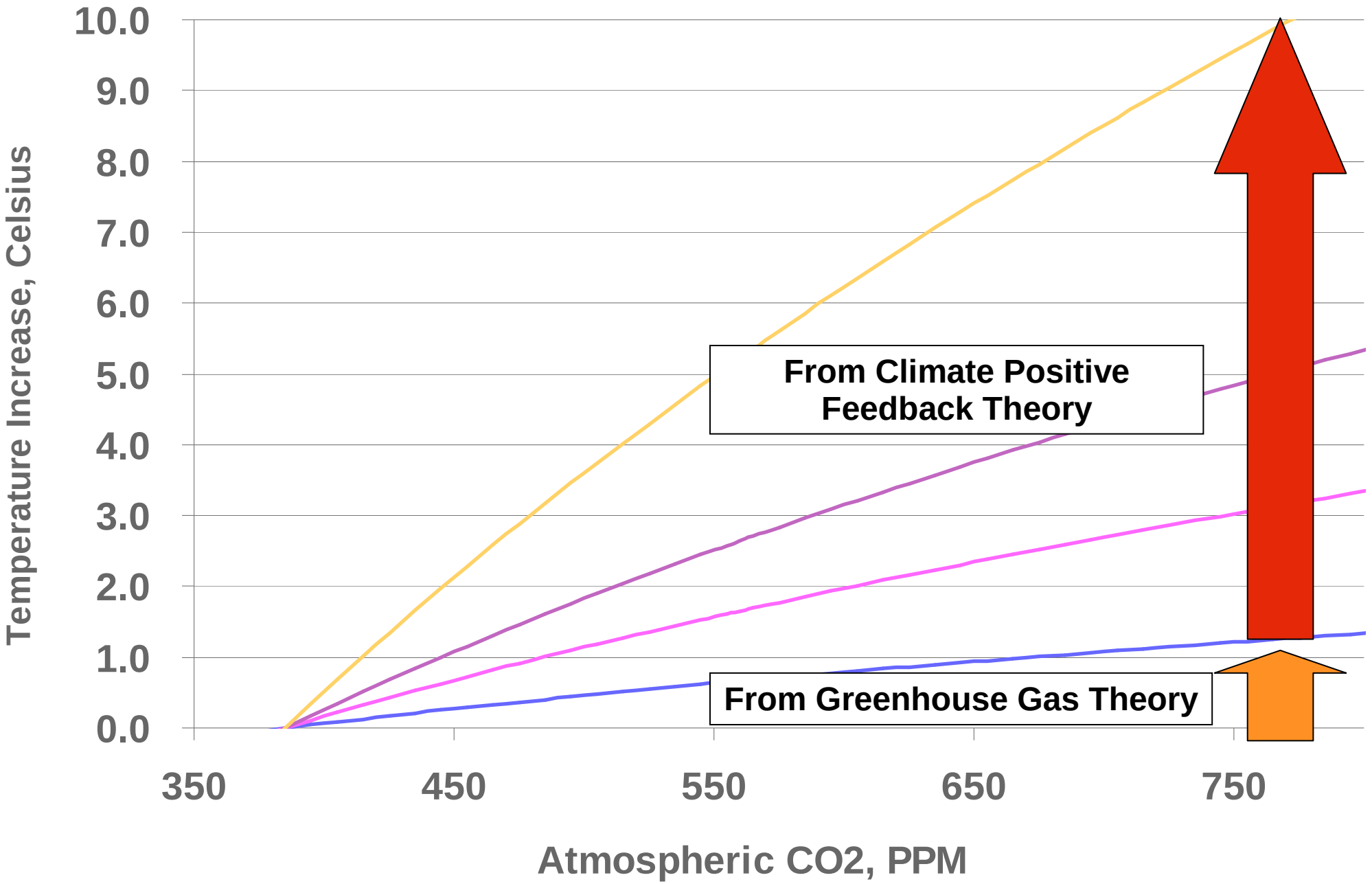


Catastrophic Global Warming Theory Based on Two Chained Theories



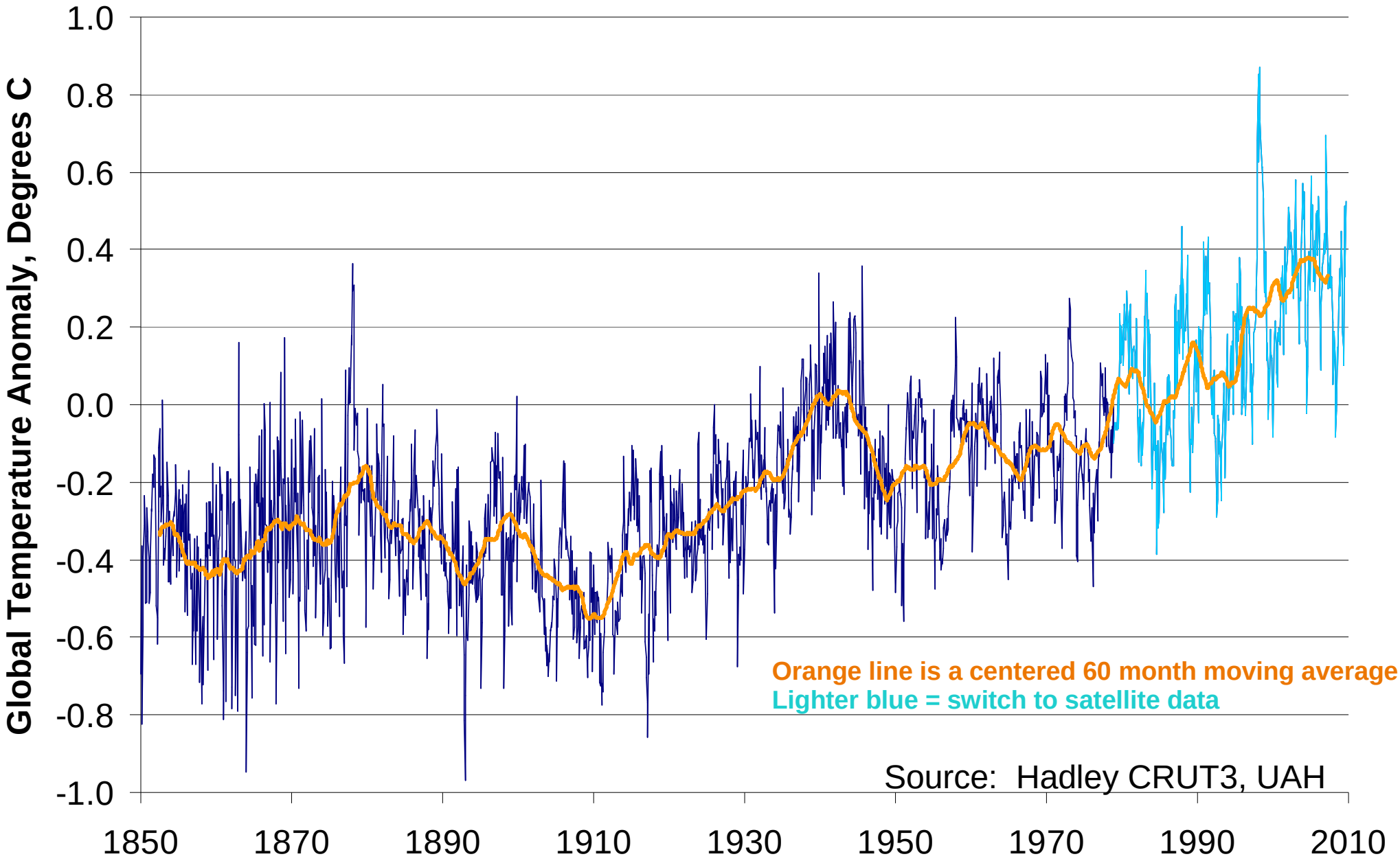
Rising Temperatures Lead to Other Negative Climate Changes

- Changing precipitation patterns (more drought in some areas, more rain in others)
- Melting ice and rising sea levels
- Species extinctions
- Increase hurricanes, tornadoes, and severe storms
- Migration of tropic diseases to new areas

Five Key Climate Questions

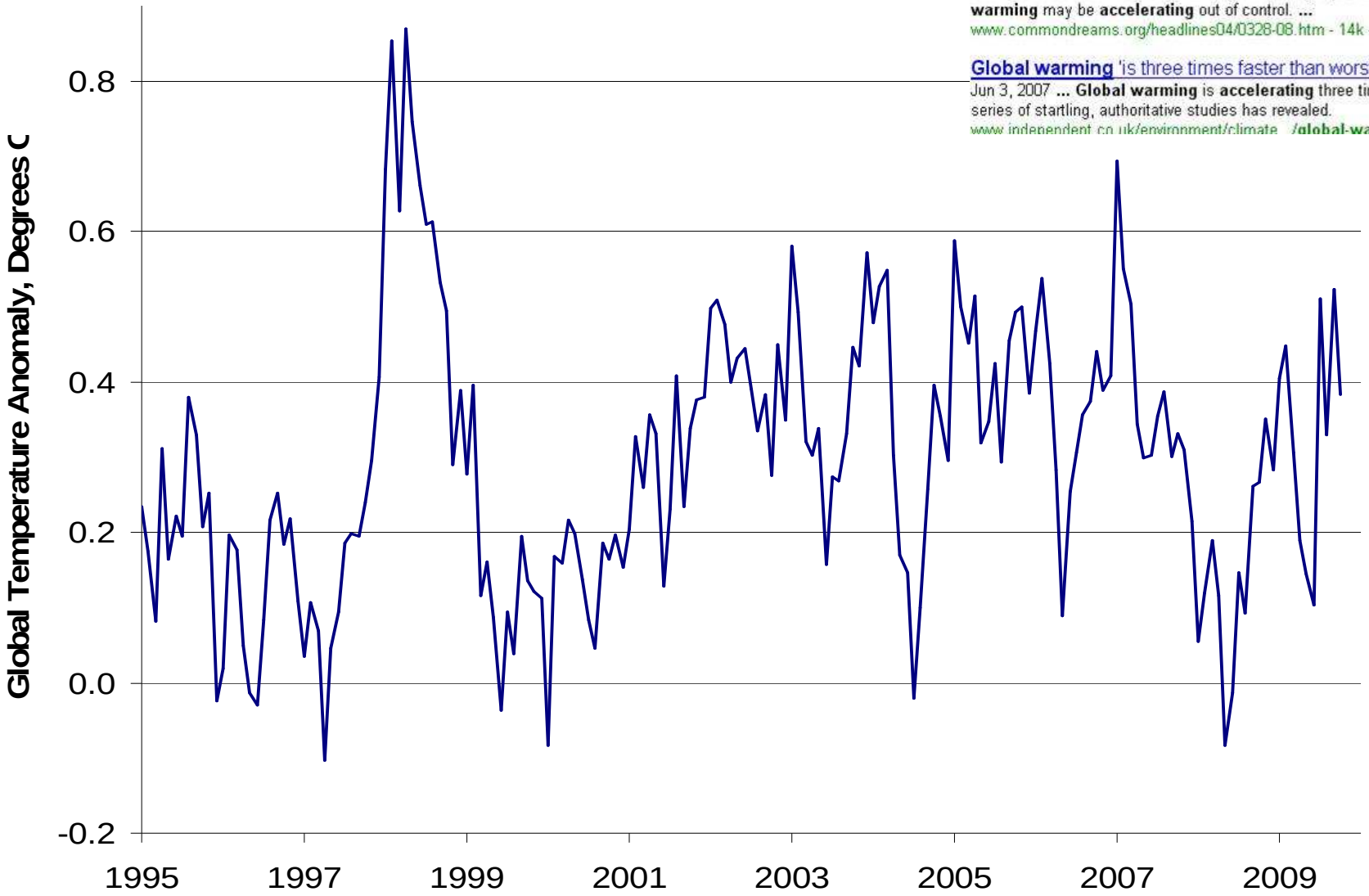
- Is the world warming?
- Is that warming due to man's CO_2?
- Will future man-made warming be substantial?
- Will we see catastrophic effects from warming?
- Do CO_2 abatement laws like cap-and-trade make sense?

Historic Temperature Record Shows Warming of About 0.6C



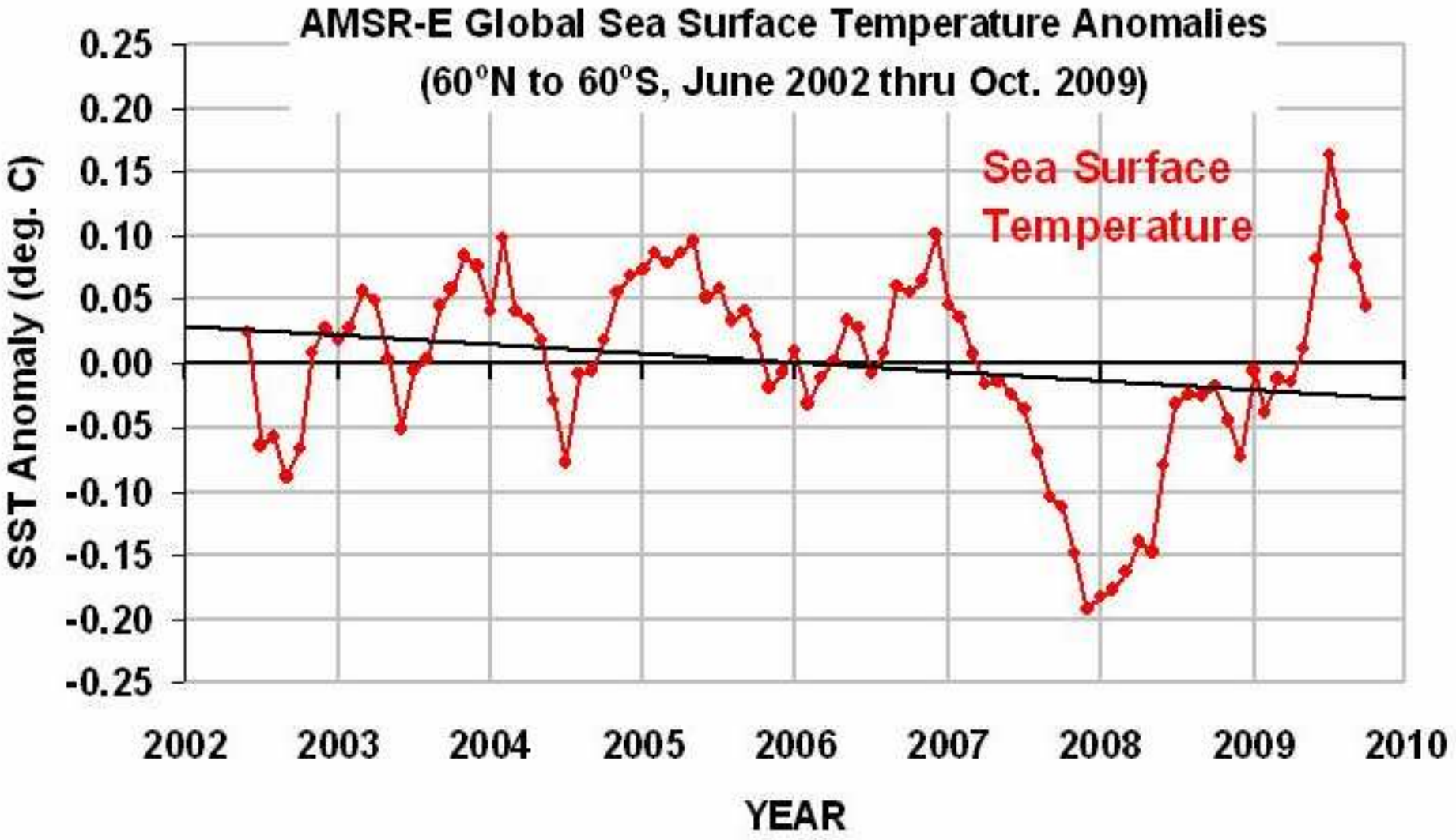
Where's The Acceleration?

Temperatures Have Been Flat for a Decade



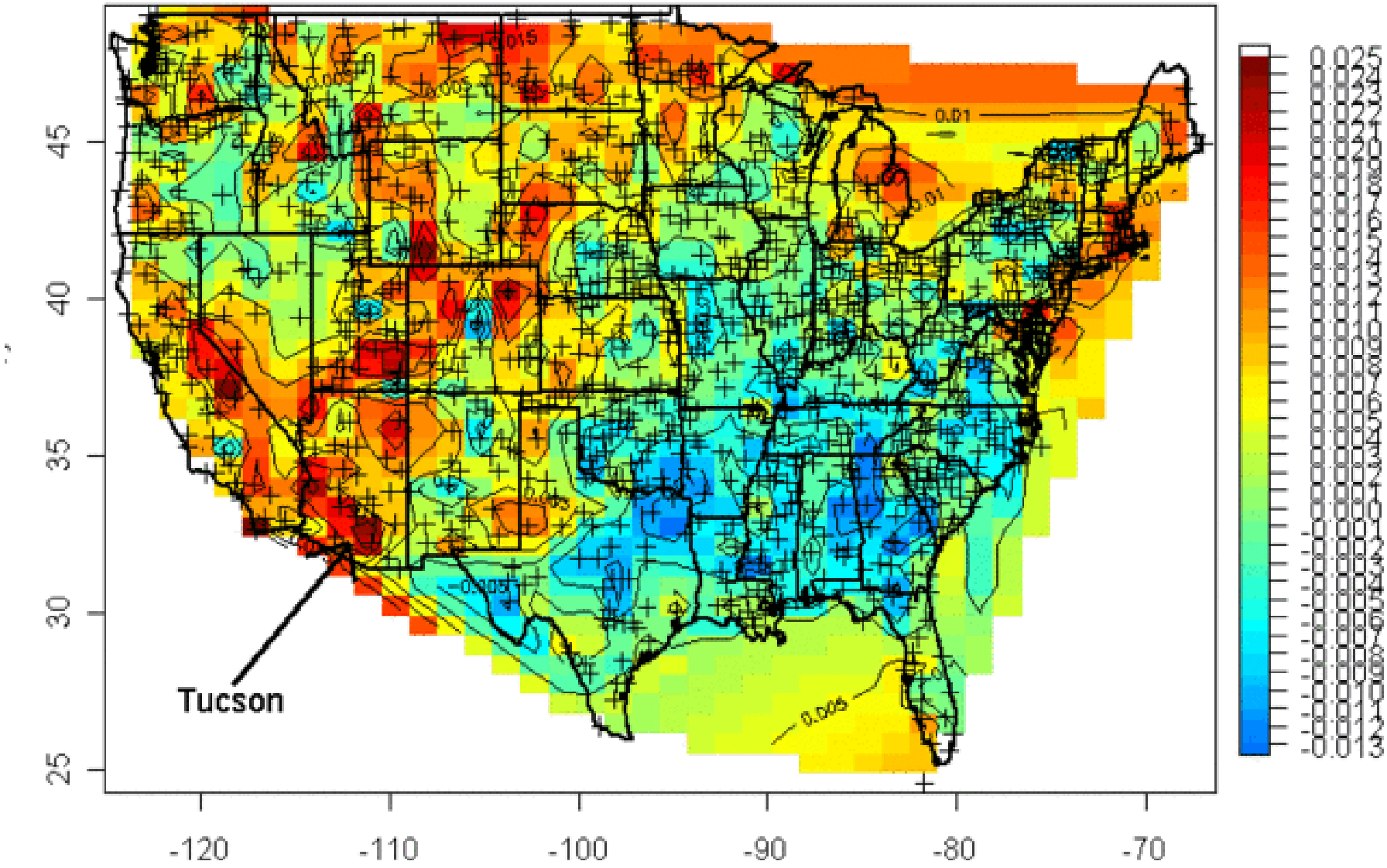
Source: Hadley CRUT, UAH

Sea Surface Temperatures Flat



Tucson Had Most Warming Since 1900

(According the USHCN Weather Station Data)



USHCN Weather Station Survey
Tucson, AZ

Official weather station in a parking lot!
I wonder what this looked like in 1900?

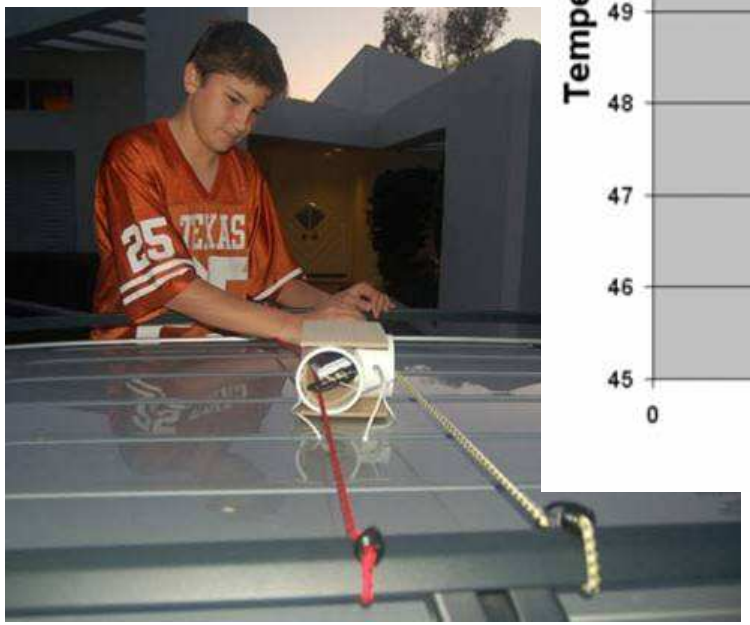
Survey archived at www.WeatherStations.org

