Climate Change
Science, Policy, Politics

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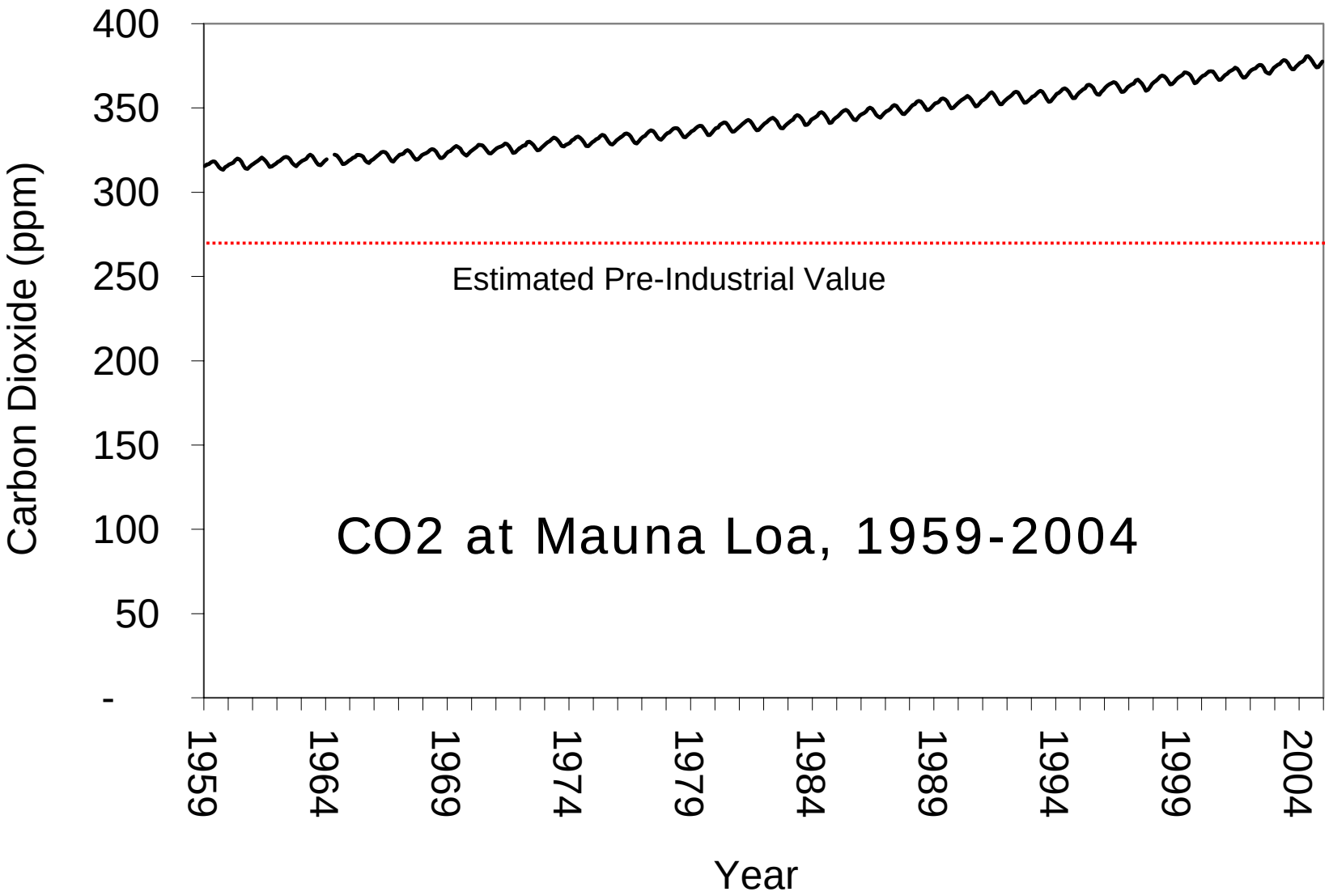
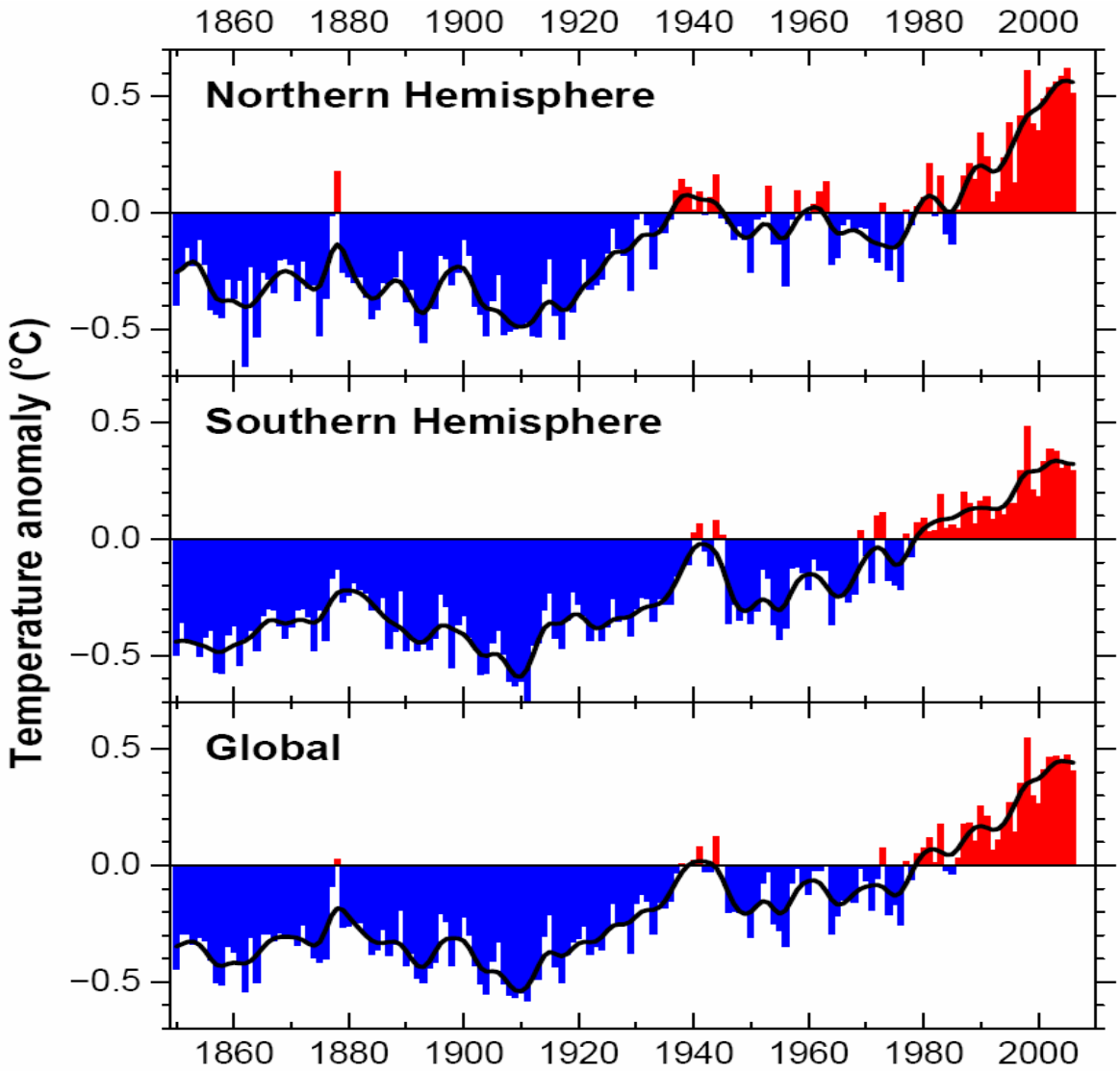
- Climate Change: The big questions
  - Is human-caused, greenhouse-enhanced global warming happening? (Anthropogenic Greenhouse Warming, AGW)
  - If so, how harmful will it be; what will it take to stop it?
  - What should we do about climate change?
- Where to look for answers
  - How well do real world observations match AGW predictions?
  - How well do climate models match observations?
  - How well do claims of climate change harm match past experience?
  - How easy is it to reduce greenhouse gas (GHG) emissions?
- Put California's climate change plans in context

Atmospheric CO2 is rising



Source: Carbon Dioxide Information and Analysis Center (CDIAC)

Earth's Average Temperature Is Rising



Temperature trend, 1850-2005

Average temperature "anomaly" relative to 1961-1990 average

Rising temperatures since late 1970s

Temperature rise has leveled off during last several years

Source: Climate research unit, U of East Anglia

How much warming is from human GHG emissions?

- All of the scary climate change claims are based on warming predictions from climate models, and modeled harm presumed to ensue from modeled warming
  - But how good are the models and the data input to the models?
- Is the Earth behaving the way you'd expect based on the assumption that most warming is caused by human GHG emissions?

Models opposite of reality on warming trends

- **Models:** surface warms *slower* than lower troposphere (vertical red line)
- **Observations:** surface *warms* faster than lower troposphere (satellite and radiosonde markers)
- US National Assessment demonstrates discrepancy (see figure).
  - But summary still claims “This significant discrepancy [between surface and lower atmosphere warming] no longer exists…”