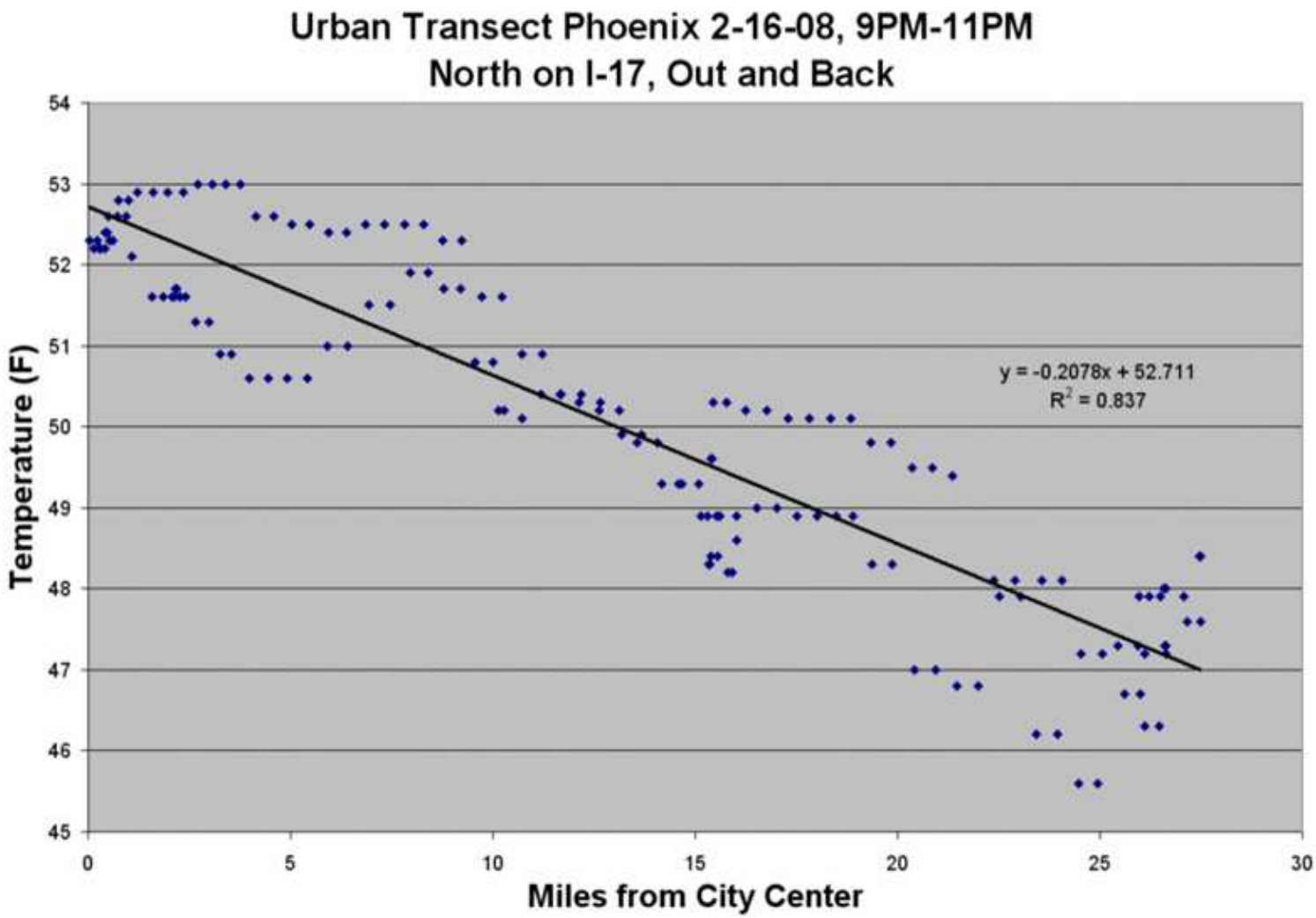
Tucson AZ Site circa 1900

We Found Consistently Bad Siting Around Arizona

Surveys archived at www.WeatherStations.org

Measuring the Phoenix Urban Heat Island 5 to 10 Degrees F

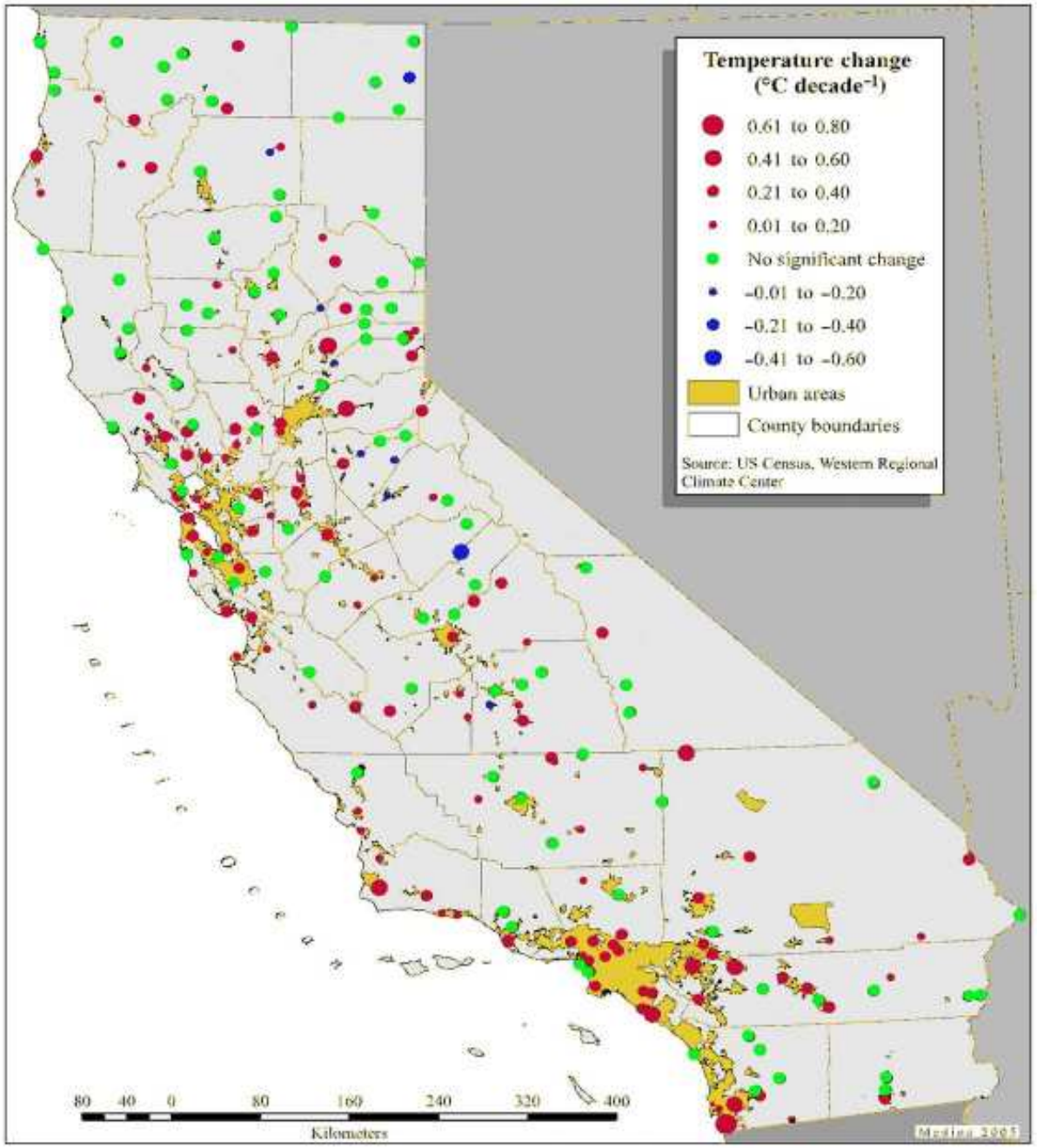




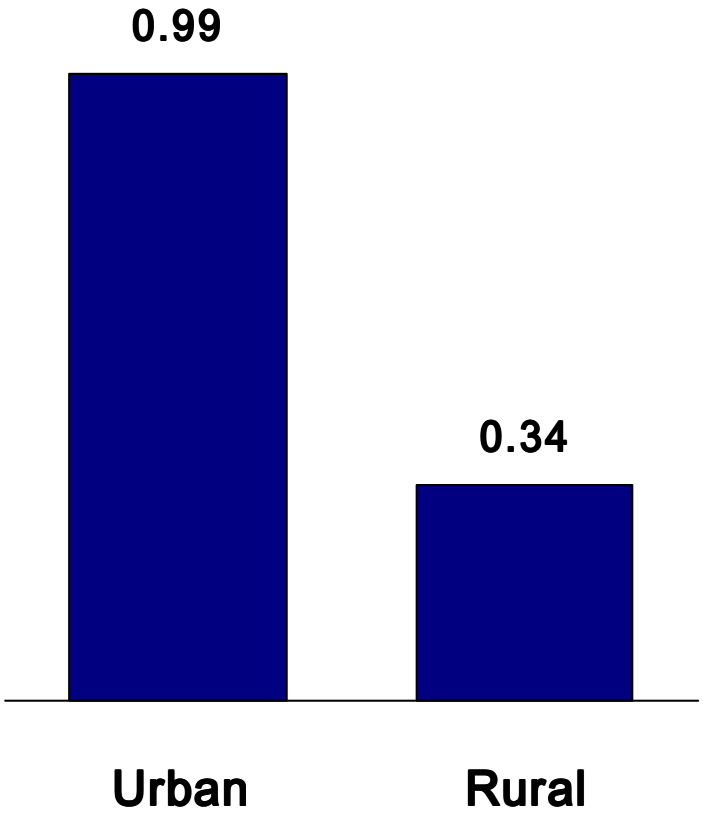
Meyer, 2008

Urban Growth Biases Temperatures Upwards

Half or More of Measured Temperature Increases May Be Due to Urban Biases



1950-2000 California Temperature Change, Celsius

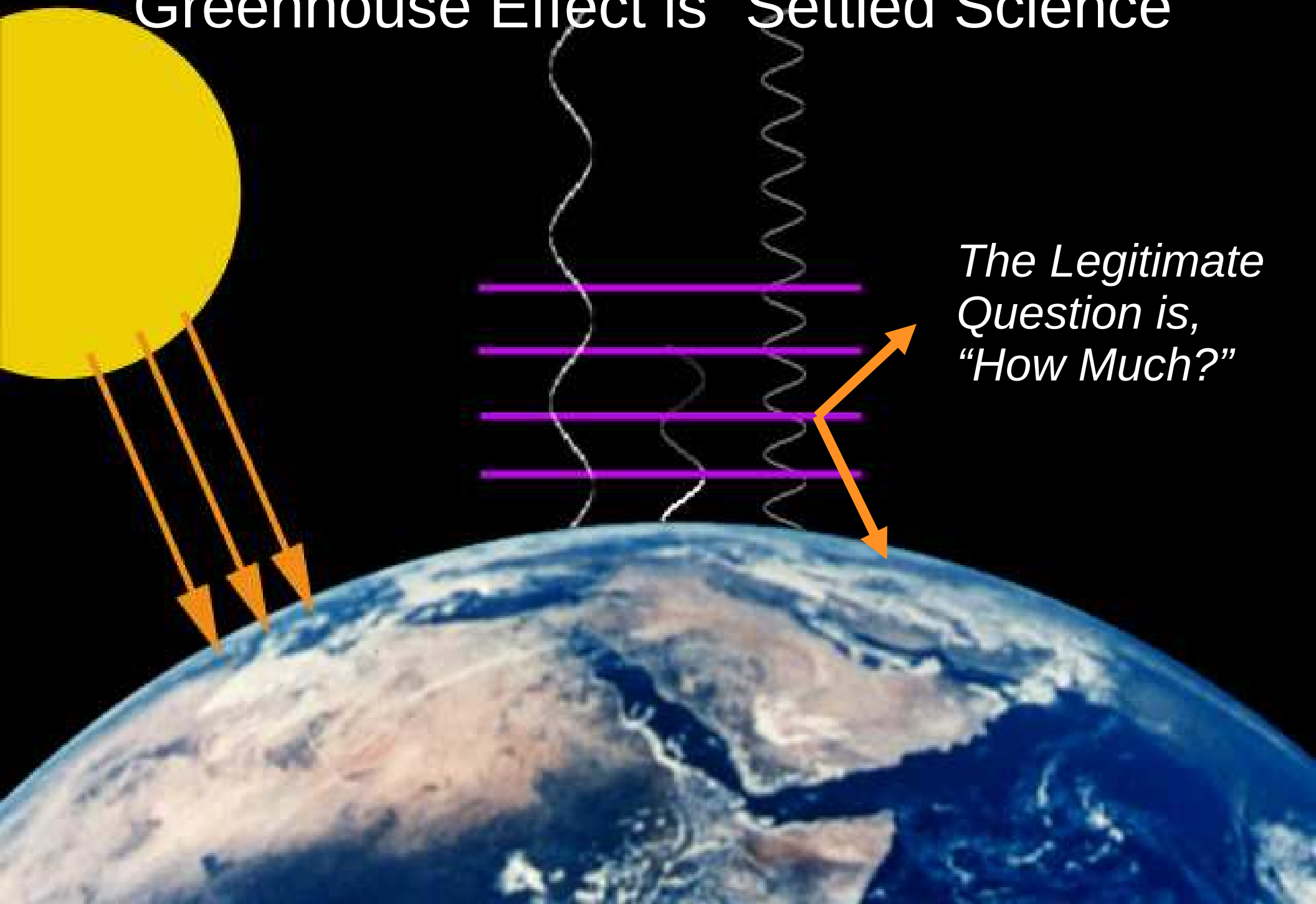


Source: LaDochy, 2007

Five Key Climate Questions

- Is the world warming?
  - *Yes, but historic record likely overstated, and there has been no warming in last 10-15 years*
- Is that warming due to man's CO_2?
- Will future man-made warming be substantial?
- Will we see catastrophic effects from warming?
- Do CO_2 abatement laws like cap-and-trade make sense?

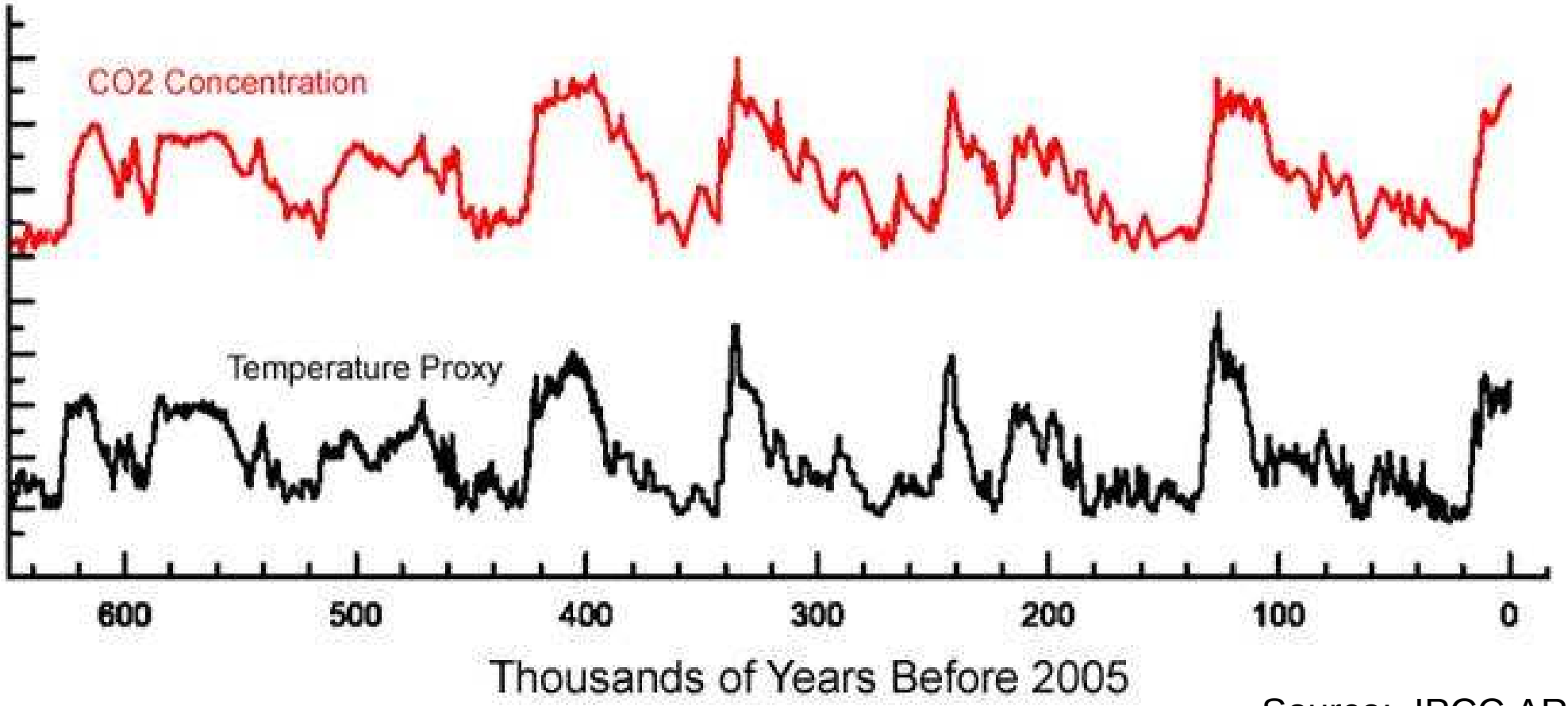
The Existence of Warming from the Greenhouse Effect is “Settled Science”



The Legitimate Question is, “How Much?”

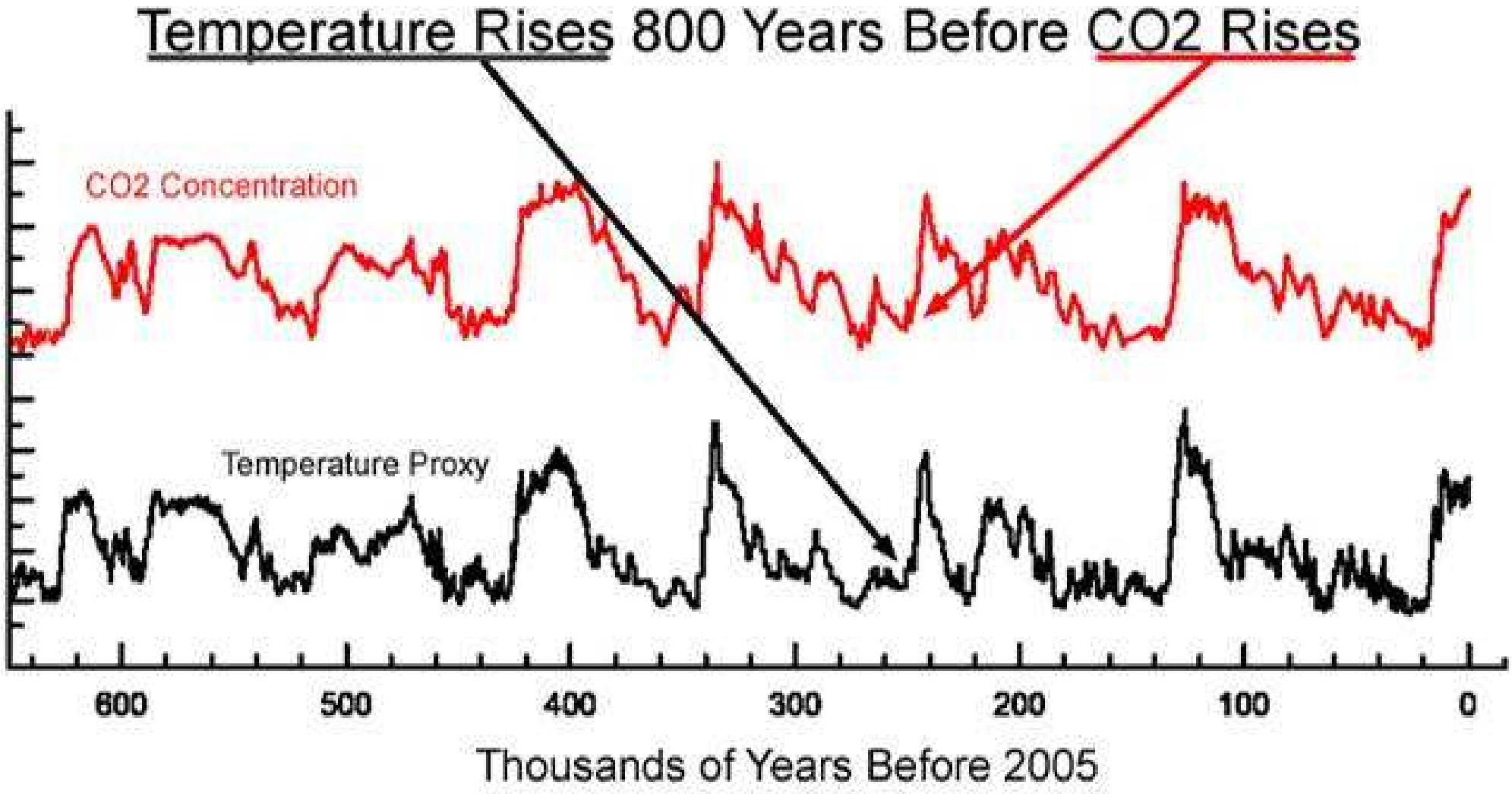
Early Ice Core Studies Seemed to Have Found the Smoking Gun

CO_2 appeared to be a strong driver of global temperatures…

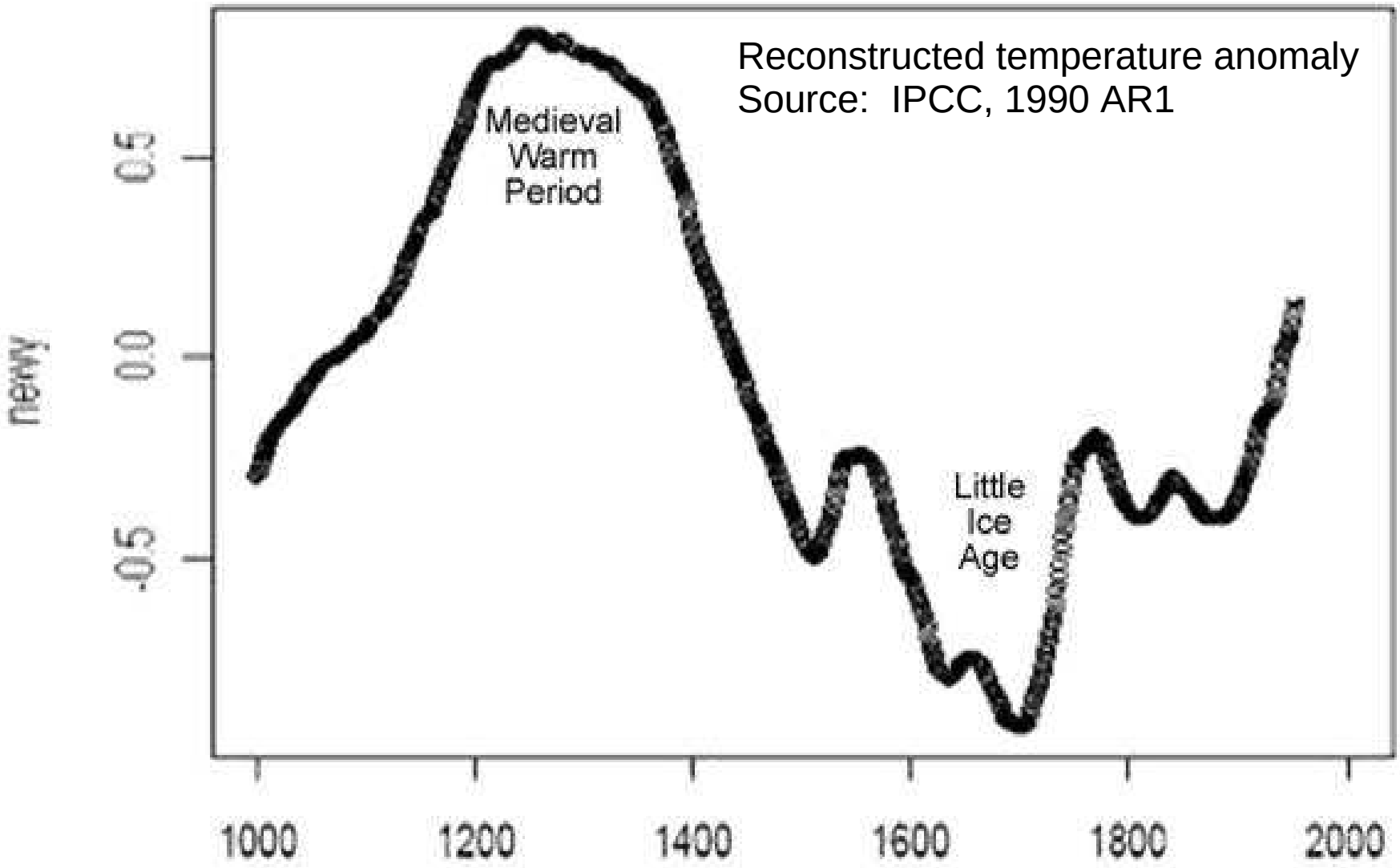


Source: IPCC AR4

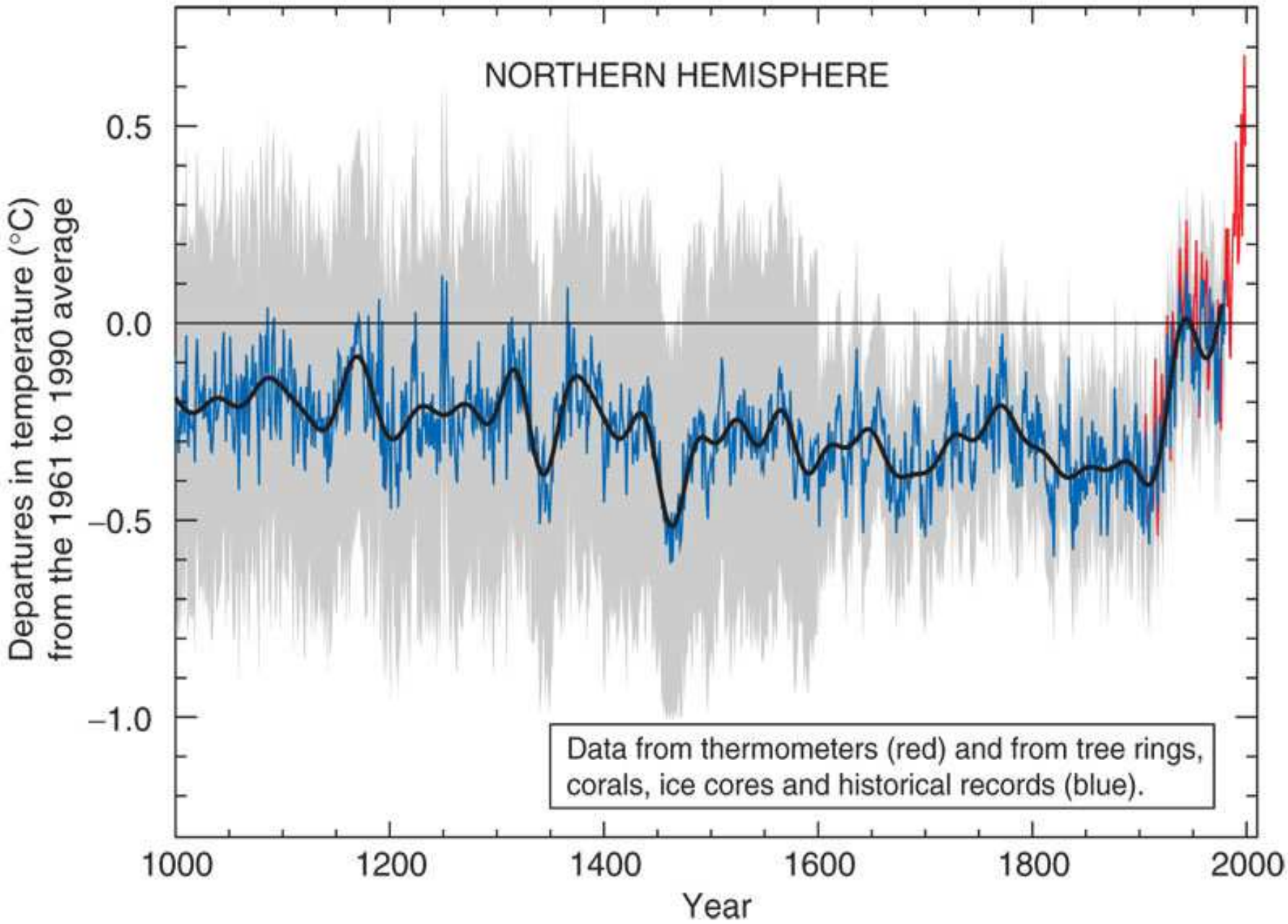
More Careful Measurements Have Reversed the Findings



Early IPCC Reports Found Current Temperatures to be Unexceptionable

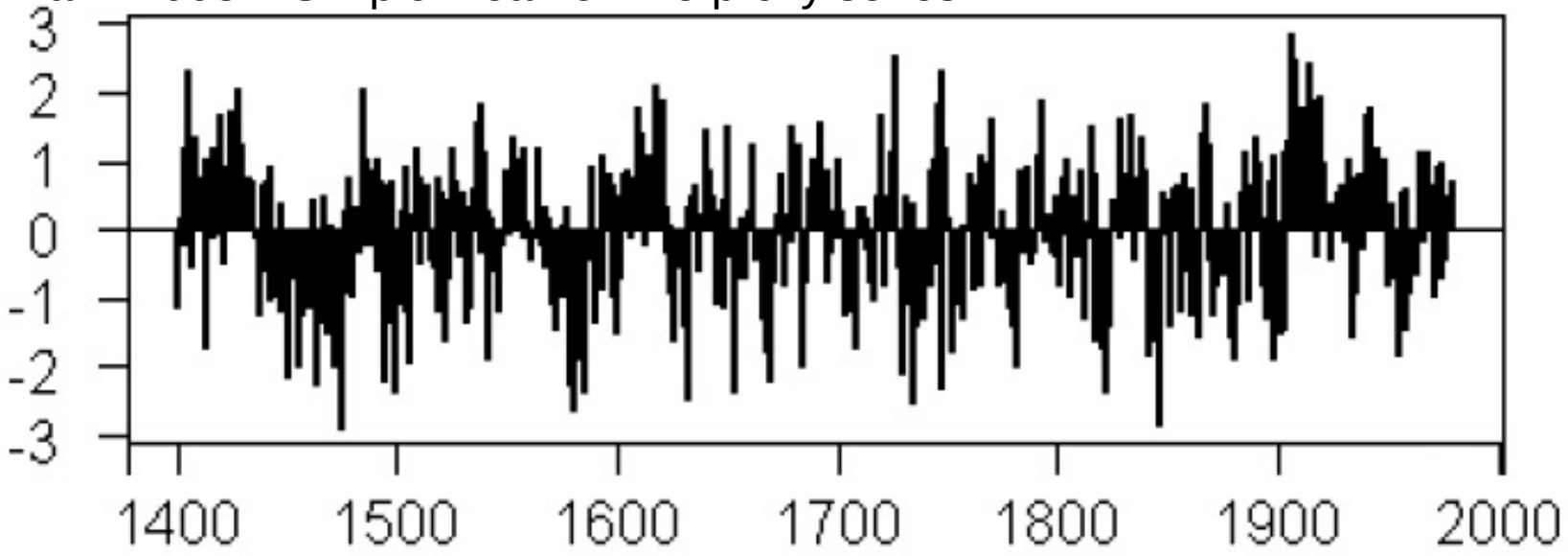


Mann's Hockey Stick Purported to Show Recent Warming as Unprecedented

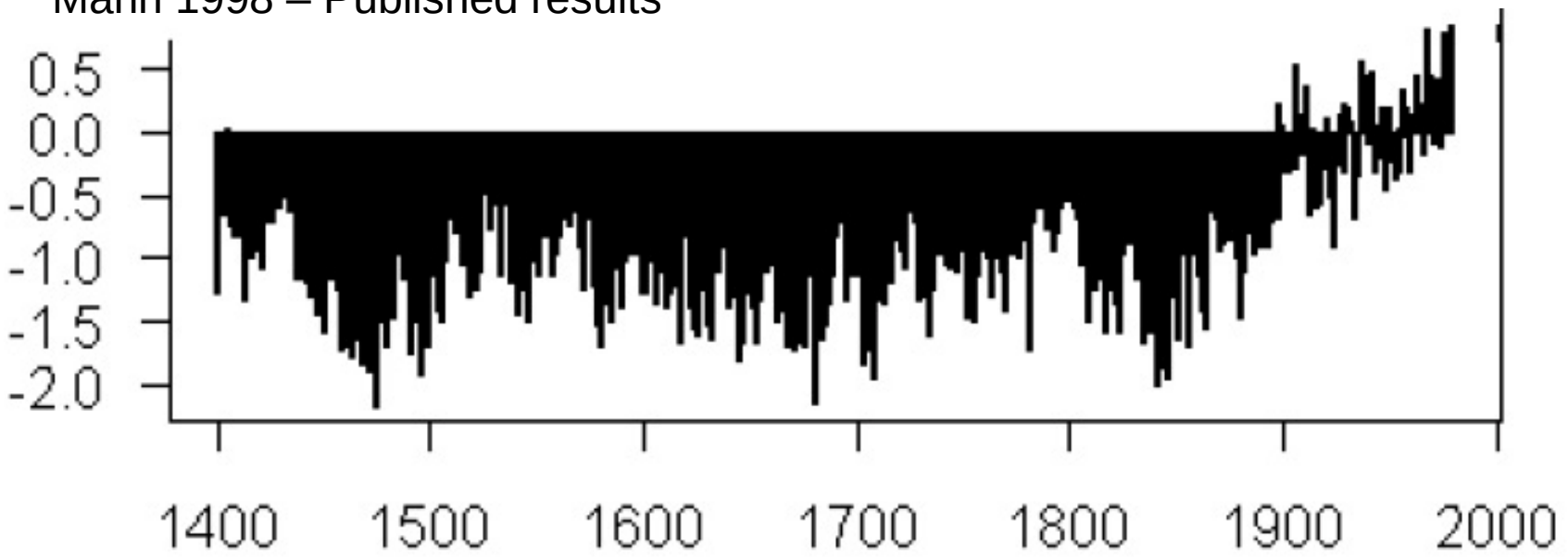


“Novel” Statistical Methods

Mann 1998 – Simple mean of 415 proxy series



Mann 1998 – Published results



McIntyre & McKitrick, 2006

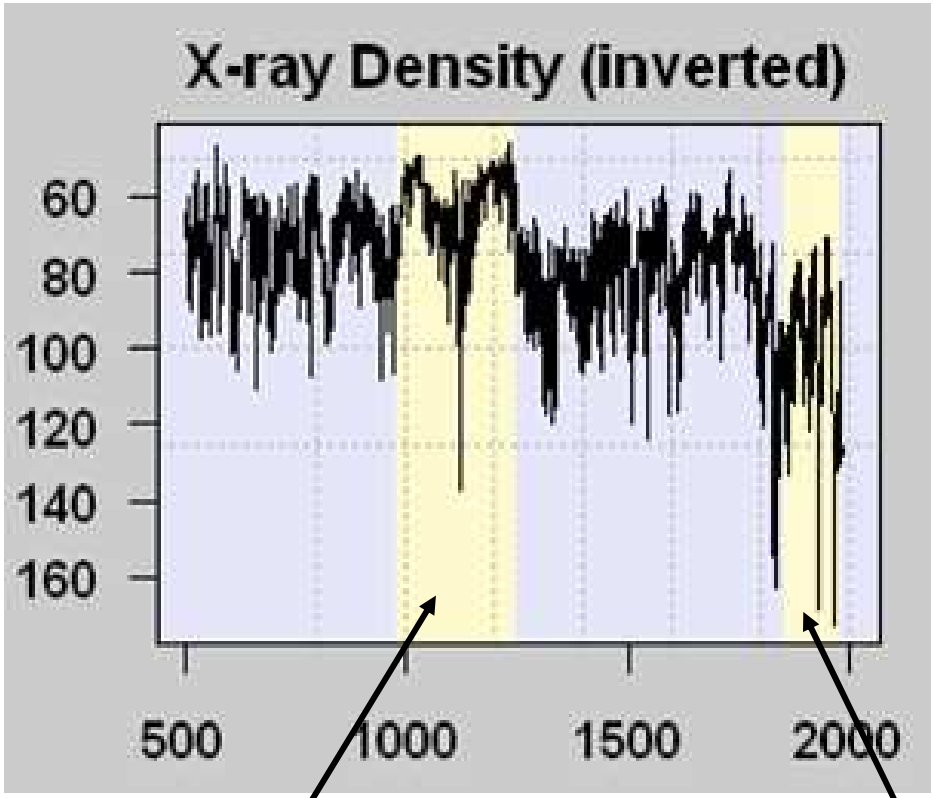
A Few Proxy Series (<5% of the total) Drive the Result

- Multiple studies, but they are not independent
  - Same researchers, same reviewers
  - Different proxies at the margin, but all use a core of 2-3 proxies know to drive hockey stick results
- McIntyre & McKitrick (2005) showed the Mann methodology used and re-used by these studies
  - Creates hockey sticks from random noise
  - Seeks out and overweights HS shaped proxy series
- High-Altitude southwest US bristlecone pines were for years the “secret sauce” to make hockey sticks
  - Questionable proxy – are we measuring rainfall, temperature, or CO2 fertilization?
  - Many modern anthropogenic factors
  - Proxies used by Mann and others have not been replicated by more recent work (Ababneh 2007)

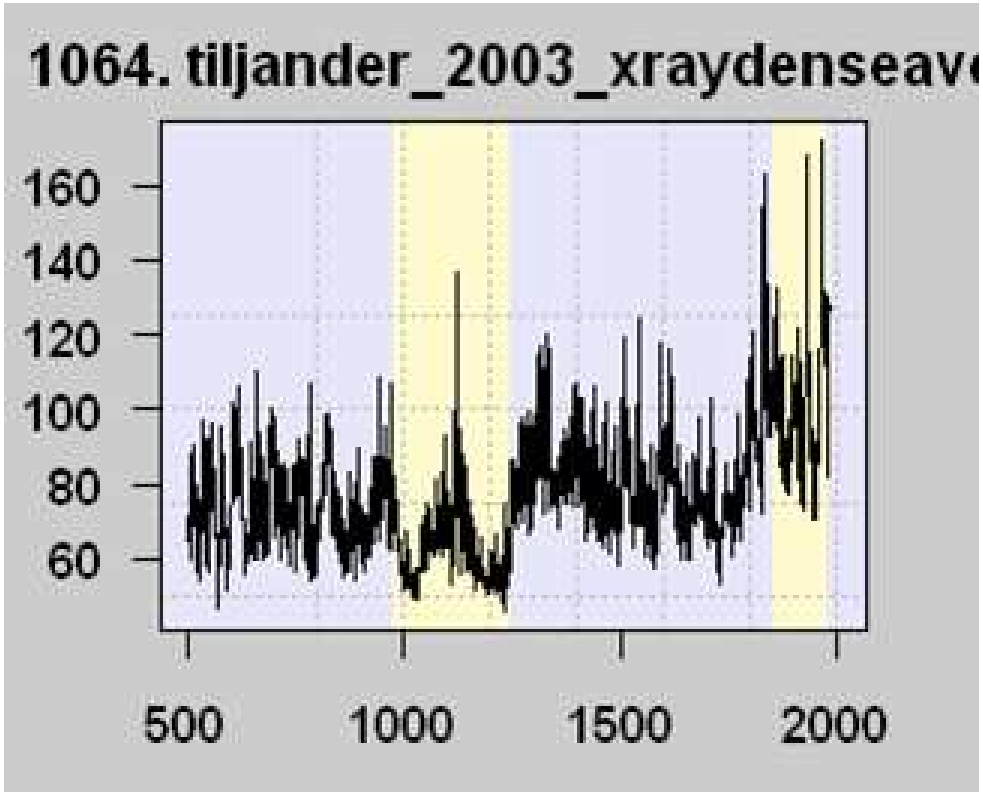
Flipping Proxies Upside Down Tiljander Sediments Example

Warmer Year → More Organic Matter in Sediment → Lower X-ray Density

Original Proxy Findings



Mann 2008 (and others) Used the Proxy Upside-Down to Show Hockey Stick Warming

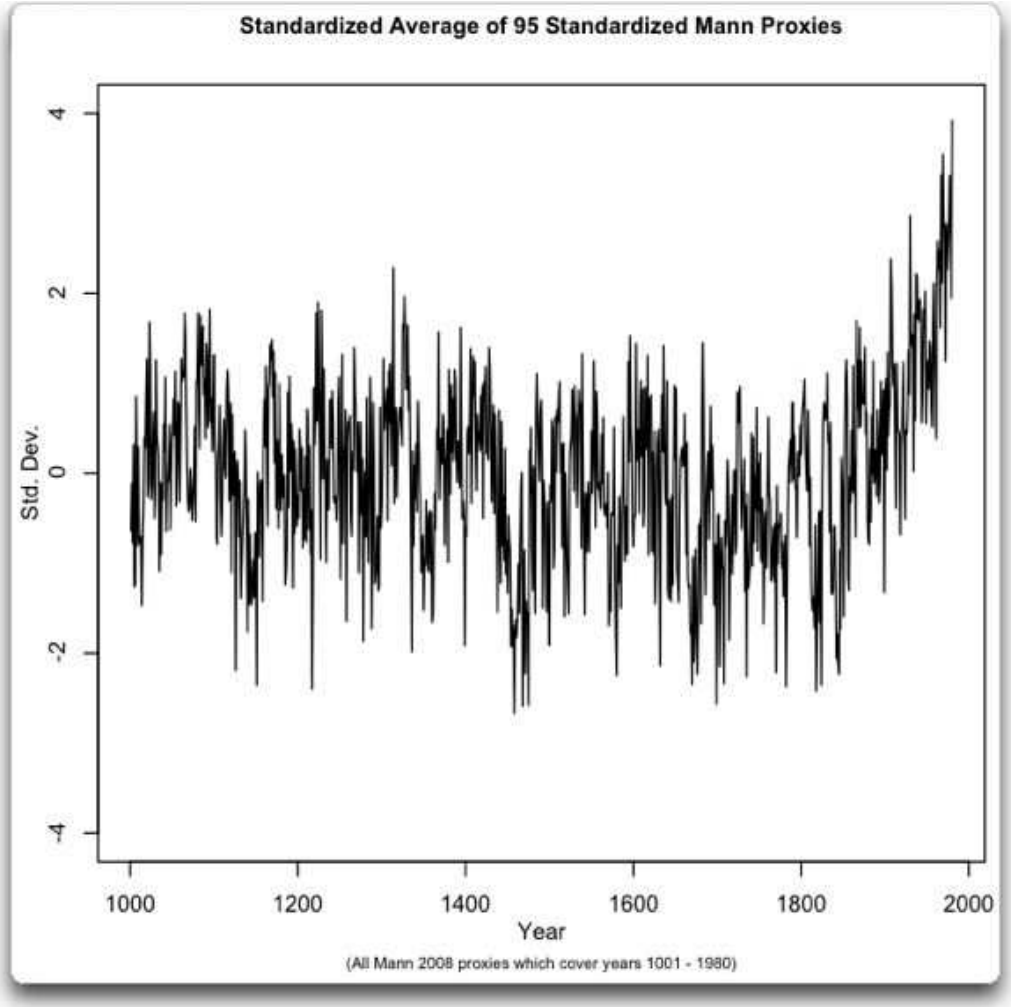


Medieval Warm Period

Sediments Disturbed by Agriculture
(e.g. proxy meaningless in this period)

Excluding Tiljander Sediments and SW Pines Changes the Entire Answer

Mann 2008 Long-Term Proxy Average



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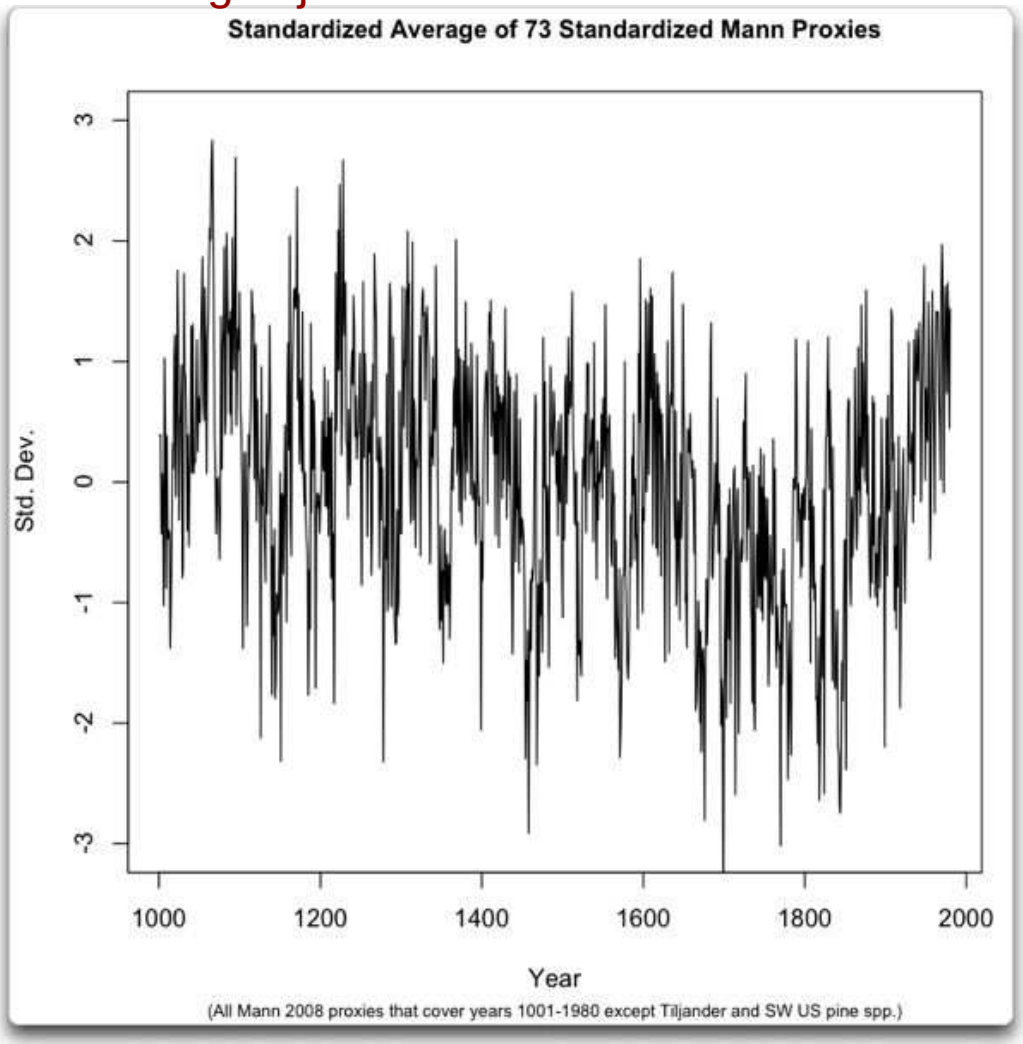
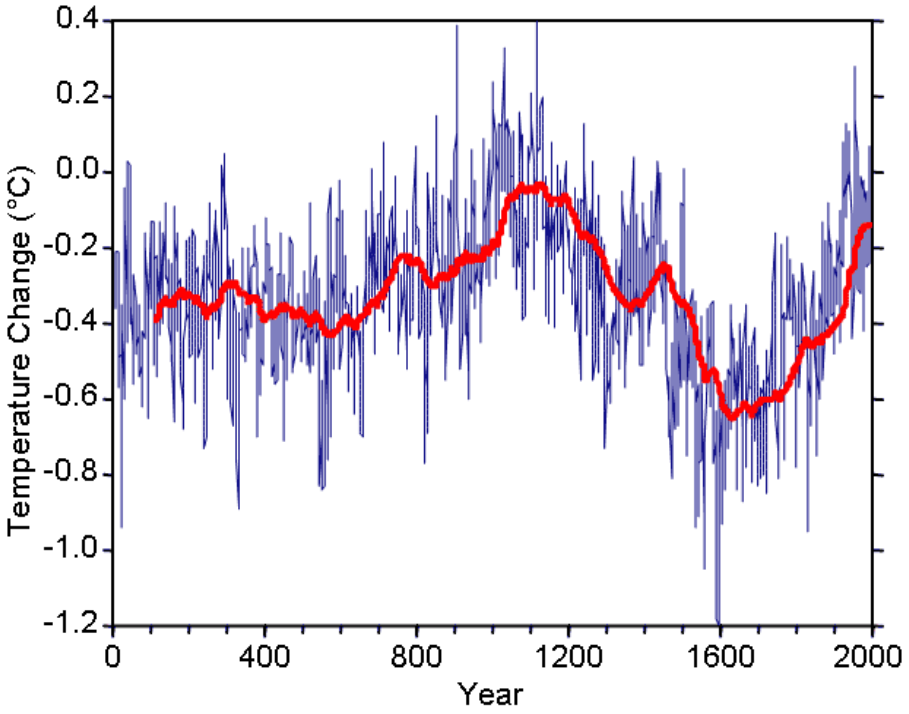


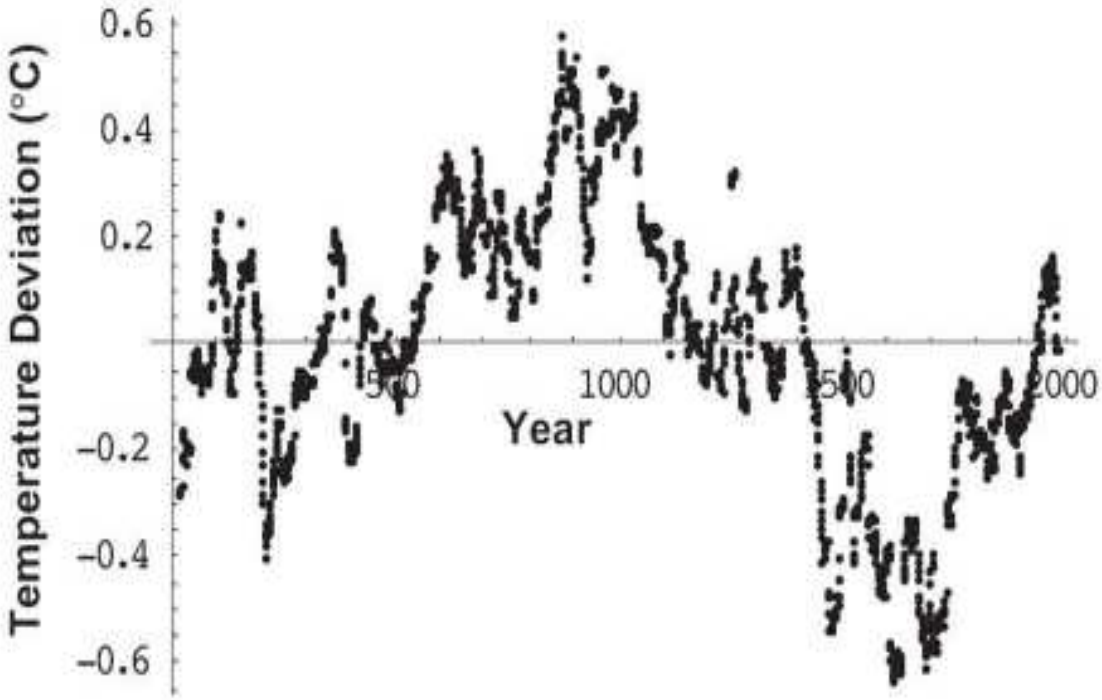
Eschenbach, 2008

Proxy Studies Without These Questionable Series Take Us Back to the Traditional View

Moberg, 2005

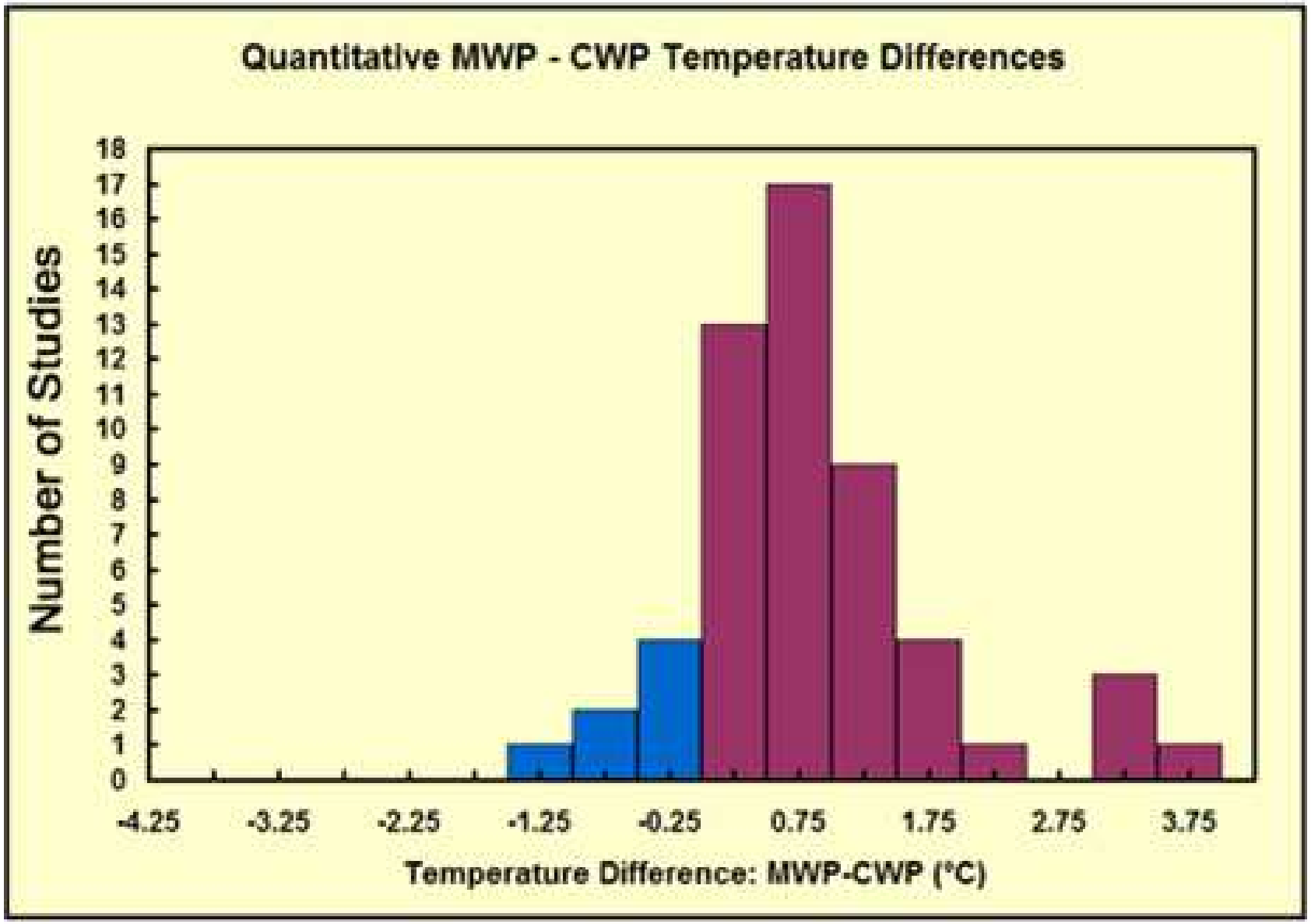


Loehle, 2007



Medieval Warm Period, Little Ice Age, and Temperatures Today That Are Not Unprecedented

Comparing the Medieval Warm Period to Today



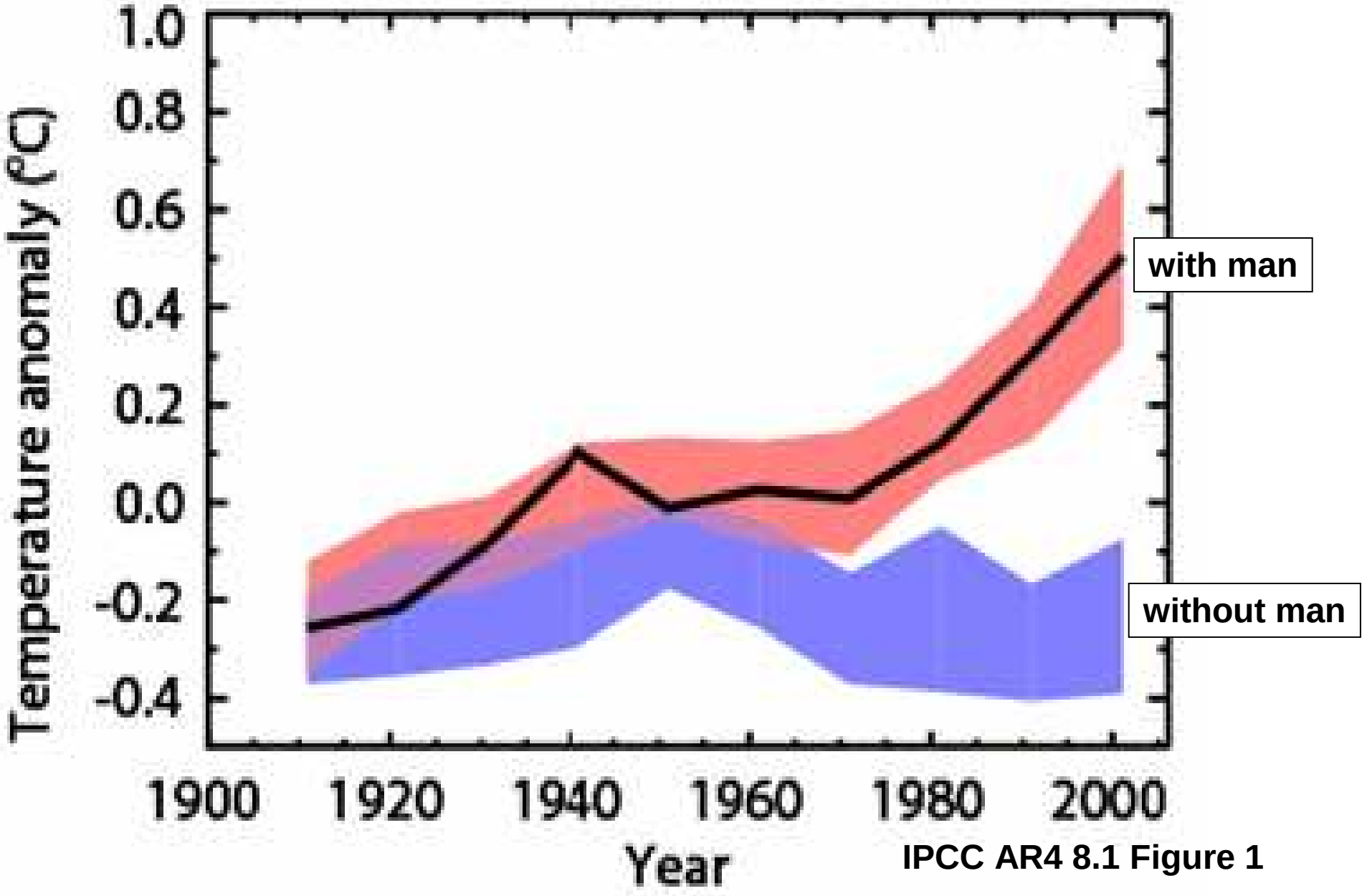
Center for the Study of Carbon Dioxide and Global Change

Current Lead Argument:
Warming Caused By Man Because We Can't Think of Anything Else It Could Be

Per Dr. Richard Lindzen of MIT:

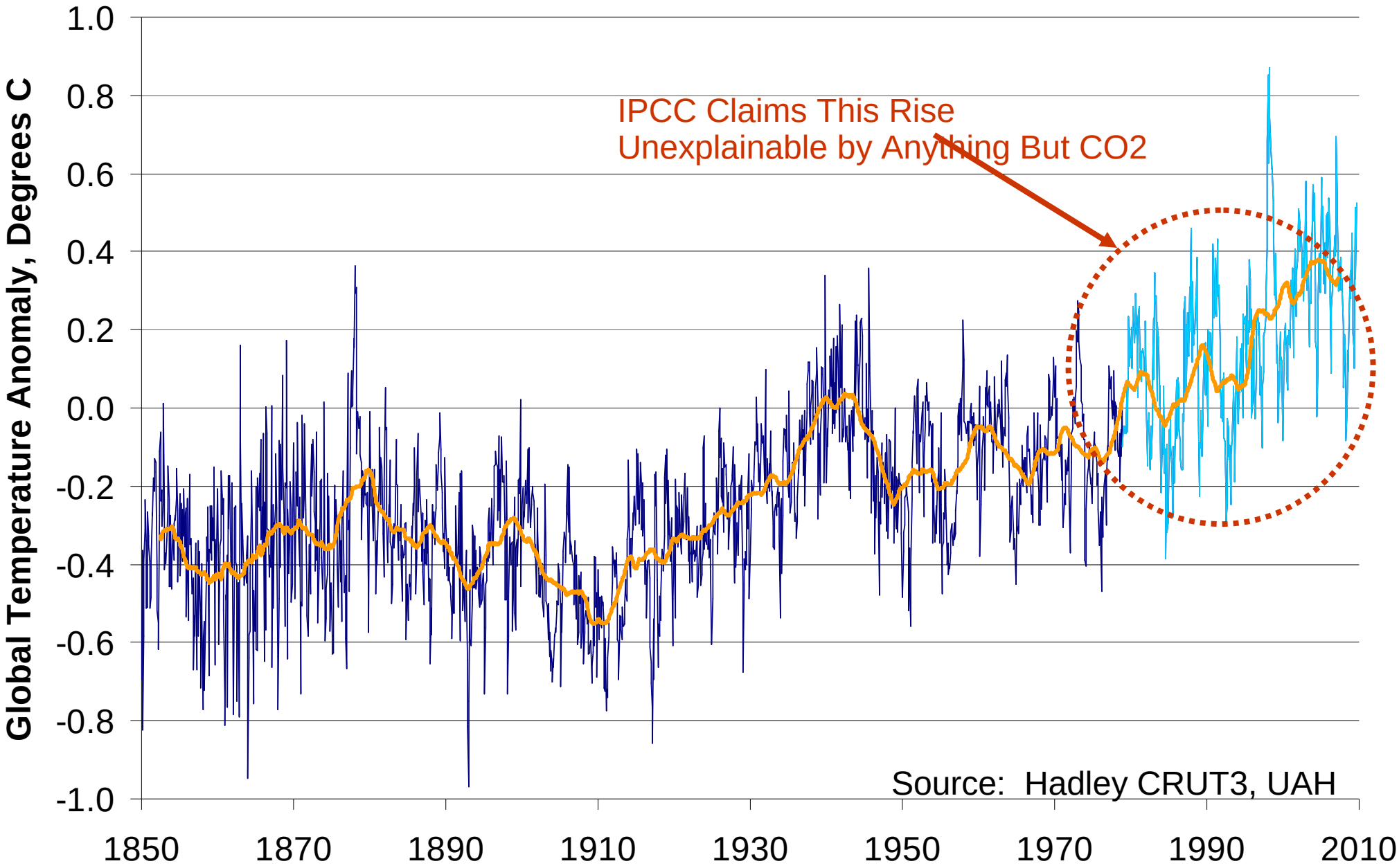
> *What was done, was to take a large number of models that could not reasonably simulate known patterns of natural behavior (such as ENSO, the Pacific Decadal Oscillation, the Atlantic Multidecadal Oscillation), claim that such models nonetheless accurately depicted natural internal climate variability, and use the fact that these models could not replicate the warming episode from the mid seventies through the mid nineties, to argue that forcing was necessary and that the forcing must have been due to man. (Lindzen)*

IPCC Models Say Nature Would Have Cooled Without Man



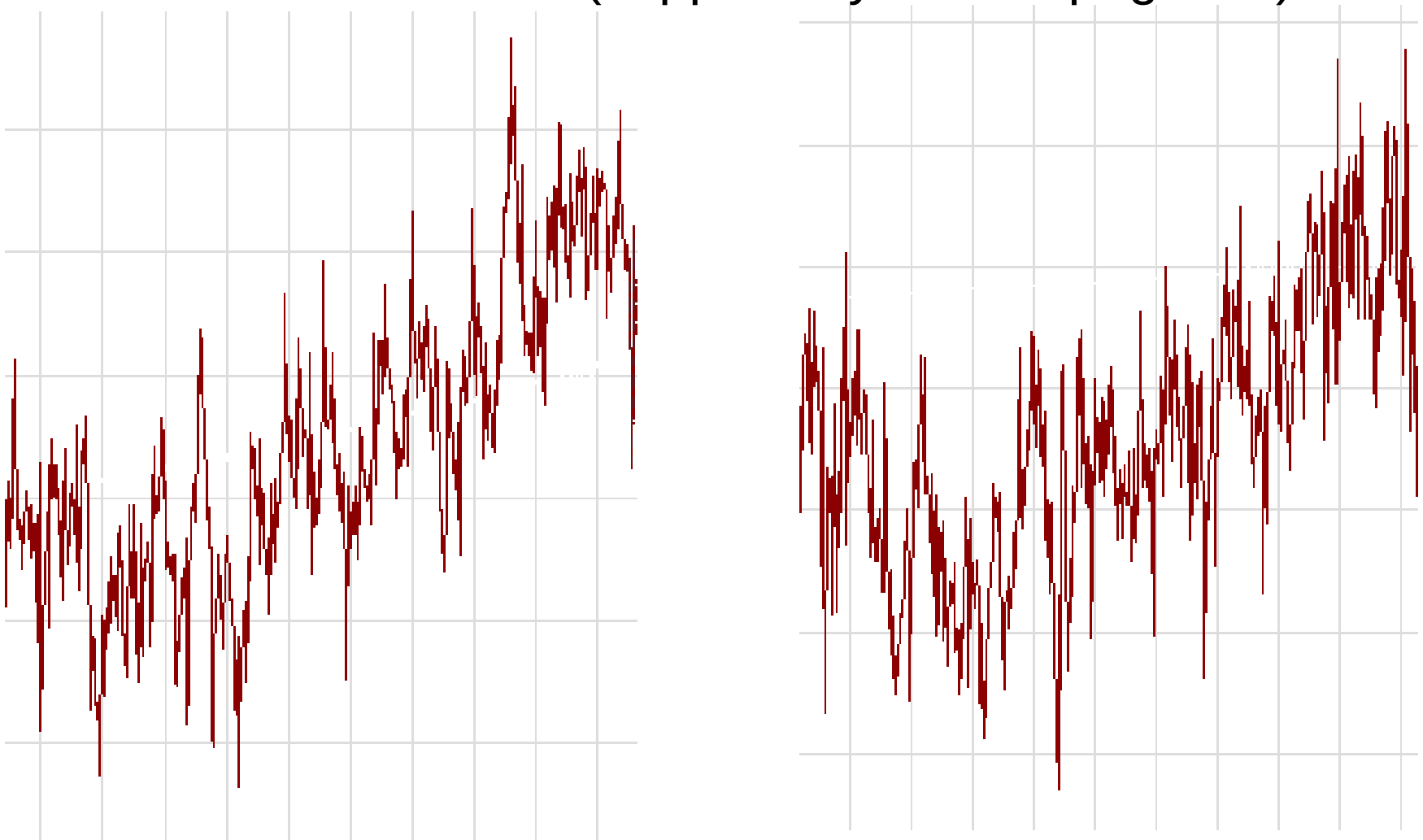
IPCC AR4 8.1 Figure 1

Climate Alarmists Claim 1970-2000 Temperature Rise Must Be Due to Man



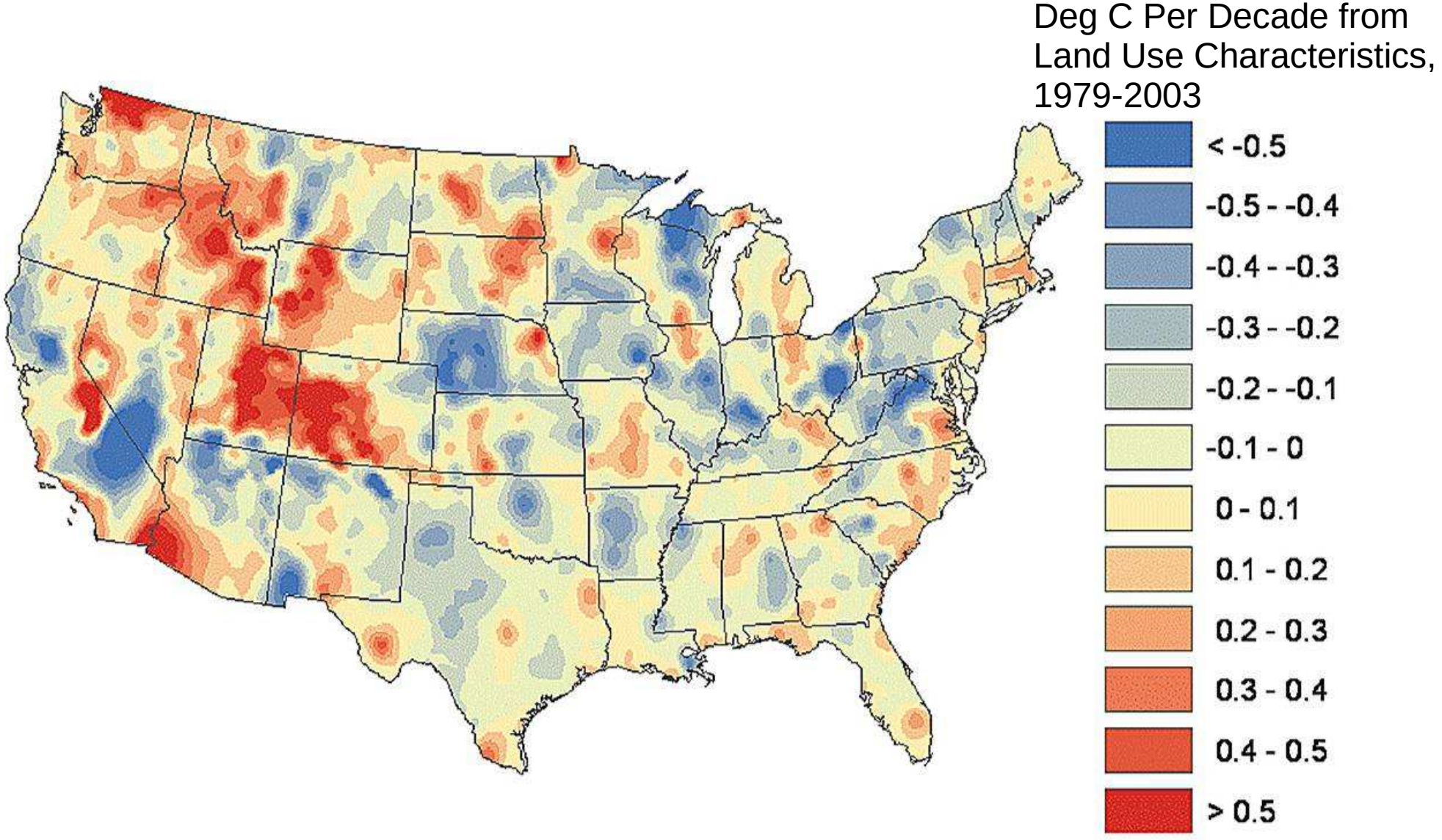
Two 51-Year Periods: Which Is Man, And Which is Mother Nature?

One Period is 1895-1946 (“nature”) and the other Period is 1957-2008 (supposedly “Anthropogenic”)



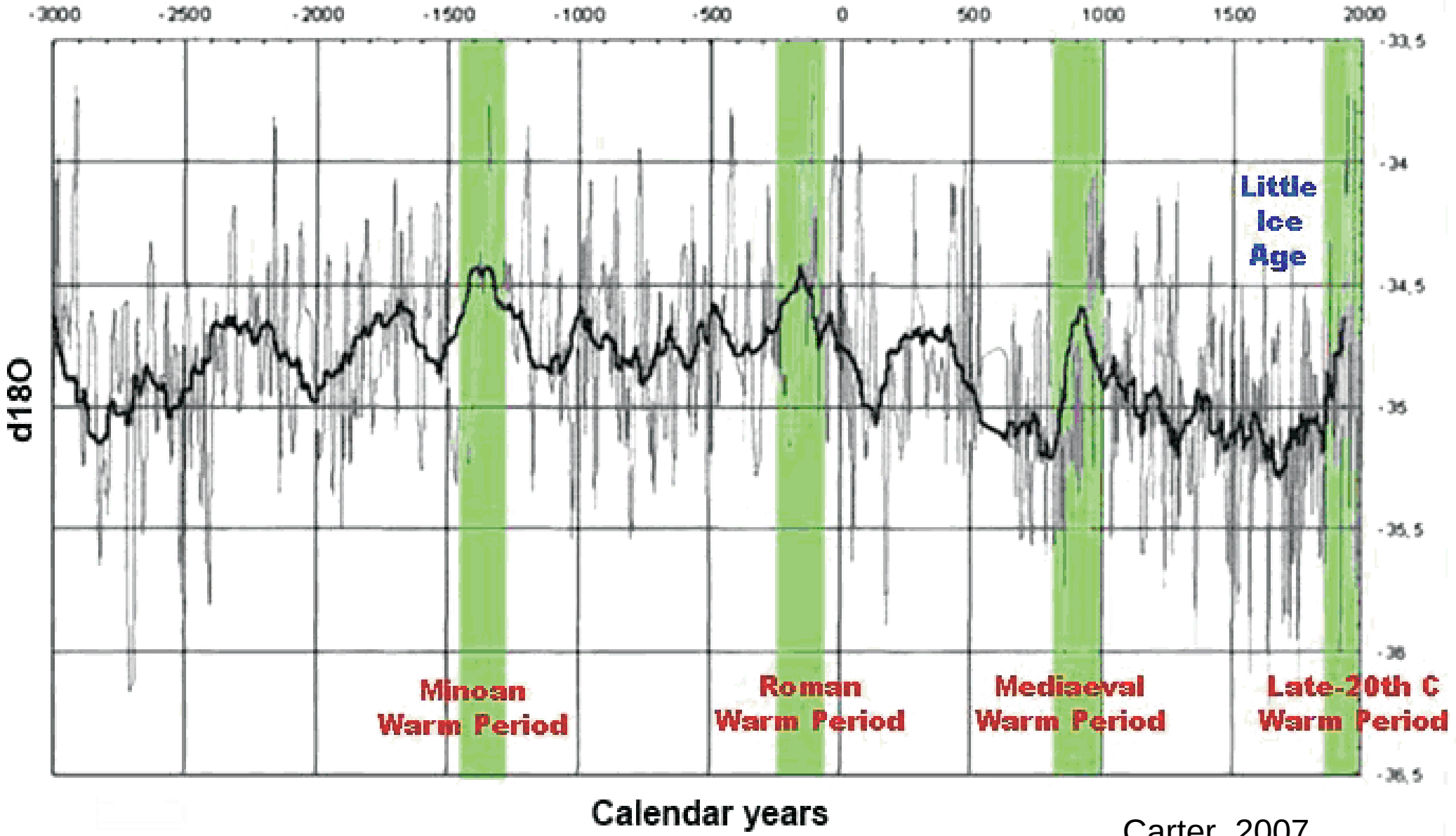
Both time and temperature scales are the same between graphs

Omitted: Land Use Changes Affect Temperatures



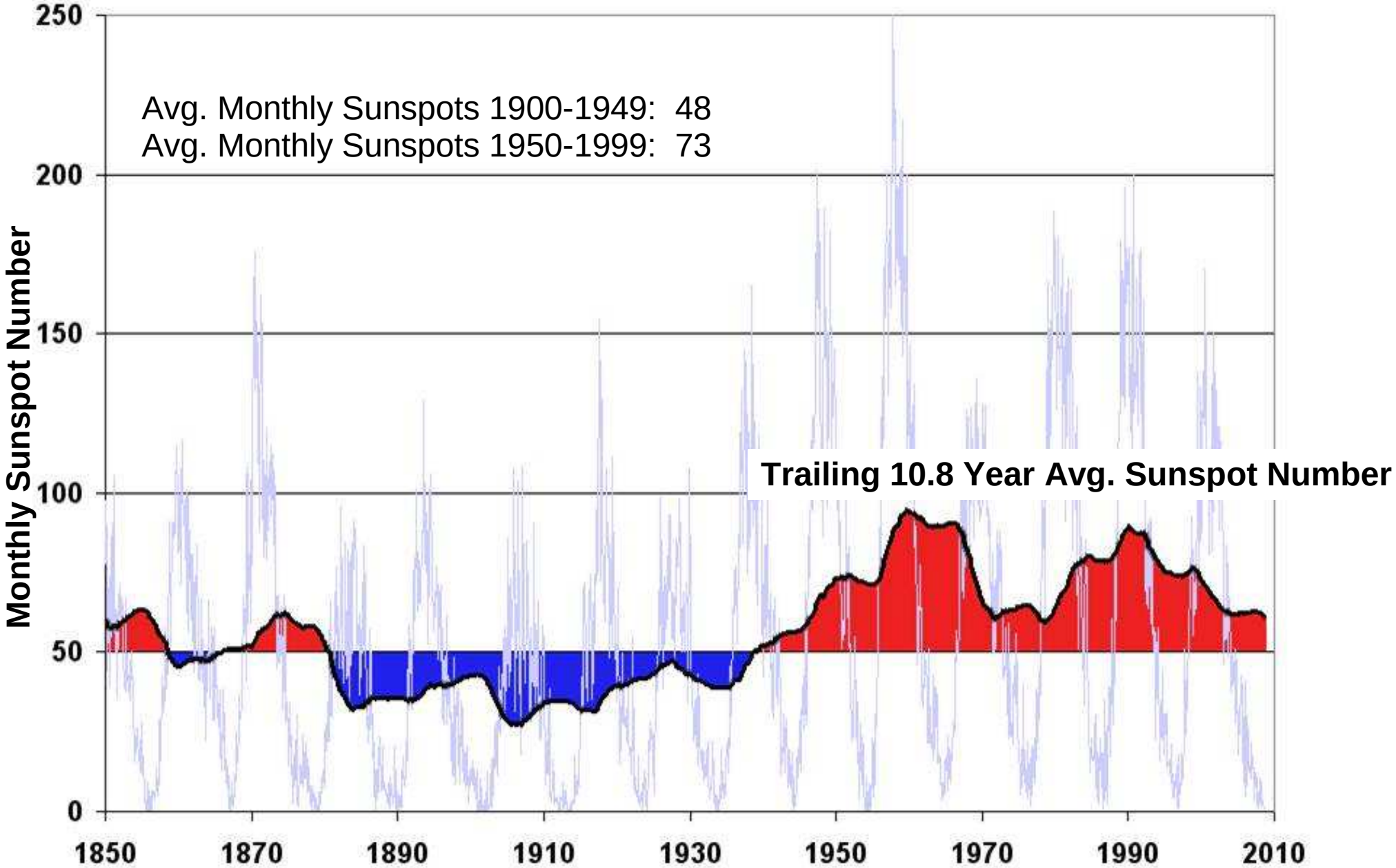
Fall, S., D. Niyogi, A. Gluhovsky, R. A. Pielke Sr., E. Kalnay, and G. Rochon, 2009

Omitted: Recovery from the Little Ice Age

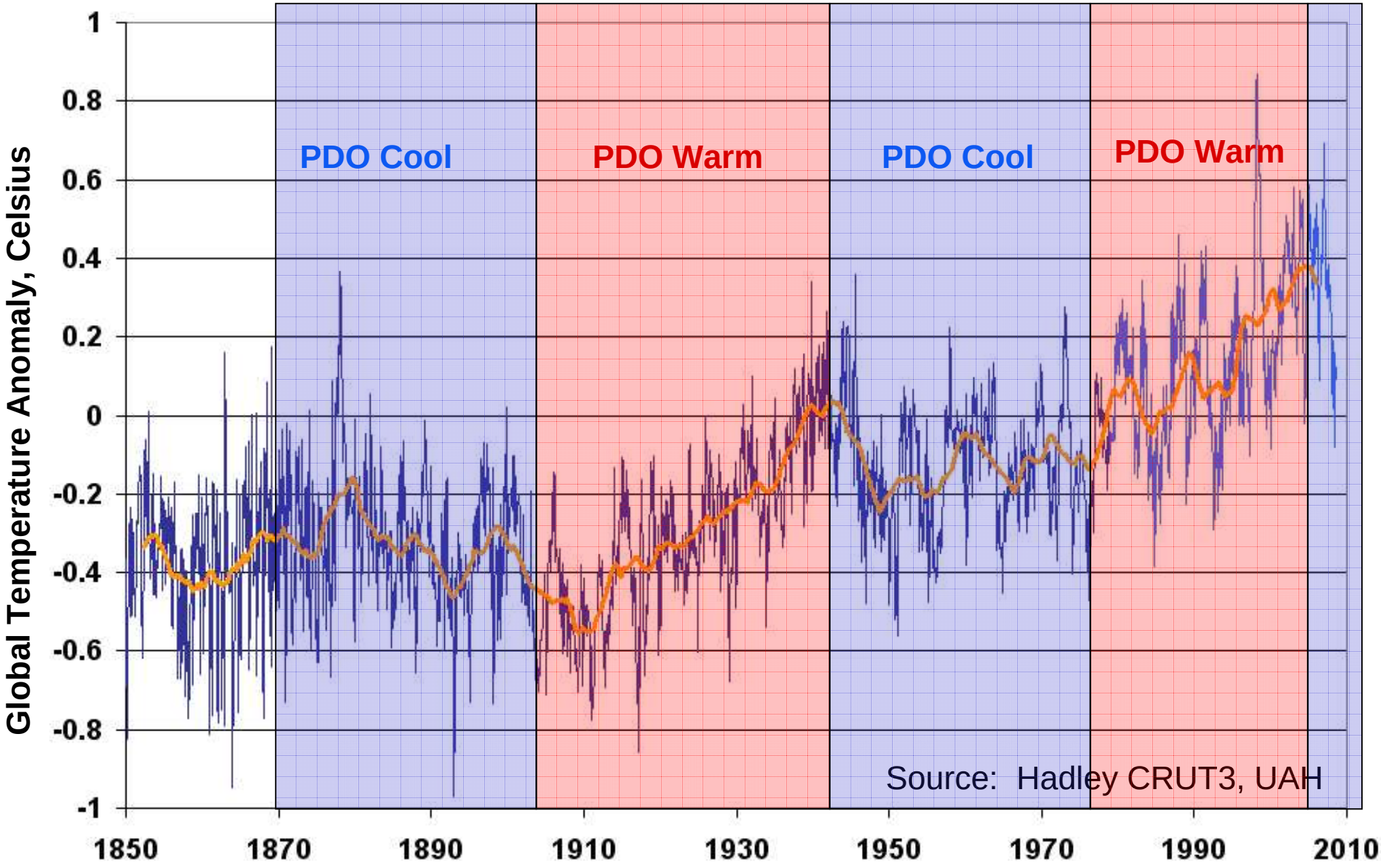


Carter, 2007

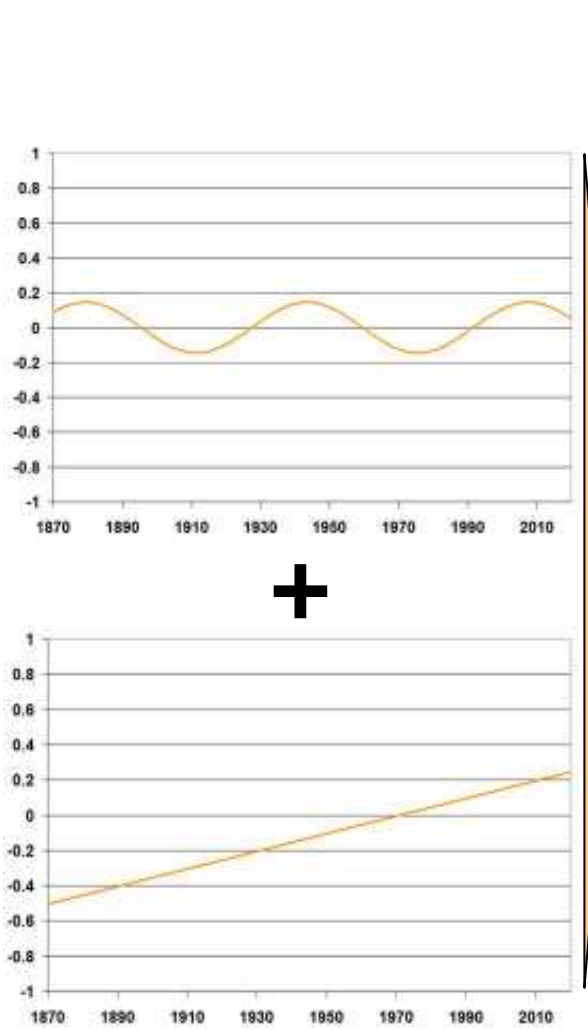
Omitted: Sun Has Been Unusually Active in Last 50 Years



Omitted: The Pacific Decadal Oscillation Has An Enormous Effect on Temperatures



Historic Temperatures Can Be Modeled with a Constant Linear Trend + A 60-Year Cycle



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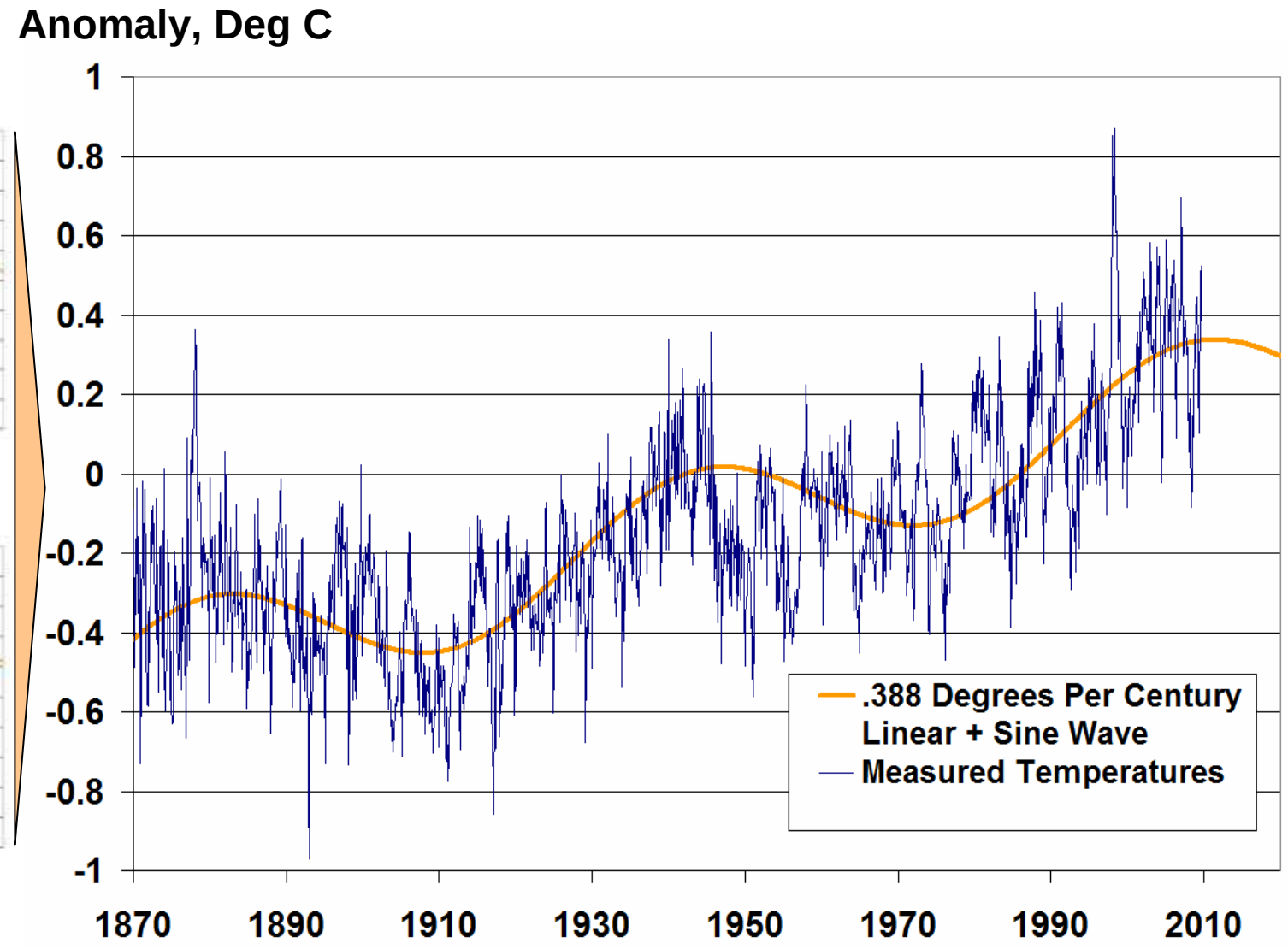
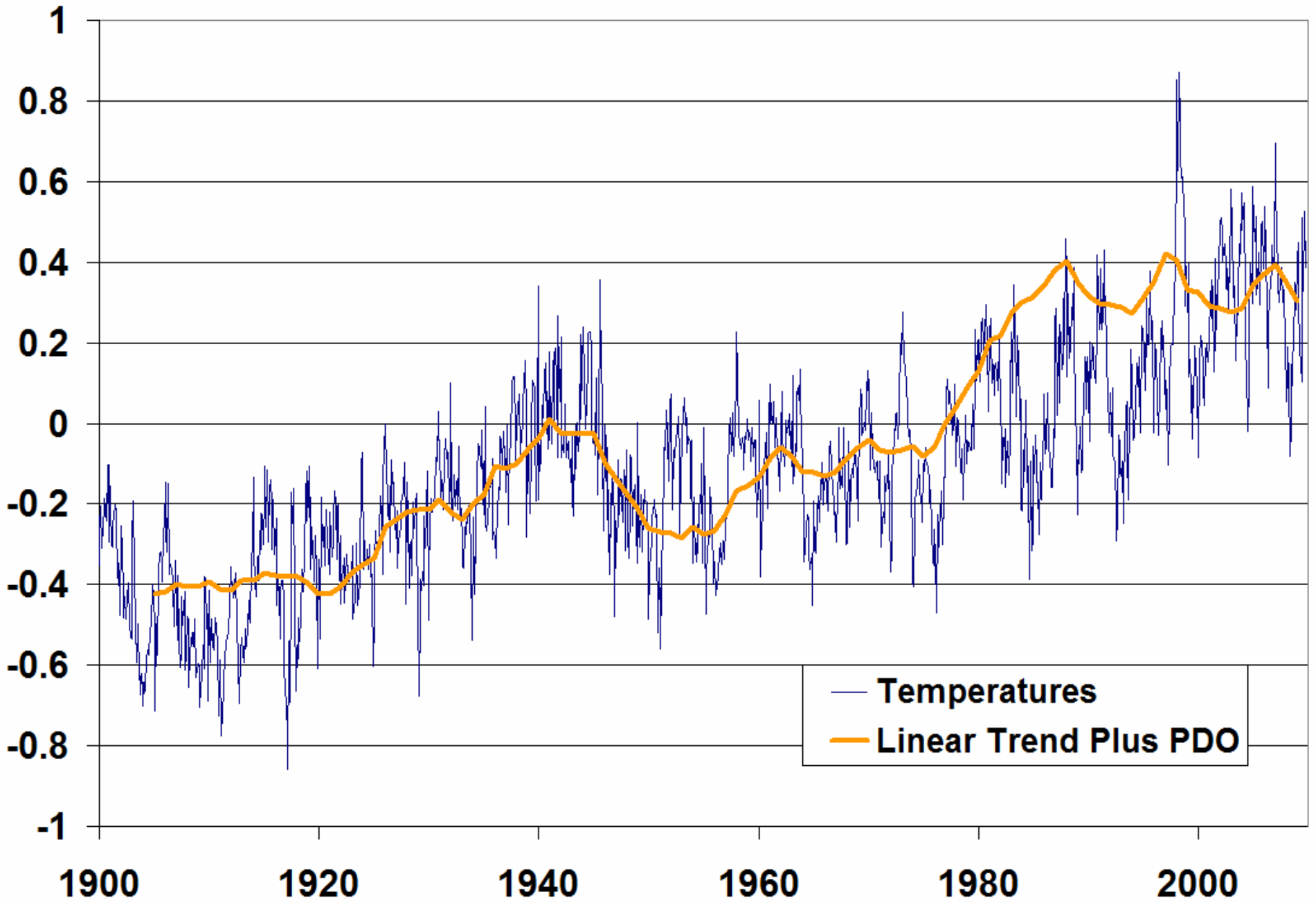


Modeling Historic Temperatures with PDO + Linear Trend



Five Key Climate Questions

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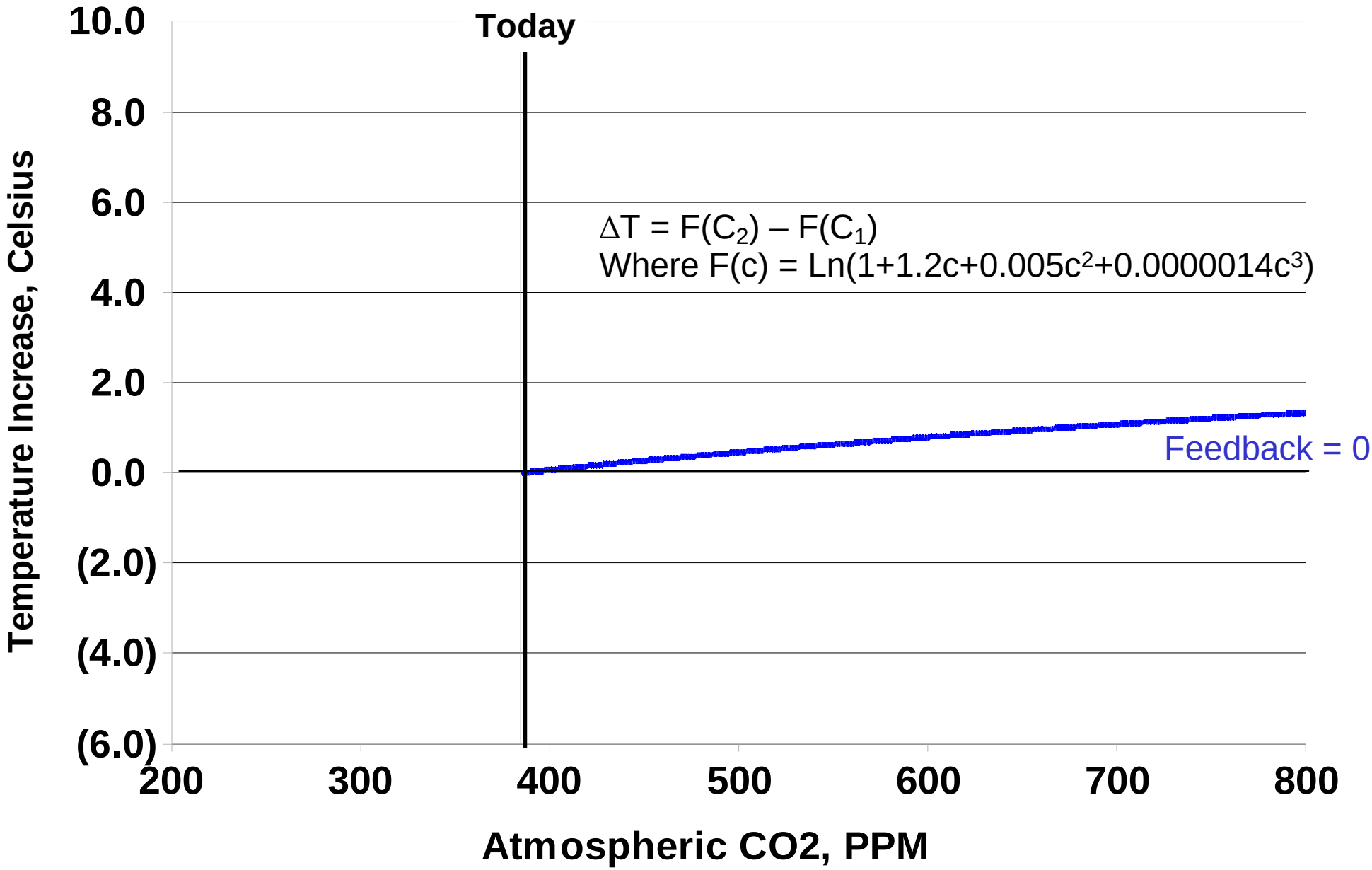
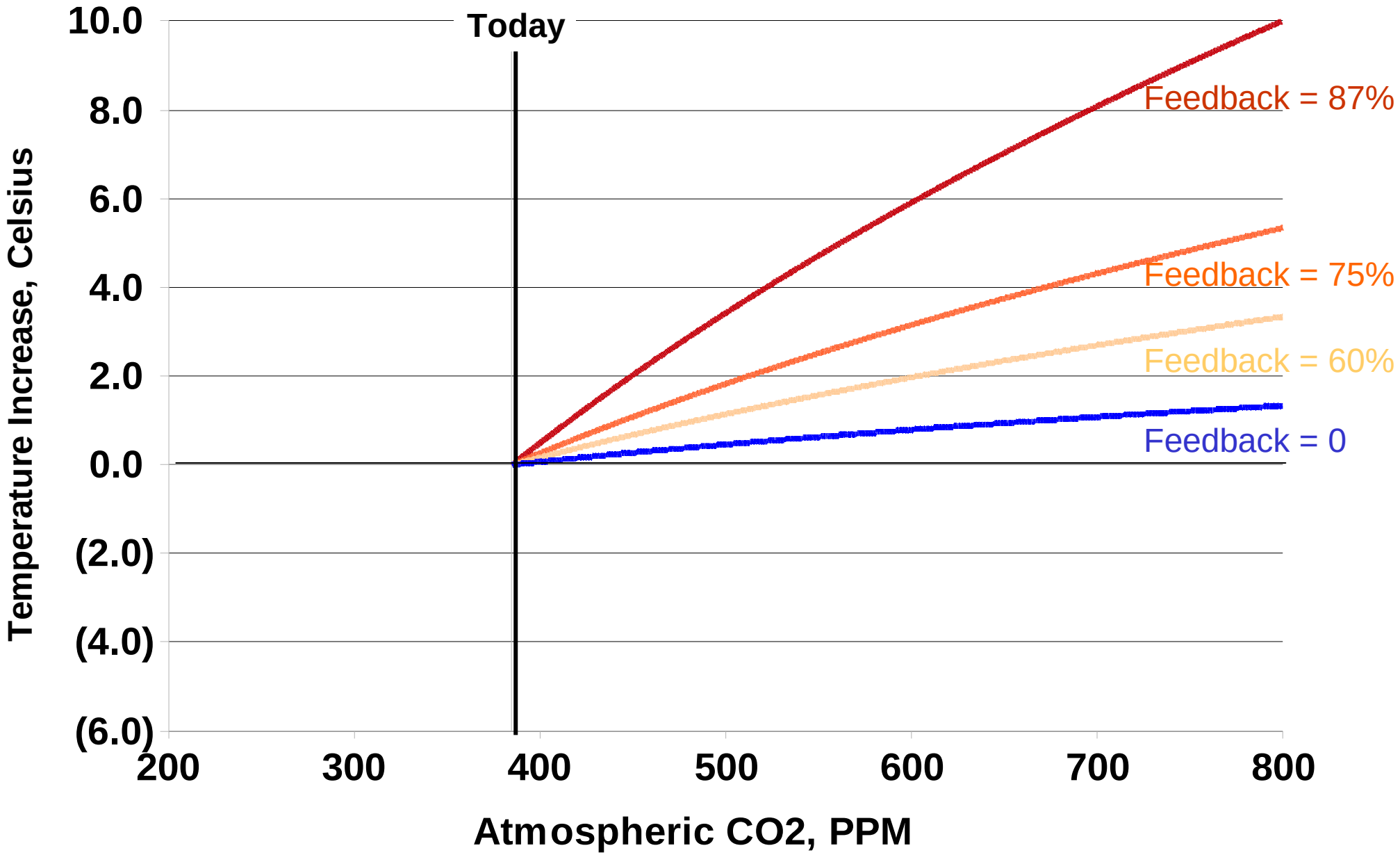
IPCC Forecast for Temperature Increase due to CO_2 Alone is Not Catastrophic

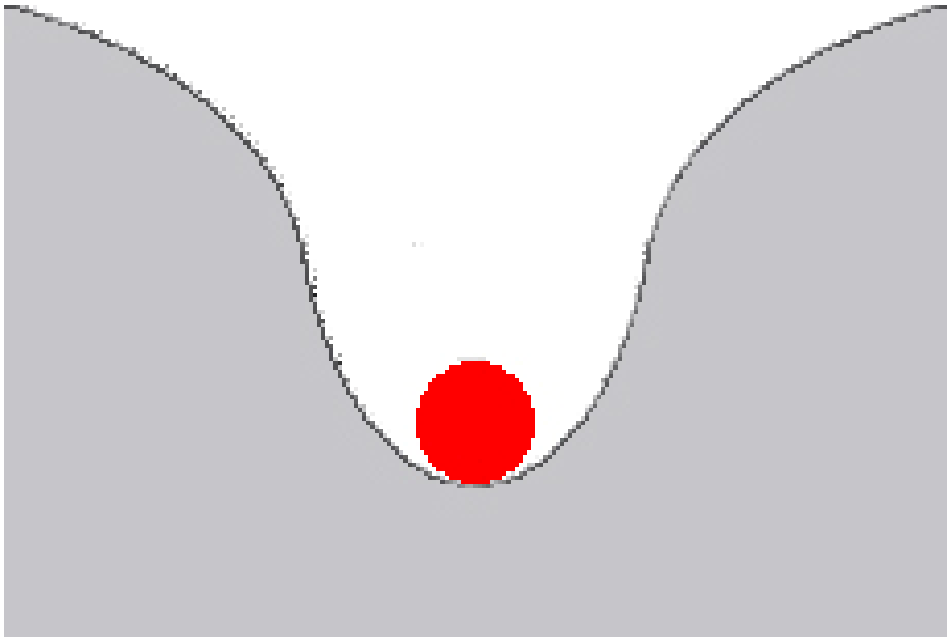


Feedback Assumptions for IPCC Forecasts are VERY High



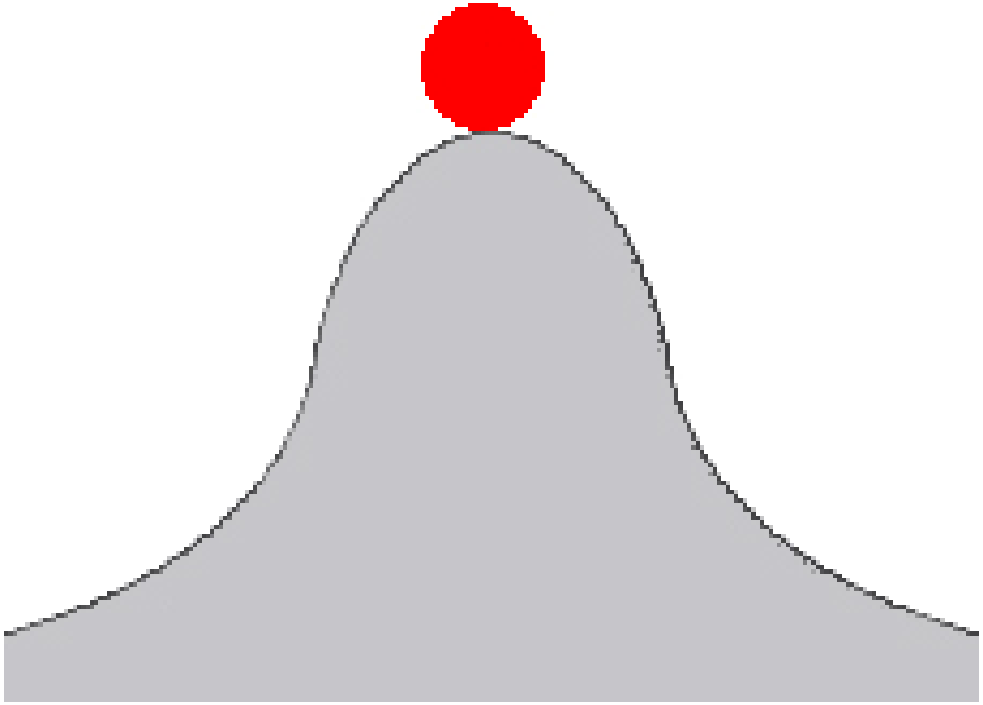
Positive Feedback is Unusual for Long-Term Stable Natural Processes

Negative Feedback



- **Disturbances are damped**
- **System remains near its starting point, though it can oscillate**

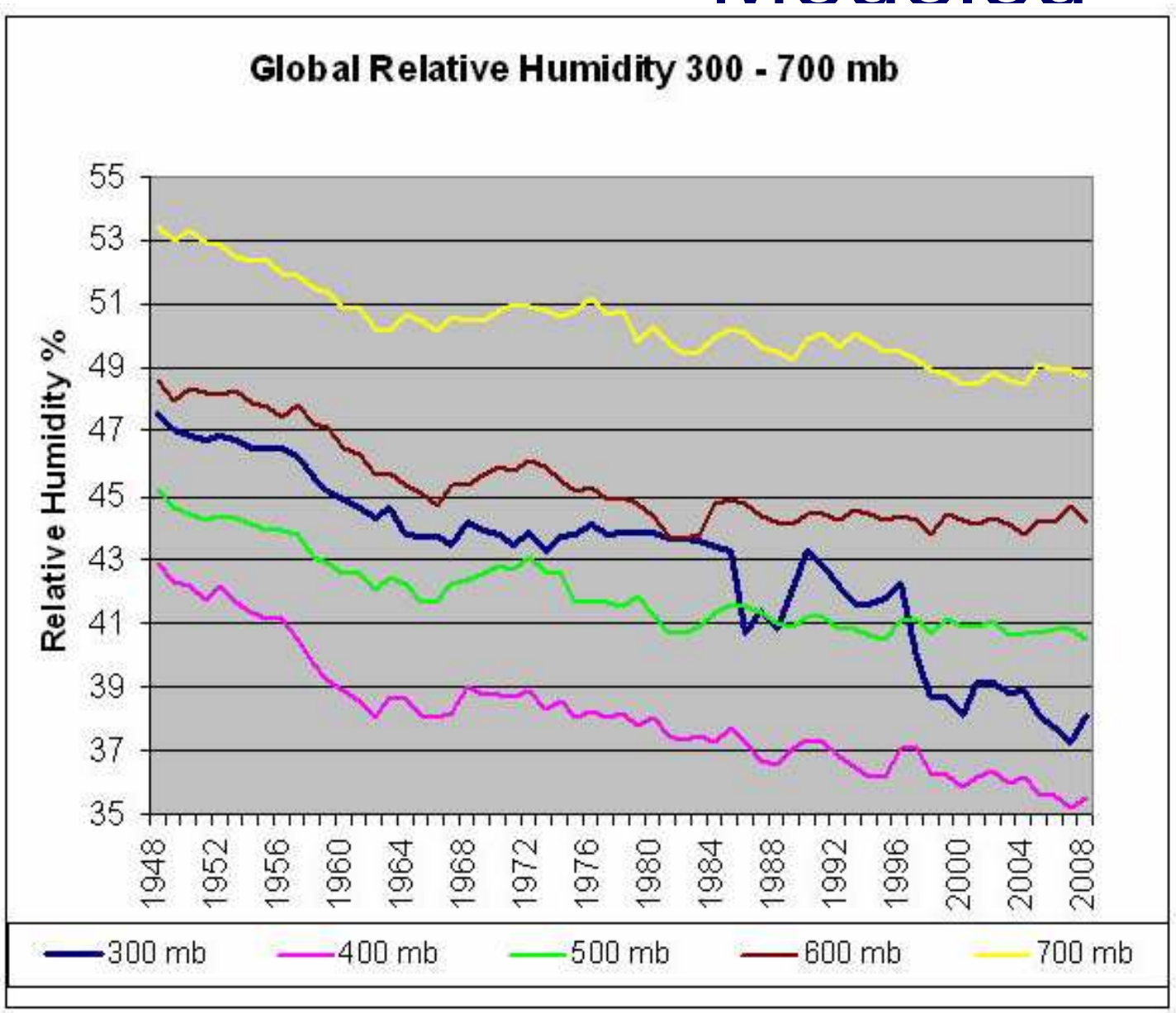
Positive Feedback



- **Disturbances are amplified**
- **System may end up far from its starting point**

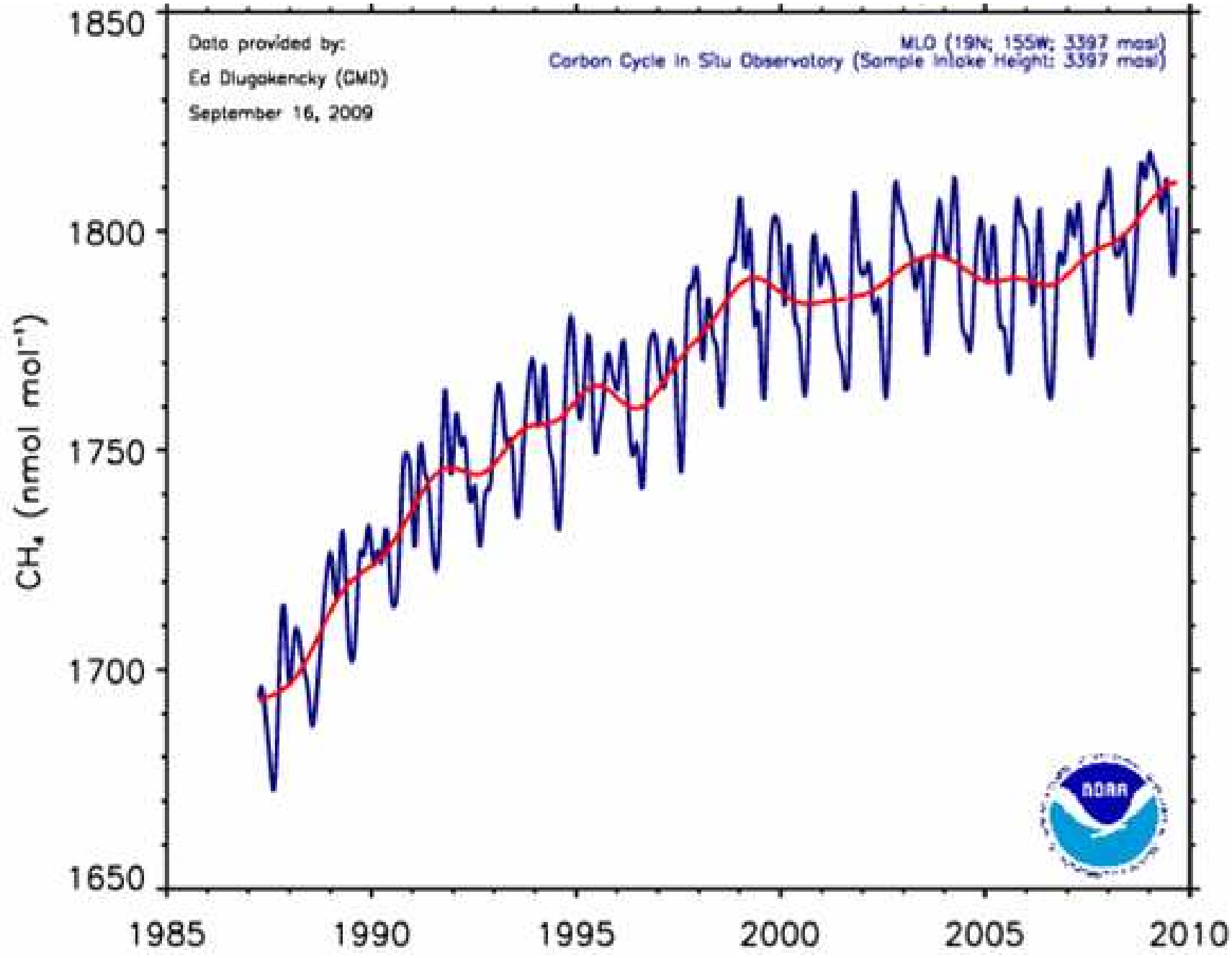
How can Mann (very narrow temperature variation over 1000 years) and assumptions of very high positive feedback both be right

Atmospheric Moisture Content Not Growing as Fast as Modeled

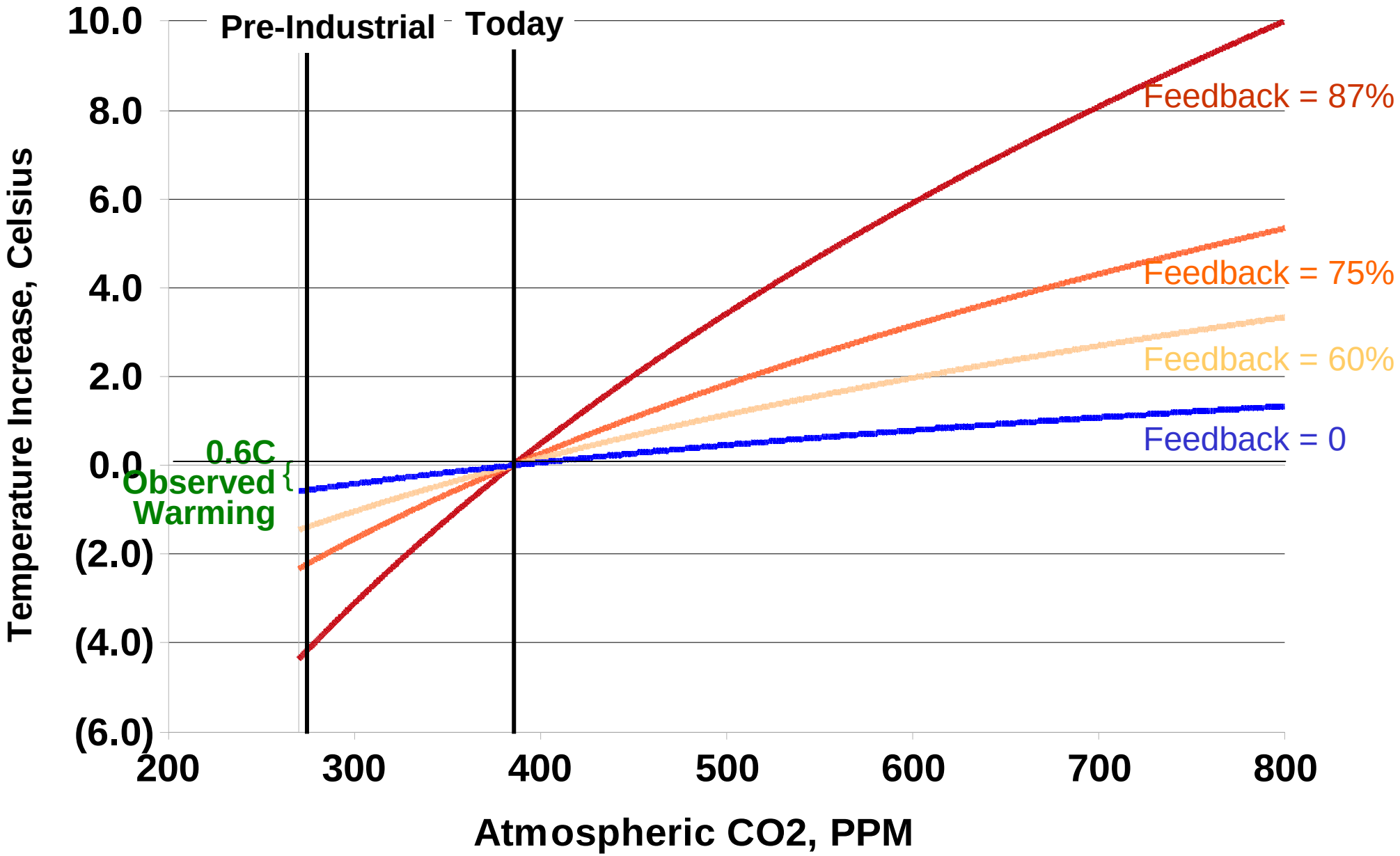


Models assume flat relative humidity as temperatures rise, but in fact it has been falling.

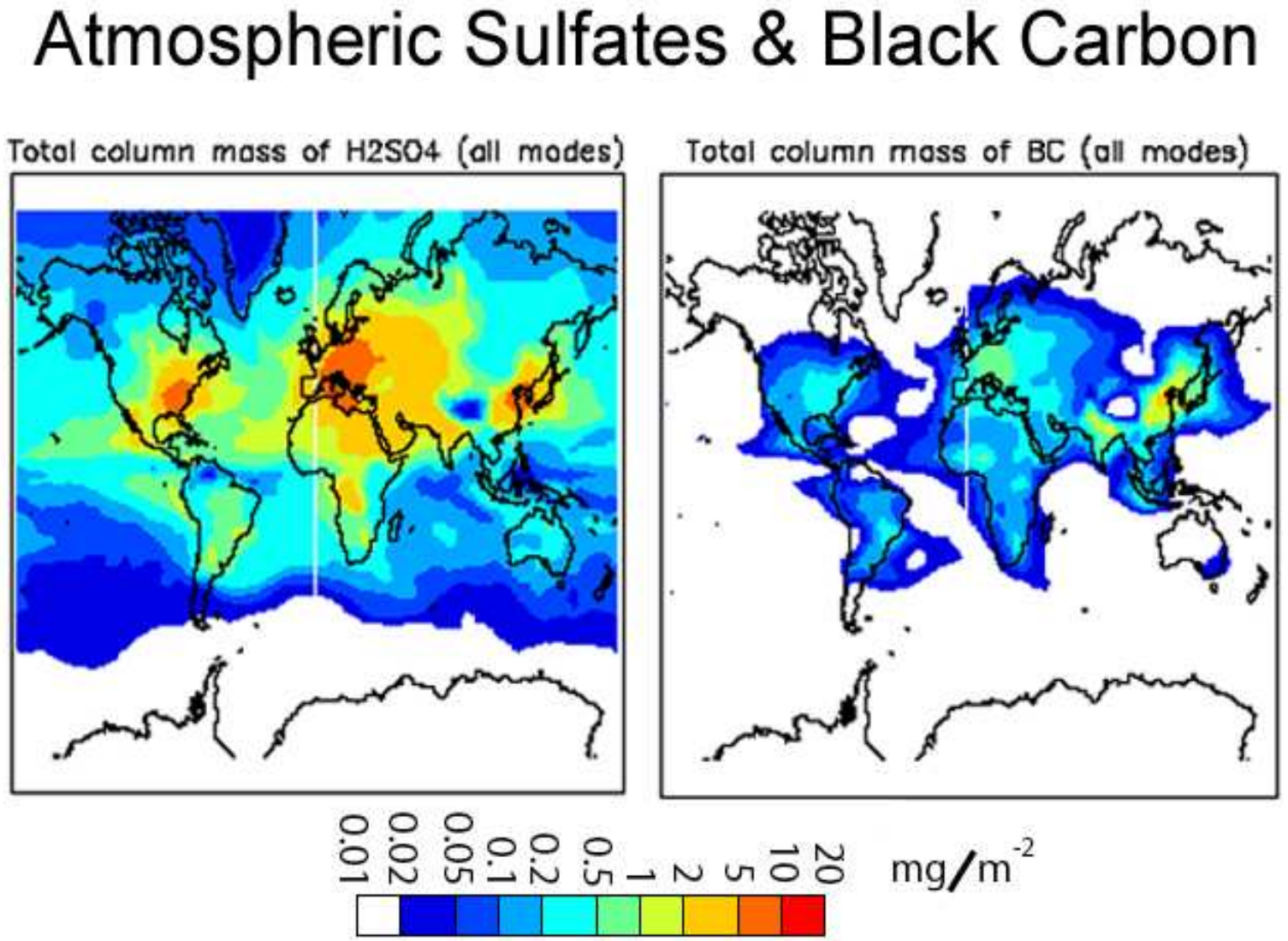
Methane Growth Slowing, Not Accelerating



High Feedbacks Greatly Over-Predict Past Warming



Sulfates & Black Carbon too Localized to Mask Substantiallv



If they cover 40% of the land area (10% of the world's surface), it takes 10C of local masking to lower world temps 1C

Is the Heat Hiding?
Ocean Heat Content Hasn't Risen

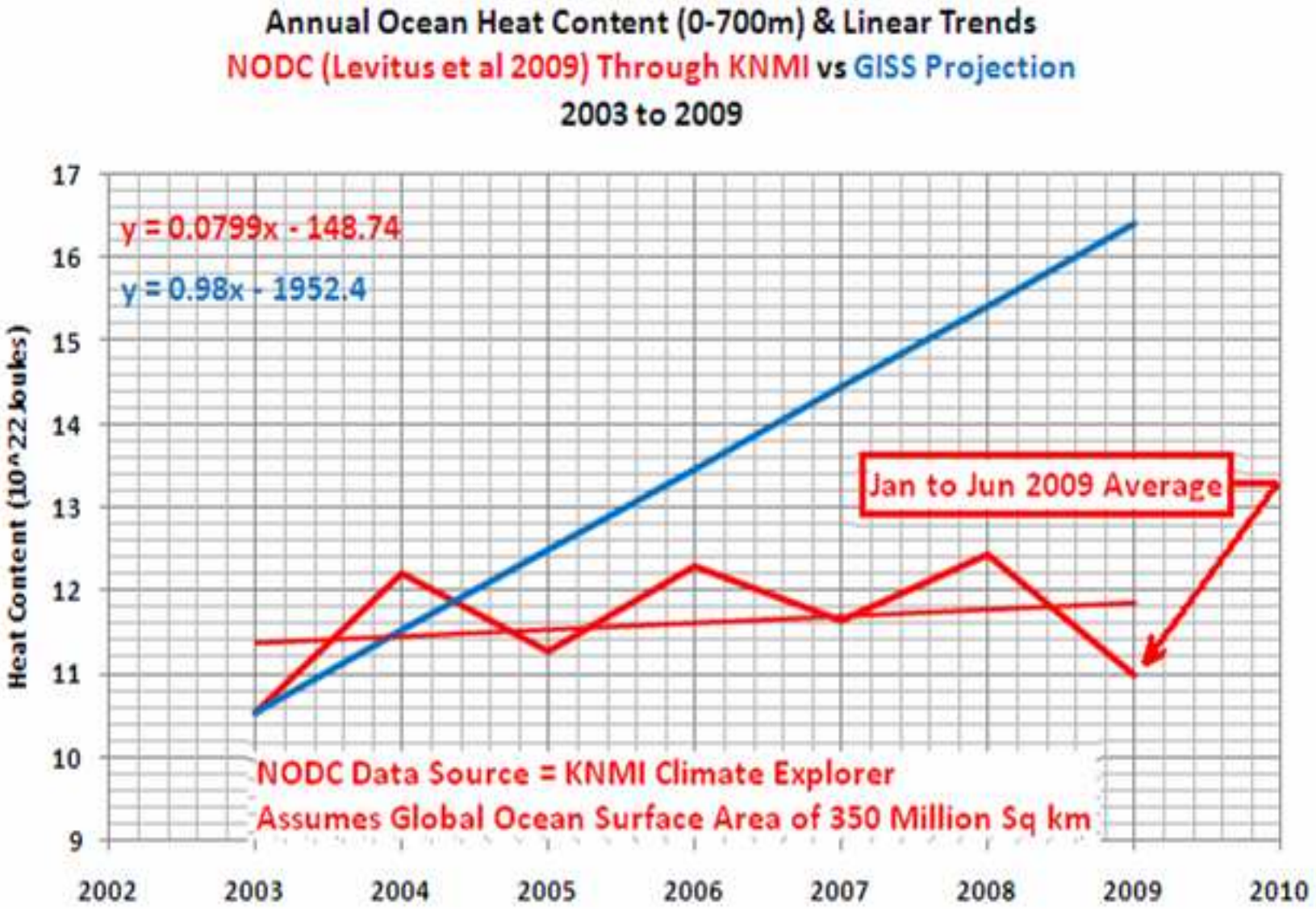
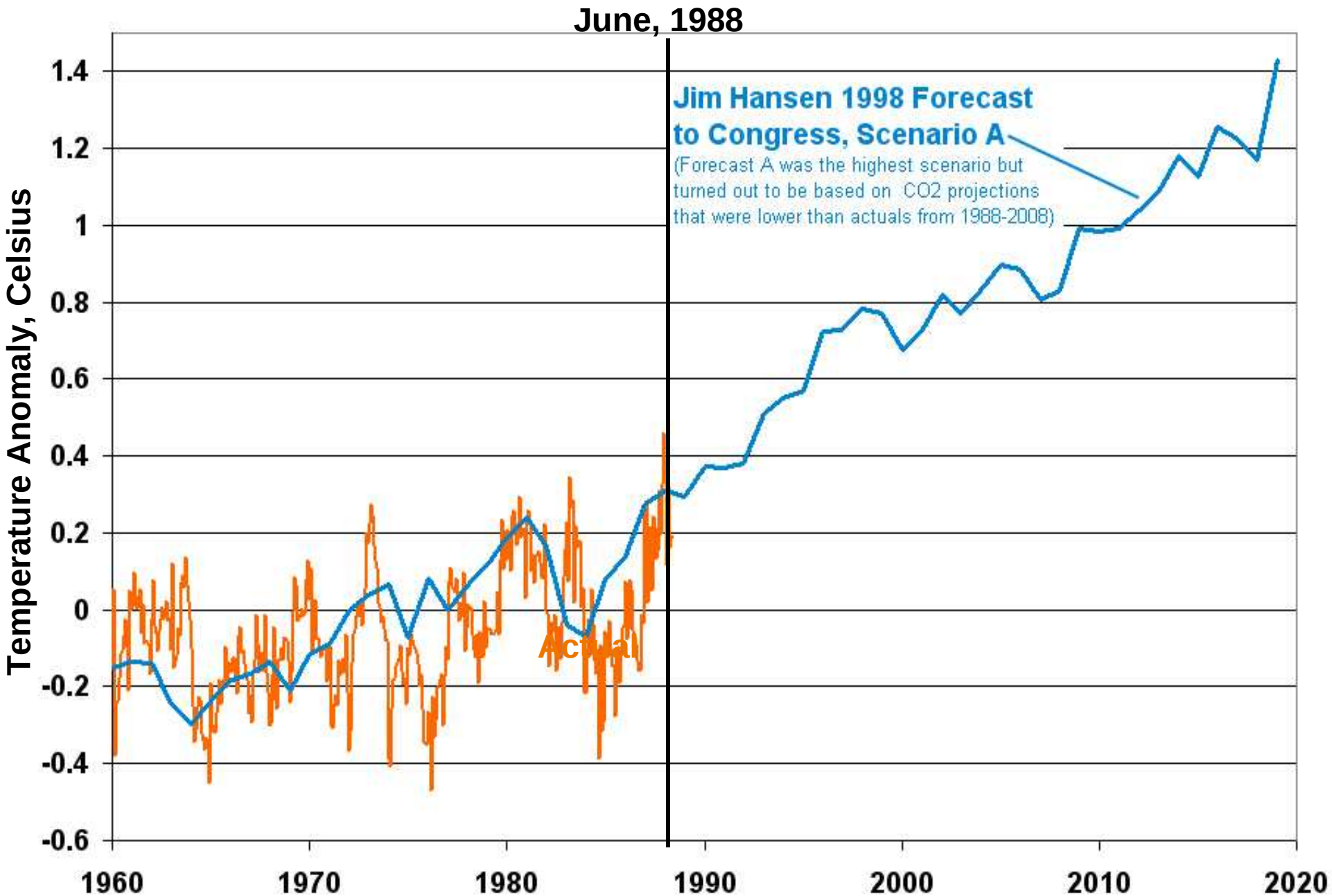
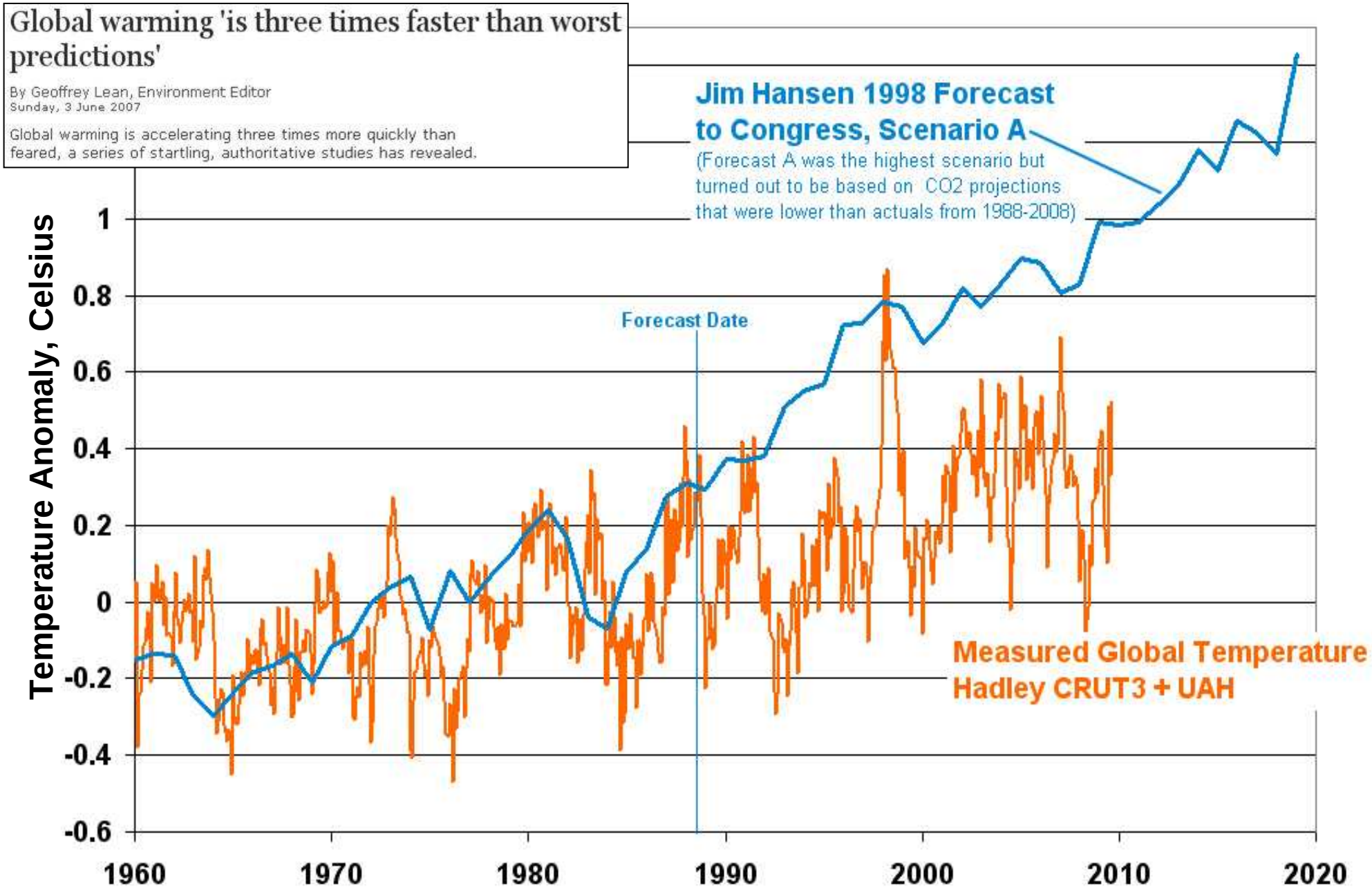


Chart Via Bob Tisdale

In 1988, James Hansen's Speech to Congress Showed Good Fit Between His Climate Models and History



James Hansen's 1988 Forecast to Congress Was Grossly Exaggerated



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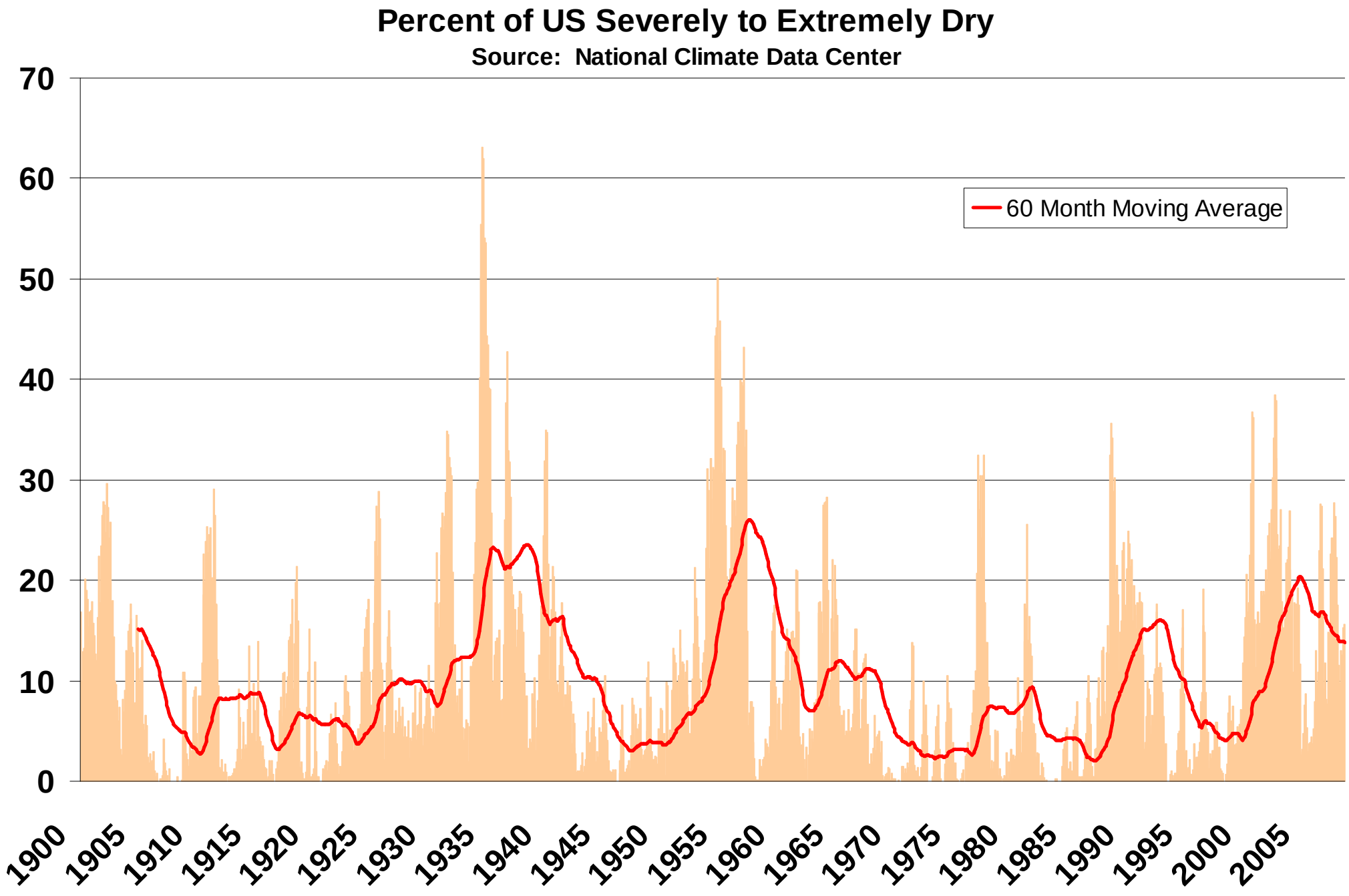
Warmer Weather Has Historically Been Beneficial

Take any history course – and warm weather has always been associated with prosperity

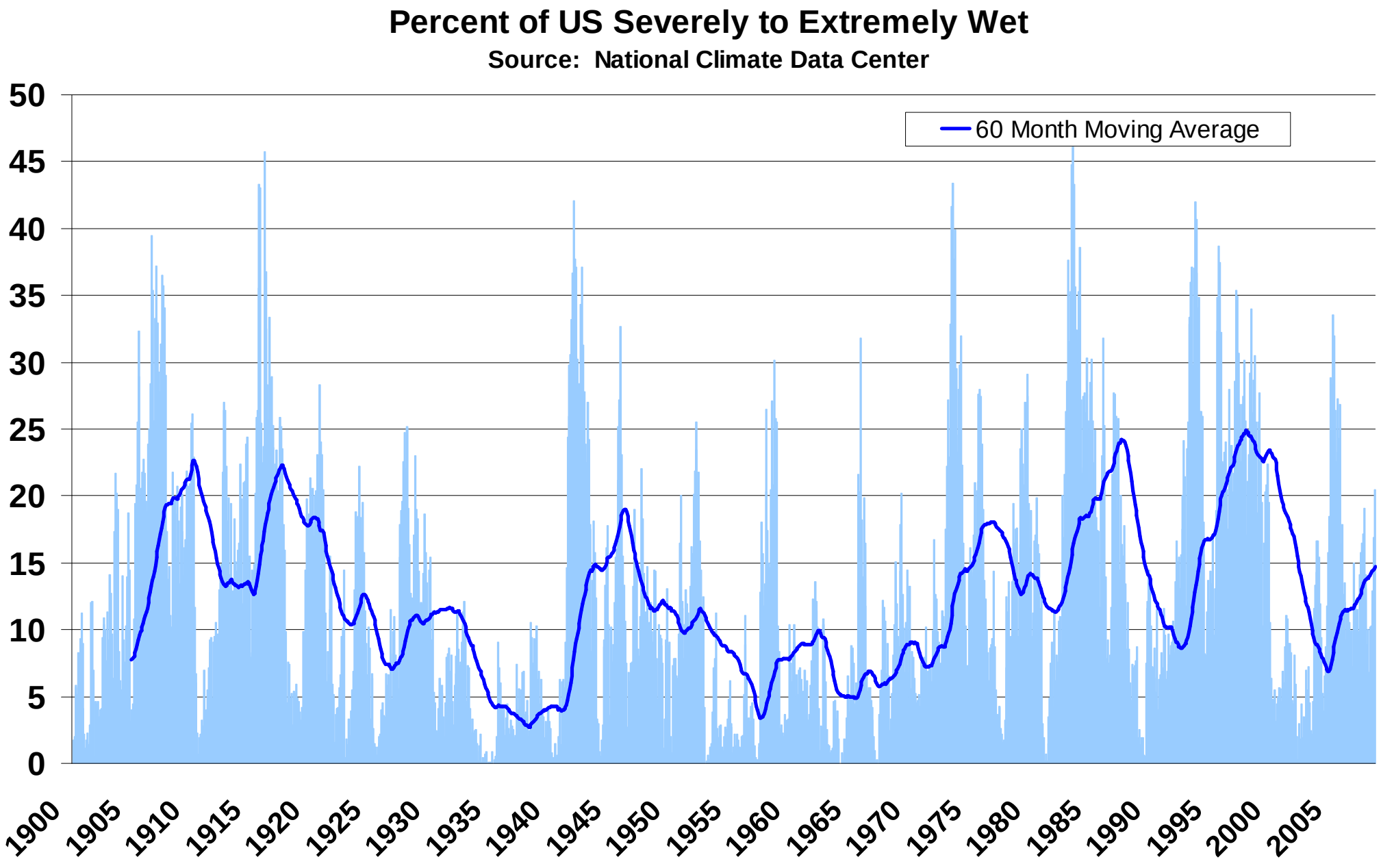
Marketing is Not Science

- Global warming is being re-marketed as climate change.
- CO2 cannot change the climate by any mechanism we understand or has even been proposed EXCEPT via higher temperatures. CO2 cannot be causing climate change if it is not causing warming.

No Upward Trend In Droughts...



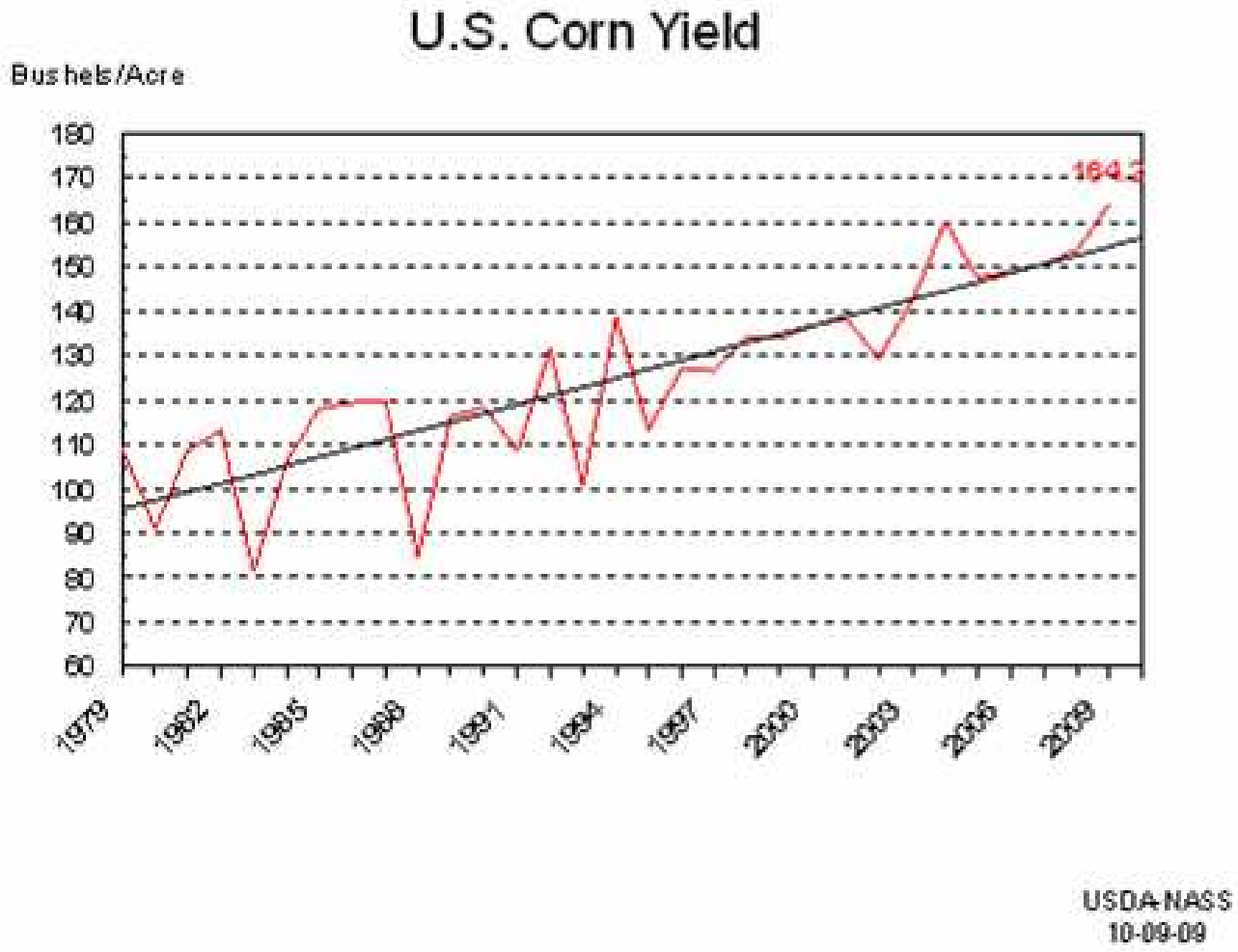
And No Significant Trend In Wet Weather



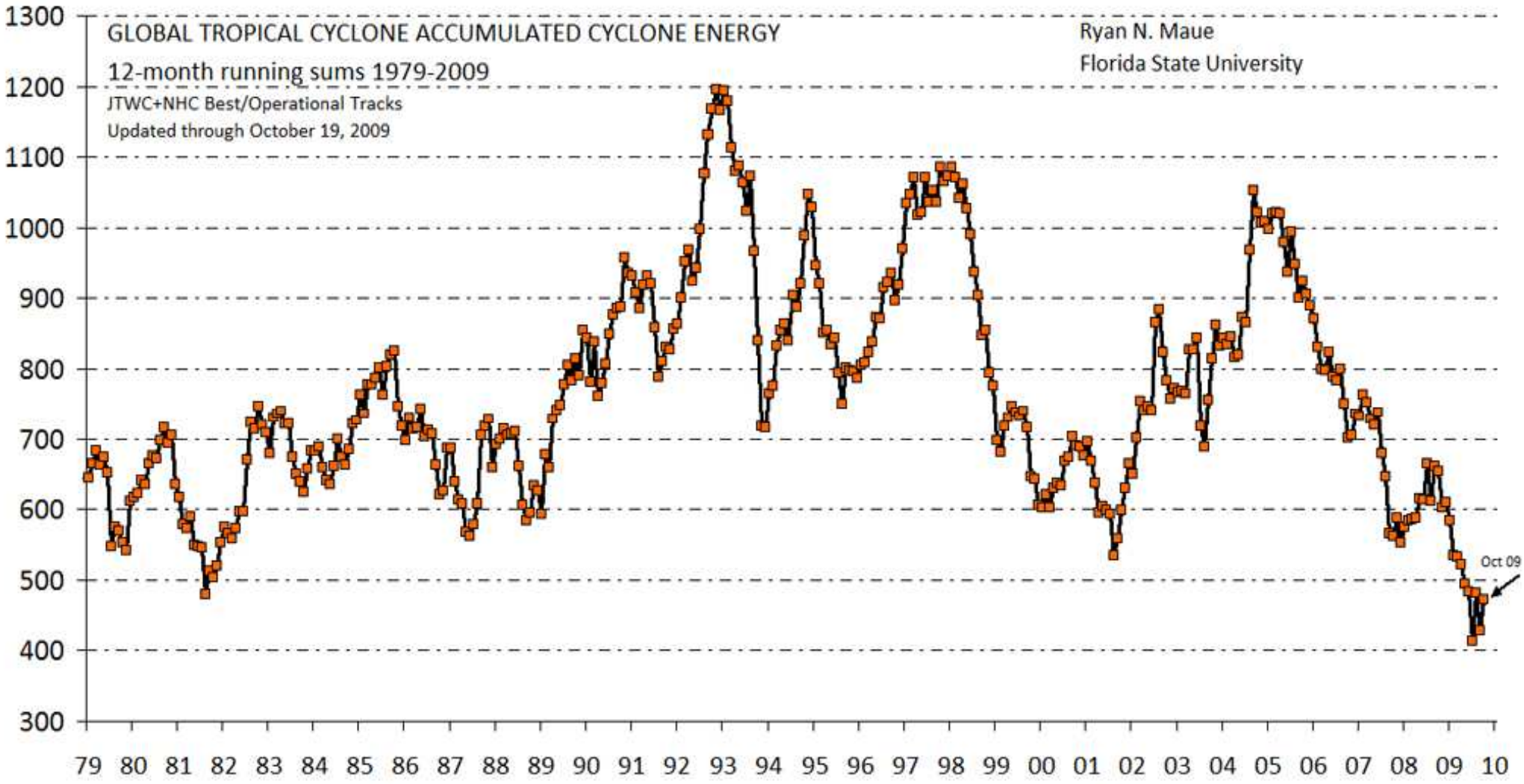
Crops Like Long, Warm Growing Seasons
(Historical Famines Associated with Cold, Not Warm, Weather)

"Corn likes it cool, but global warming is raising temperatures across the nation," said Environment America Global Warming Advocate Timothy Telleen-Lawton. "Hotter fields will mean lower yields for corn, and eventually, the rest of agriculture."

-- April, 2009

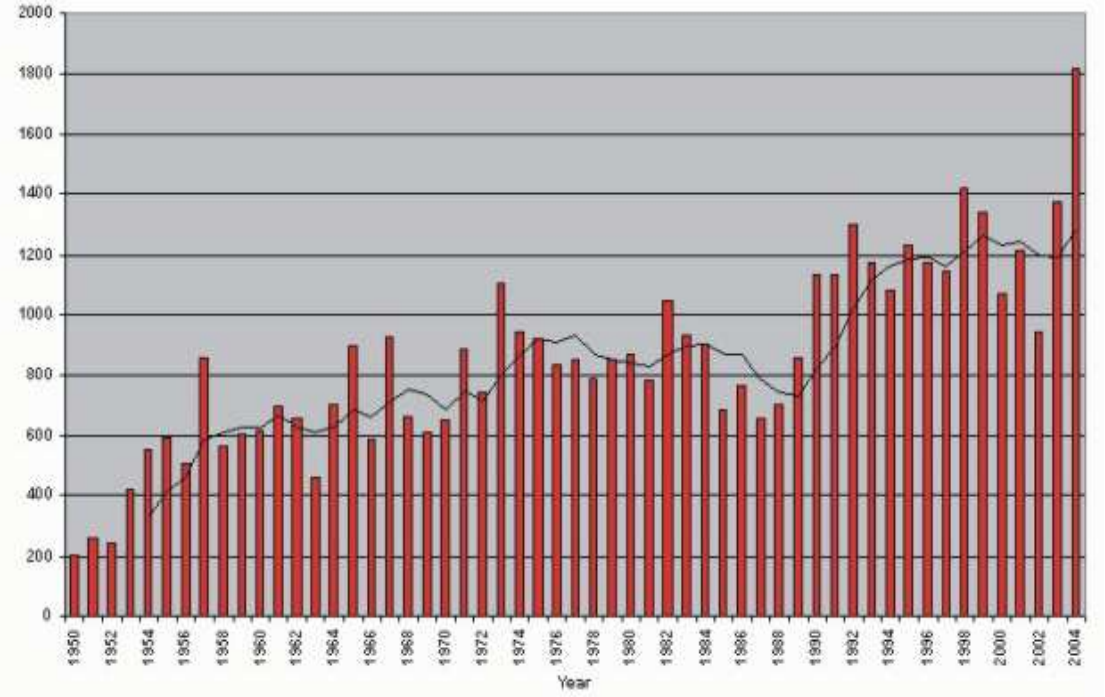


No Upward Trend in Hurricane or Cyclonic Activity



Al Gore Said Global Warming Is Increasing Tornadoes

Total US Tornadoes By Year

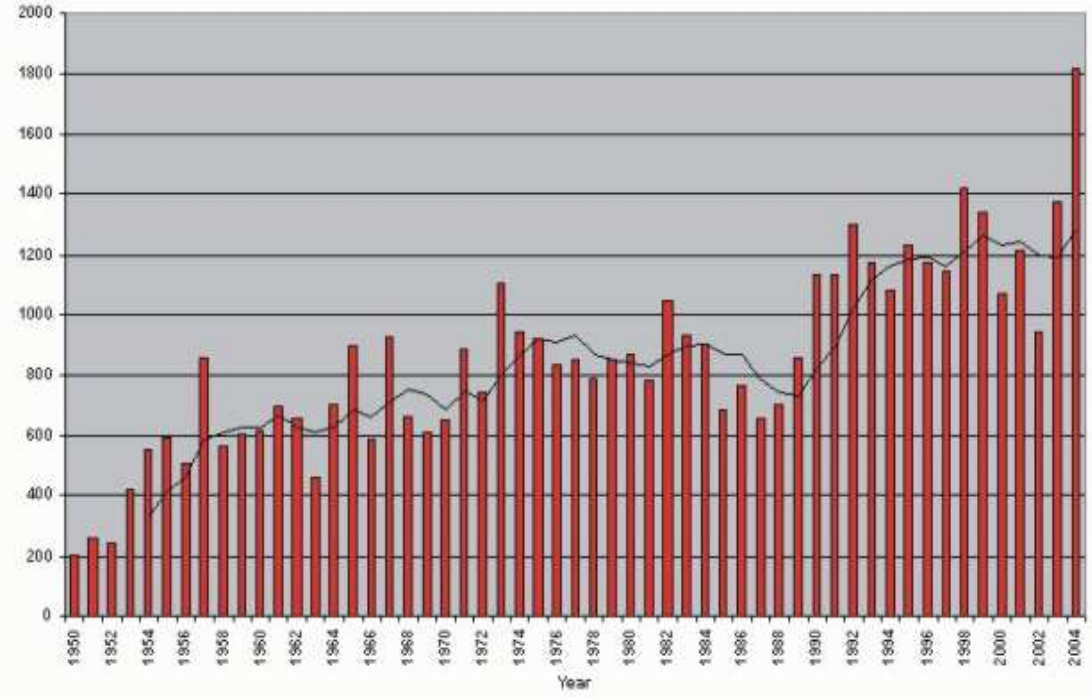


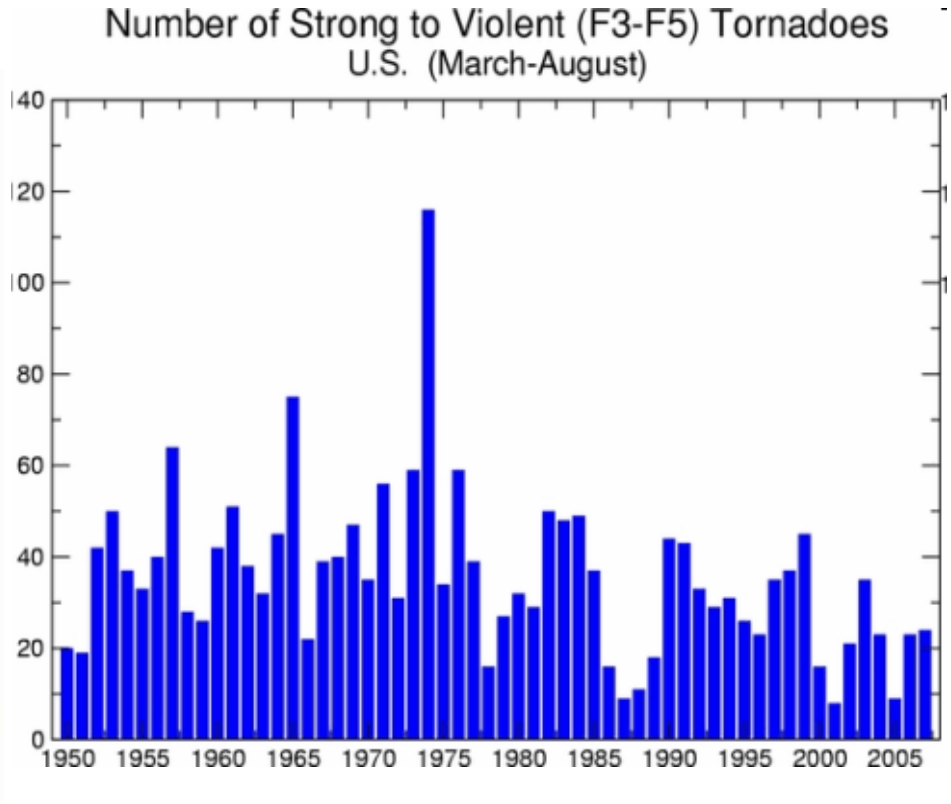
It looks, at first, like he might be right.

But in fact the increase of measured tornadoes is mainly due to better measurement (e.g. Doppler radar, storm chasers)

But, in Fact, Large Tornadoes With Consistent Measurement are Flat to Down

Total US Tornadoes By Year





In fact, high tornado spring of 2008 was the coldest spring in 15 years, well below last 30 years average

What is Normal?

“The arctic ocean is warming up, icebergs are growing scarcer and in some places the seals are finding the water too hot. Reports all point to a radical change in climate conditions and hitherto unheard-of temperatures in the arctic zone. Expeditions report that scarcely any ice has been met with as far north as 81 degrees 29 minutes. Great masses of ice have been replaced by moraines of earth and stones, while at many points well known glaciers have entirely disappeared.”

—US WEATHER BUREAU

Via Lindzen, 2009

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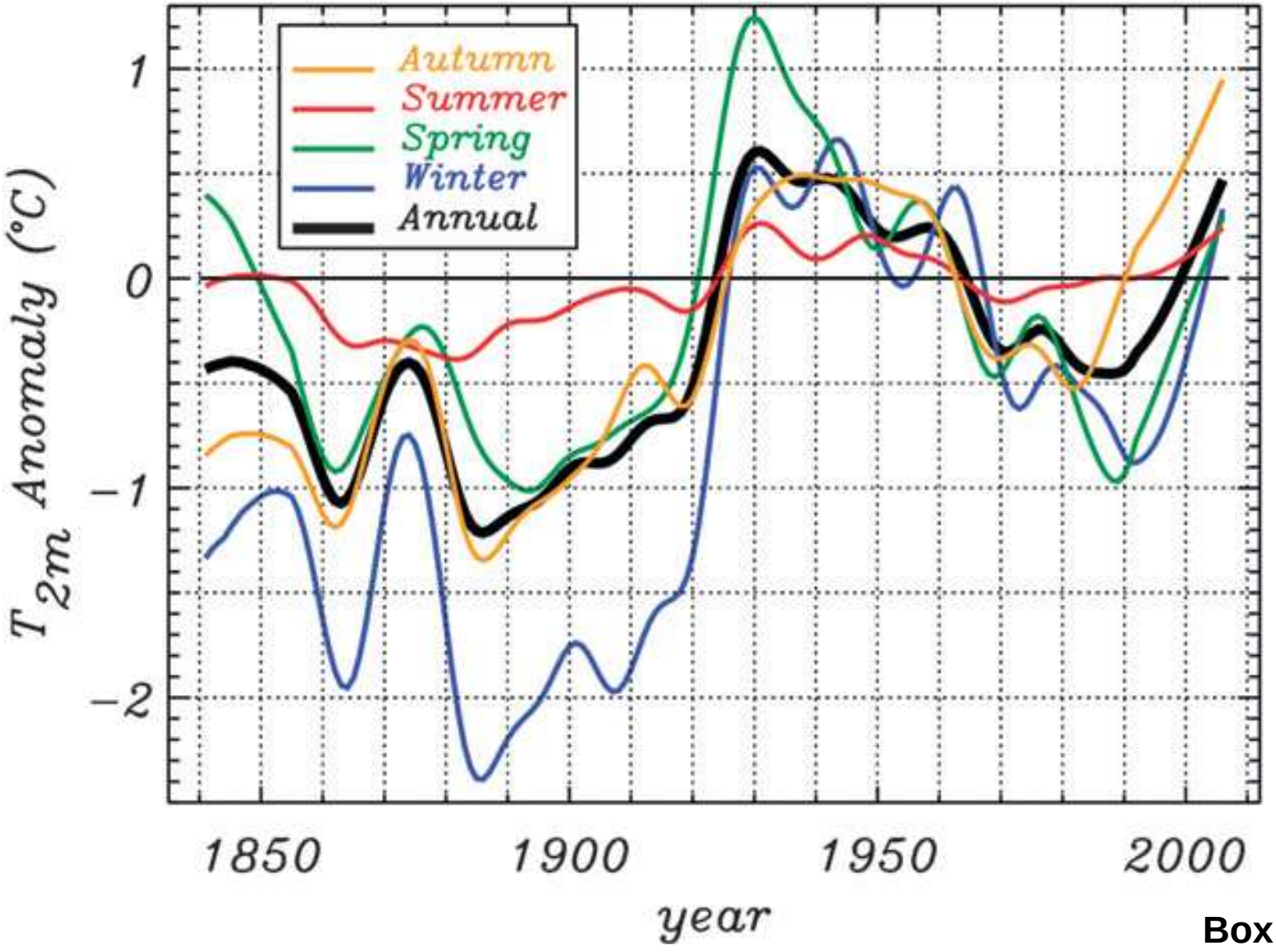
—US WEATHER BUREAU, **1922**

Via Lindzen, 2009

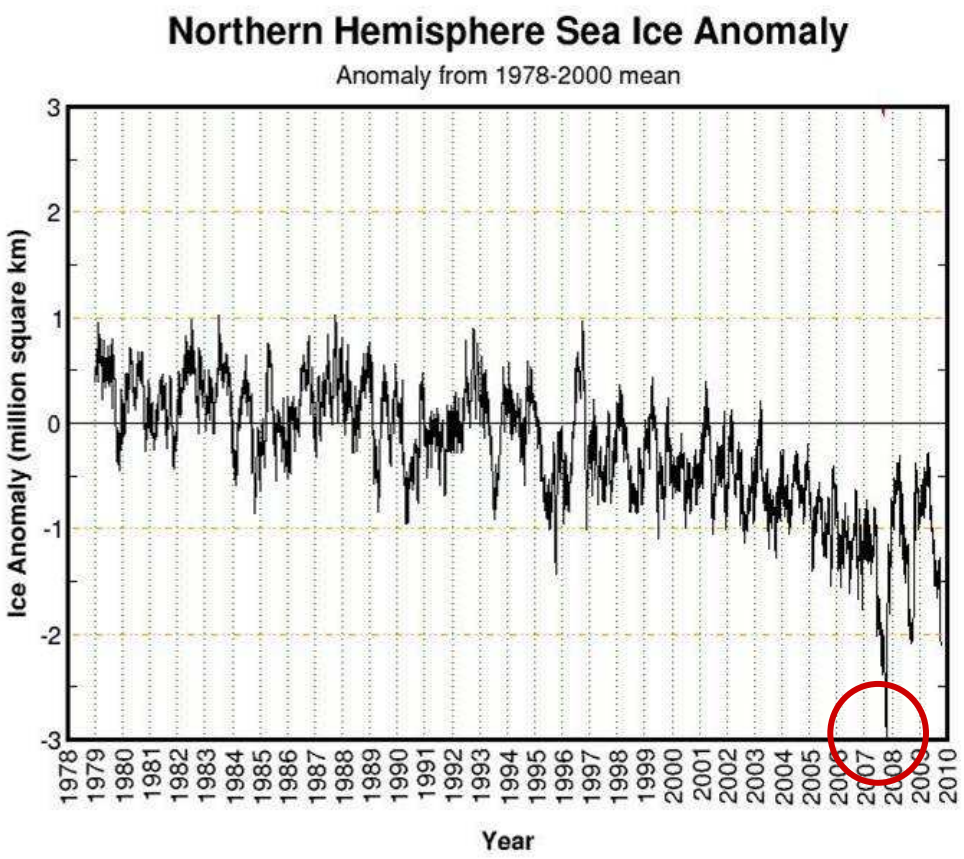
Greenland Ice Sheet Temperatures By No Means Unprecedented

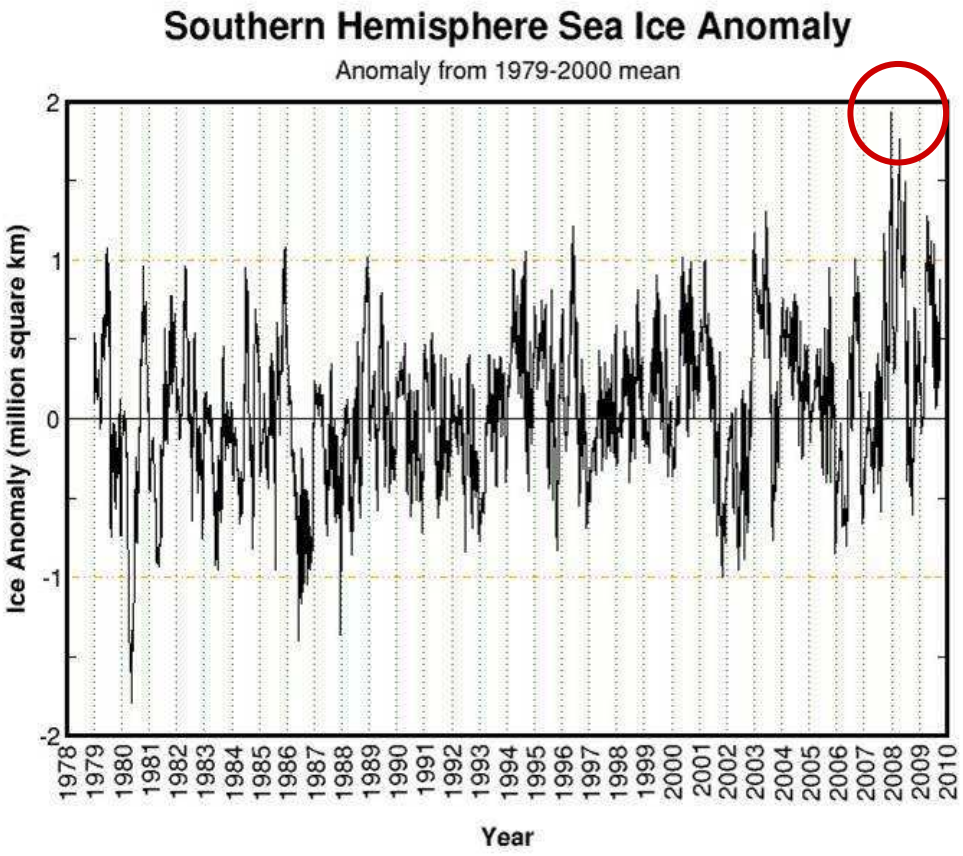


Not to mention the Viking experience – Called Greenland not Glacierland

Box et al, 2009

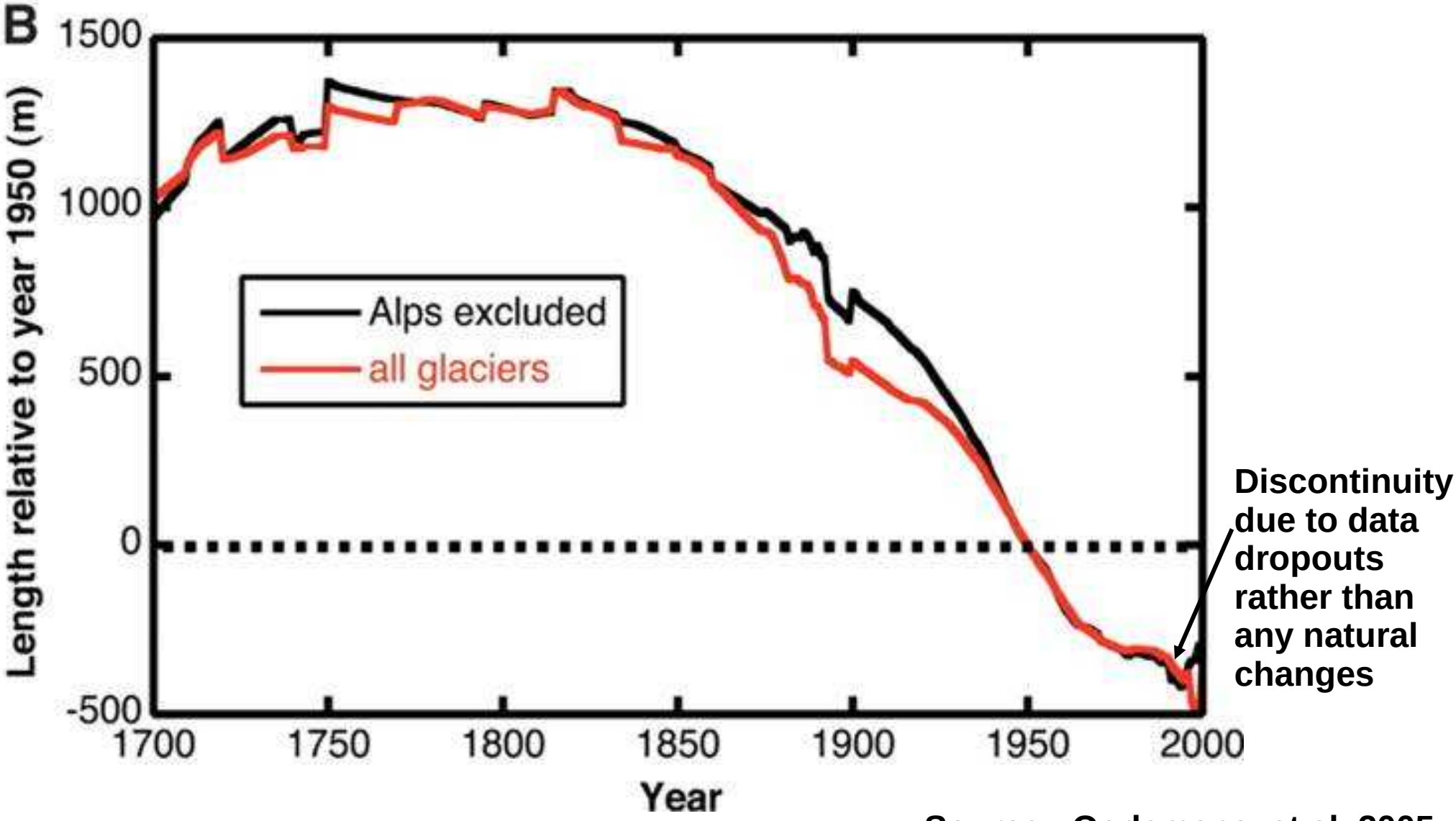
North Pole Ice "All-Time Low" on Same Day as South Pole All-Time High





Source: University of Illinois Urbana-Champaign Polar Research Institute

Glaciers Have Been Retreating far Longer than We Have Emitted CO_2

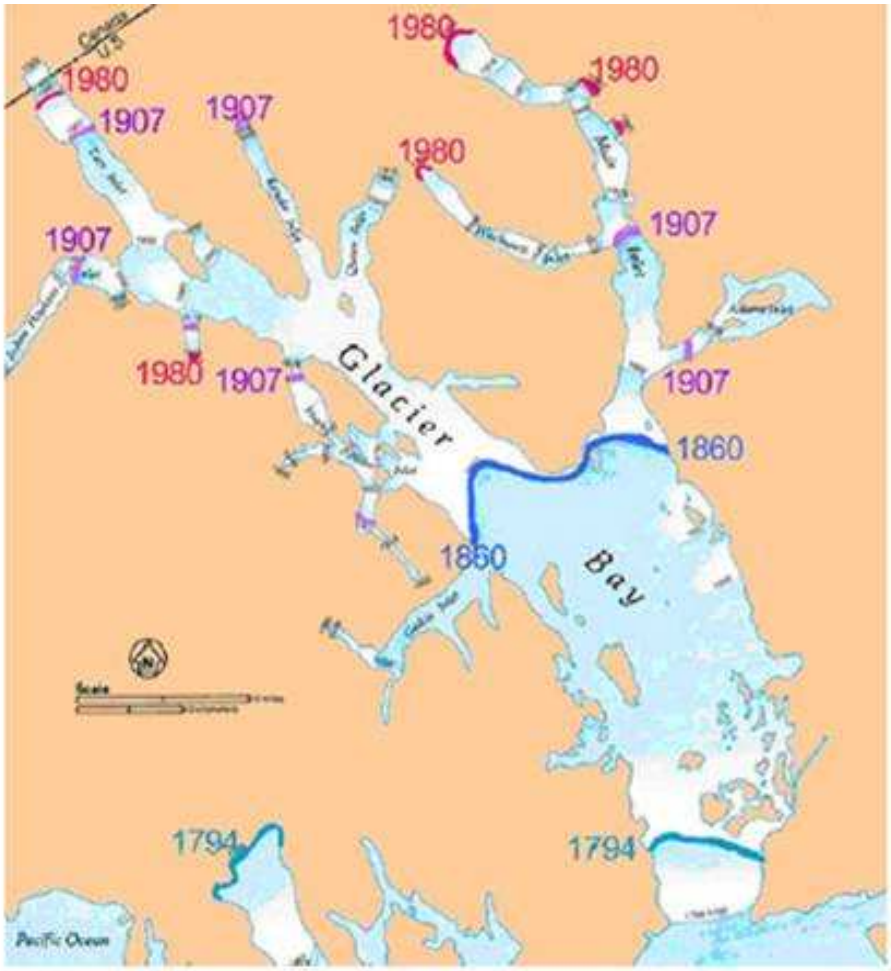


Source: Oerlemans, et al, 2005

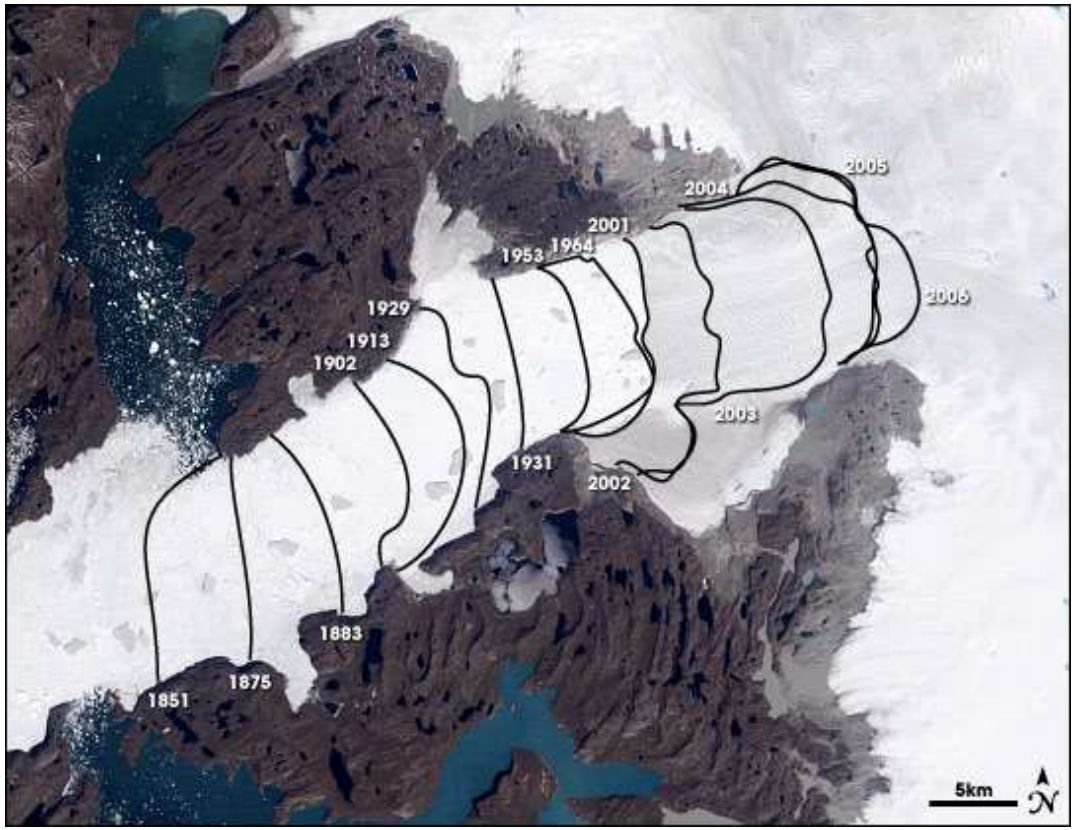
Example Glaciers

Most of the Retreat Long Before Man's CO2

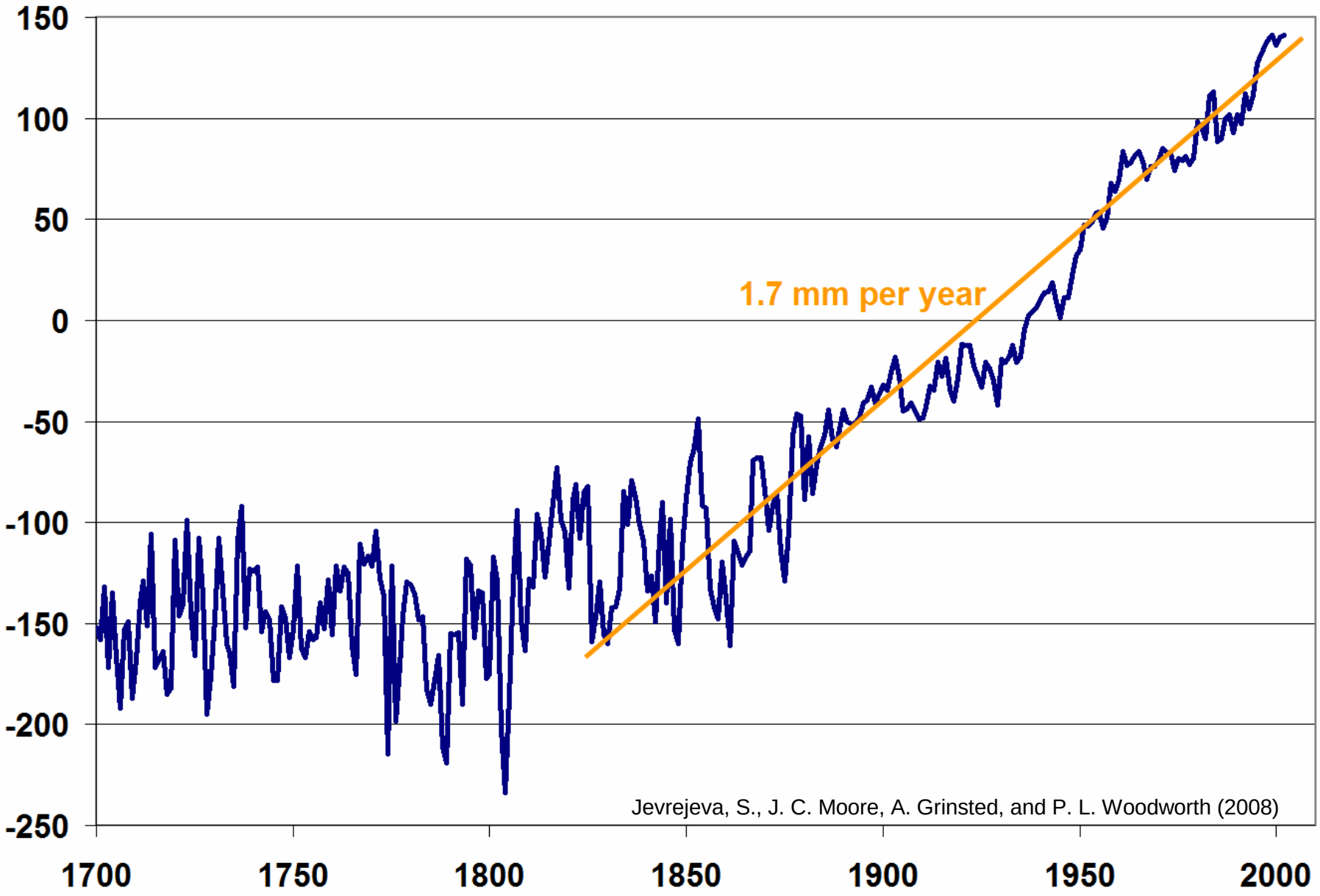
Glacier Bay, Alaska



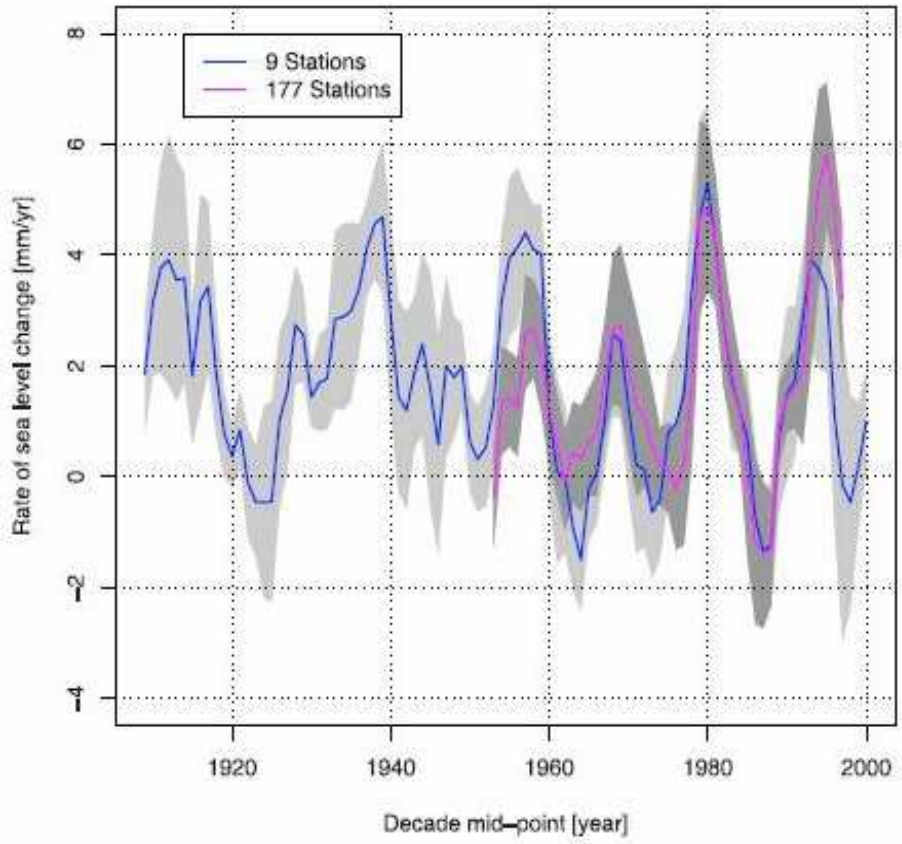
Jakobshavn, Greenland

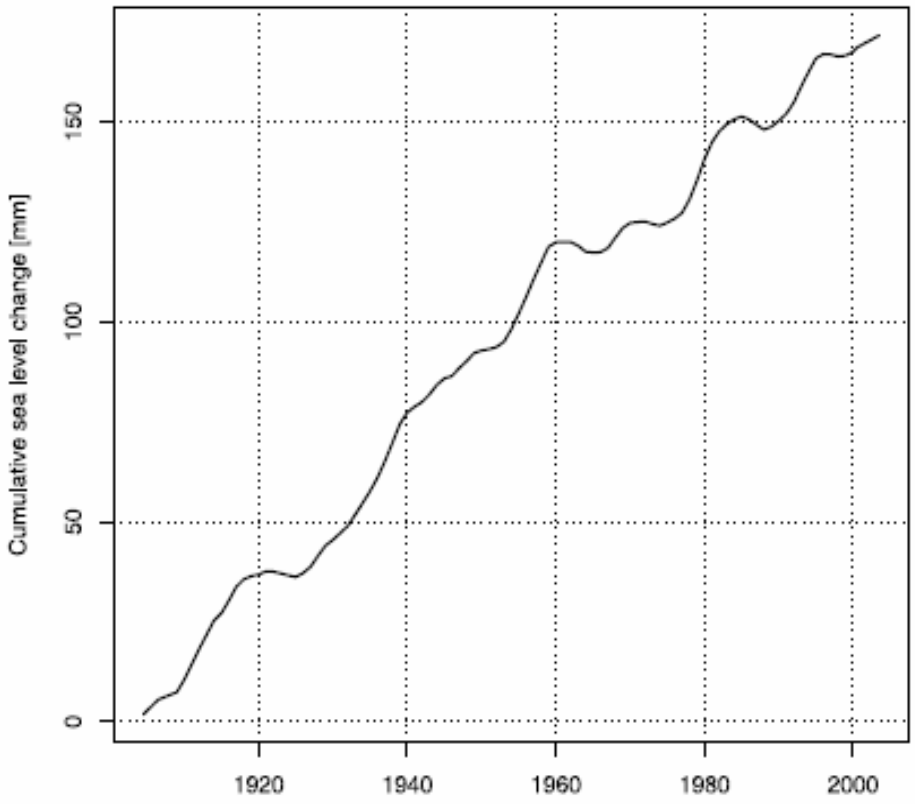


Sea Levels Have Risen At A Fairly Constant Rate Since the Little Ice Age



Sea Levels Have Risen Steadily for Decades, even Centuries





Holgate, 2007

Mean Forecast Even from IPCC is for 12 inch rise by 2100

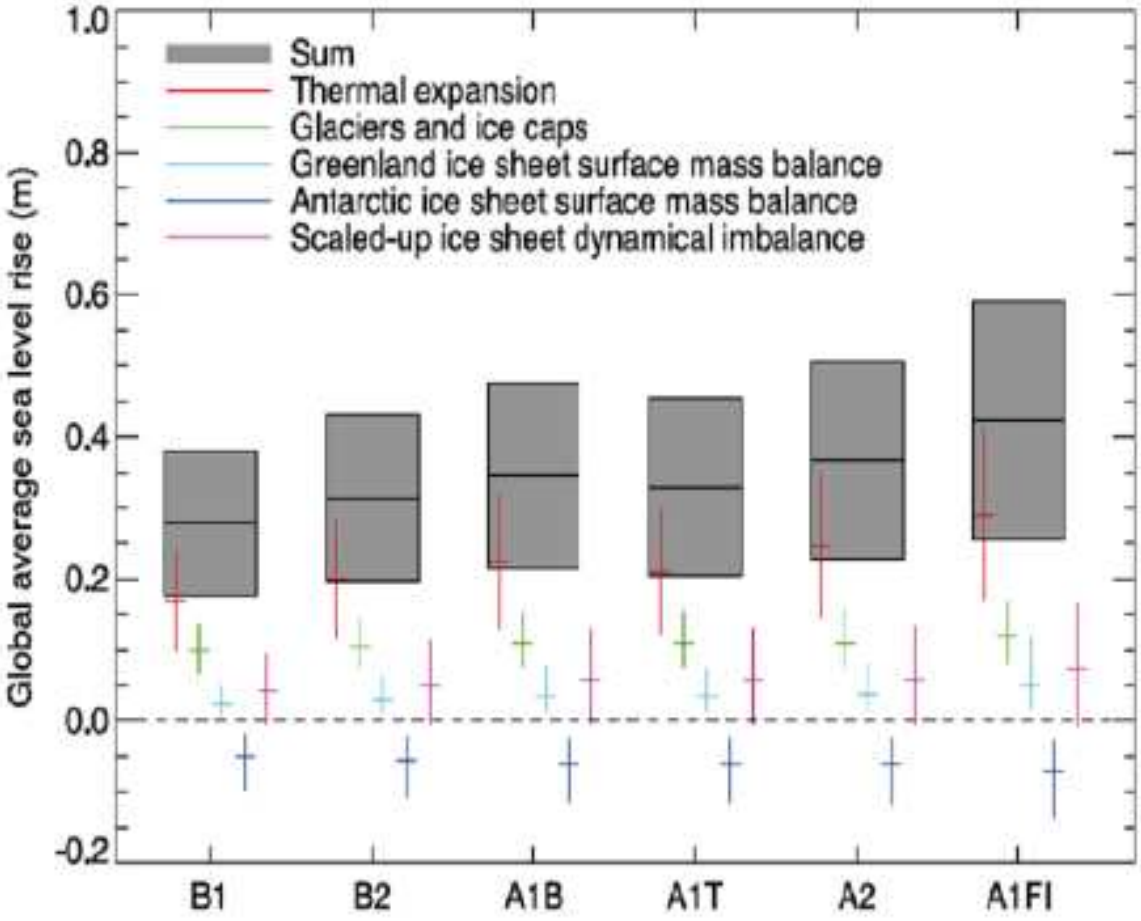


Figure 10.33. *Projections and uncertainties (5 to 95% ranges) of global average sea level rise and its components in 2090 to 2099 (relative to 1980 to 1999) for the six SRES marker scenarios. The projected sea level rise assumes that the part of the present-day ice sheet mass imbalance that is due to recent ice flow acceleration will persist unchanged. It does not include the contribution shown from scaled-up ice sheet discharge, which is an alternative possibility. It is also possible that the present imbalance might be transient, in which case the projected sea level rise is reduced by 0.02 m. It must be emphasized that we cannot assess the likelihood of any of these three alternatives, which are presented as illustrative. The state of understanding prevents a best estimate from being made.*

This is not readily distinguishable from the change that has been occurring since the end of the last ice age.

- Richard Lindzen, MIT

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  - *Likely not – we have not seen them so far*
- Do CO_2 abatement laws like cap-and-trade make sense?

Problems with the Precautionary Principle

- Insurance makes no sense when the premiums are higher than the value of what you are insuring
- Costs are going to be enormous to really make any kind of impact at all
  - Europeans have $8-$9 gas and they are not any where near the kinds of reductions activists say are necessary

There is no free lunch on CO_2 abatement

A Plea for Sanity: A Carbon Tax Far Better than Cap and Trade

- Carbon tax much simpler to administer. Emissions accounting is a nightmare (California CARB as an example)
- Cap and trade is a lobbyist's dream
  - Nearly infinite space for influence peddling, special deals, exemptions, etc.
- European cap and trade systems are fraught with faulty accounting
- Politicians like cap and trade because it allows them to tax without appearing to tax.
- Tremendously regressive tax
- Doesn't work unless it is painful

Jeff Flake's Proposal – A Real Insurance Policy Instead of a Power-Grab

- Institute a carbon tax of whatever value
- Cut payroll taxes to match, ie to make it revenue neutral
- Would have the benefit of being neutral (no net increase in taxes) – simply shifts from sales tax on labor to sales tax on carbon-based energy
- Decreases one regressive tax to match increase in another regressive tax
- Would provide incentives for employment

Global Warming is Sucking The Oxygen Out of the Environmental Movement

- Other emissions that are more harmful that still need to be addressed (images from Beijing Olympics)
- Driving environmentally stupid behavior
  - Subsidizing corn ethanol, which does not reduce CO2 but has terrible effects on land use
- Many other areas where more impact possible for less money

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- Do CO_2 abatement laws like cap-and-trade make sense?
  - *Costs far more than it helps. Many more important priorities. Carbon tax preferred over cap-and-trade.*


DON'T PANIC

Notes / Sources

- Slide 15: The formula is from the IPCC fourth assessment, and represents estimated global temperature increase for a given concentration of CO2.
- Slide 17&18: Author's analysis. A basic introduction to feedback can be found at http://en.wikipedia.org/wiki/Feedback
- Slide 20: IPCC Fourth Assessment. The chart is base on the end point forecasts (CO2 concentration and temperature increase). Intermediate points are extrapolated proportional to the IPCC no feedback formula in chart 15.
- Slide 24: Temperature history through 1979 from the Hadley CRUT3 surface temperature database. After 1979, temperatures are from the UAH satellite data set. These two data sets have different base periods for their anomaly. To reconcile them, the avg UAH anomaly for its first 60 months of data was normalized against the Hadley CRUT3 data for the same period, resulting in an addition of 0.1C to all UAH anomalies. UAH data is here: http://vortex.nsstc.uah.edu/data/msu/t2lt/uahncdc.lt. Hadley CRUT3 data is here: http://www.junkscience.com/MSU_Temps/CRUglobal.csv
- Slide 25: Same as previous slide
- Slide 26: http://www.ssmi.com/amsr/amsre_sst_validation_statistics.html
- Slide 27: Graph by Steve McIntyre in 2007 of USHCN data adjusted for Time of Observation. http://www.climateaudit.org/?p=1687
- Slide 28 & 30: Photos by W. Meyer archived at www.climatestations.org.
- Slide 29: Old Main, University of Arizona, c. 1900
- Slide 31: Meyer & Meyer, 2008. http://www.climate-skeptic.com/2008/02/measureing-the.html

Notes / Sources

- Slide 32: LaDochy, S., R. Medina, and W. Patzert. 2007. Recent California climate variability: spatial and temporal patterns in temperature trends. *Climate Research*, **33**, 159-169.
- Slide 28, 30: This is one example site survey from www.SurfaceStations.org. Anthony Watts presentation to CIRES/UCAR in 2007 describing the survey process and results can be found at http://gallery.surfacestations.org/UCAR-slides/index.html
- Slide 31: Meyer & Meyer, 2008
- Slide 35: From figure TS.1 and figure 6.3 of the Fourth IPCC Climate Assessment
- Slide 36: This result has been confirmed by many studies, resulting in lag values of 800-2000 years, and the basic finding is not in dispute. One example was Lowell Stott, Axel Timmermann, Robert Thunell: "Southern Hemisphere and Deep-Sea Warming Led Deglacial Atmospheric CO_2 Rise and Tropical Warming" *Science*, 2007
- Slide 37: IPCC first climate assessment, 1990
- Slide 38: Mann, 1998 via the IPCC Third Assessment
- Slide 39: McIntyre and McKitrick, 2006
- Slide 41: McIntyre, 2009. http://www.climateaudit.org/?p=7599, among others
- Slide 42: http://www.climateaudit.org/?p=4428
- Slide 48: Hadley CRUT3 global surface temperature record. Both graphs are scaled exactly the same (in fact are crops from the same image). The graph on the left is 1957-2008. The graph on the right is 1895-1946

Notes / Sources

- Slide 49: Fall, S., D. Niyogi, A. Gluhovsky, R. A. Pielke Sr., E. Kalnay, and G. Rochon, 2009
- Slide 51: International sunspot number by month, ftp://ftp.ngdc.noaa.gov/STP/SOLAR_DATA/SUNSPOT_NUMBERS/MONTHLY. The moving average is a trailing 128 month average, roughly corresponding to 10.8 years or the average 20th century sunspot cycle length
- Slide 53 & 54: Author's analysis
- Slide 56 & 57: The non-feedback formula is from the IPCC fourth assessment. Feedback calculations by author, and are based on the formula: G=1/(1-f) where G is the total gain or multiplier and f is the percentage feedback. Feedbacks f>1 result in infinite gains. Feedback 1>f>0 are positive feedbacks that accelerate or intensify a process. Feedback f<0 is negative feedback that damps or slows a process.
- Slide 59: Data via KNMI climate explorer, compiled by Ken Gregory (http://www.friendsofscience.org/assets/documents/The_Saturated_Greenhouse_Effect.htm) . Further discussion here http://www.climateaudit.org/?p=5416 including Partridge, 2009
- Slide 63: Ocean heat content via KNMI climate explorer. Compiled by Bob Tisdale, 2009
- Slide 64&65: Actuals same source as slide 3. Forecast from appendices to "Statement of Doctor James Hansen, Director, NASA Goddard Institute for Space Studies" before Congress June 23, 1988. http://image.guardian.co.uk/sys-files/Environment/documents/2008/06/23/ClimateChangeHearing1988.pdf. Hansen's Scenario A was chosen for comparison because it's CO2 production assumptions most closely match actuals (it assumes 1.5% emissions growth, whereas actuals have been about 1.6% growth)

Notes / Sources

- Slide 69&70: National Climate Data Center. http://www.ncdc.noaa.gov/oa/climate/research/2008/jul/uspctarea-wetdry-svr.txt
- Slide 72: Florida State University hurricane center, http://www.coaps.fsu.edu/~maue/tropical/
- Slide 73 & 74: from NOAA National Weather Service and Storm Prediction Center
- Slide 77: J. E. *Box* et al (*2009*) *Greenland Ice Sheet* Surface Air Temperature Variability: 1840–2007 J. Climate 22, 4029-4049
- Slide 78: University of Illinois Champaign-Urbana Polar Research Group, http://arctic.atmos.uiuc.edu/cryosphere/
- Slide 79: J. Oerlemans, "Extracting a Climate Signal from 169 Glacier Records" *Science* Vol. 308, No. 5722, pp. 675-677, 29 April 2005.
- Slide 80: Left image Alaska Geographic, 1993. Right image via NASA Earth observatory
- Slide 81: Jevrejeva, S., J. C. Moore, A. Grinsted, and P. L. Woodworth (2008)
- Slide 82: Holgate, S. J. (2007), On the decadal rates of sea level change during the twentieth century, *Geophys. Res. Lett.*, 34, L01602, doi:10.1029/2006GL028492.
- Slide 83: IPCC Fourth Assessment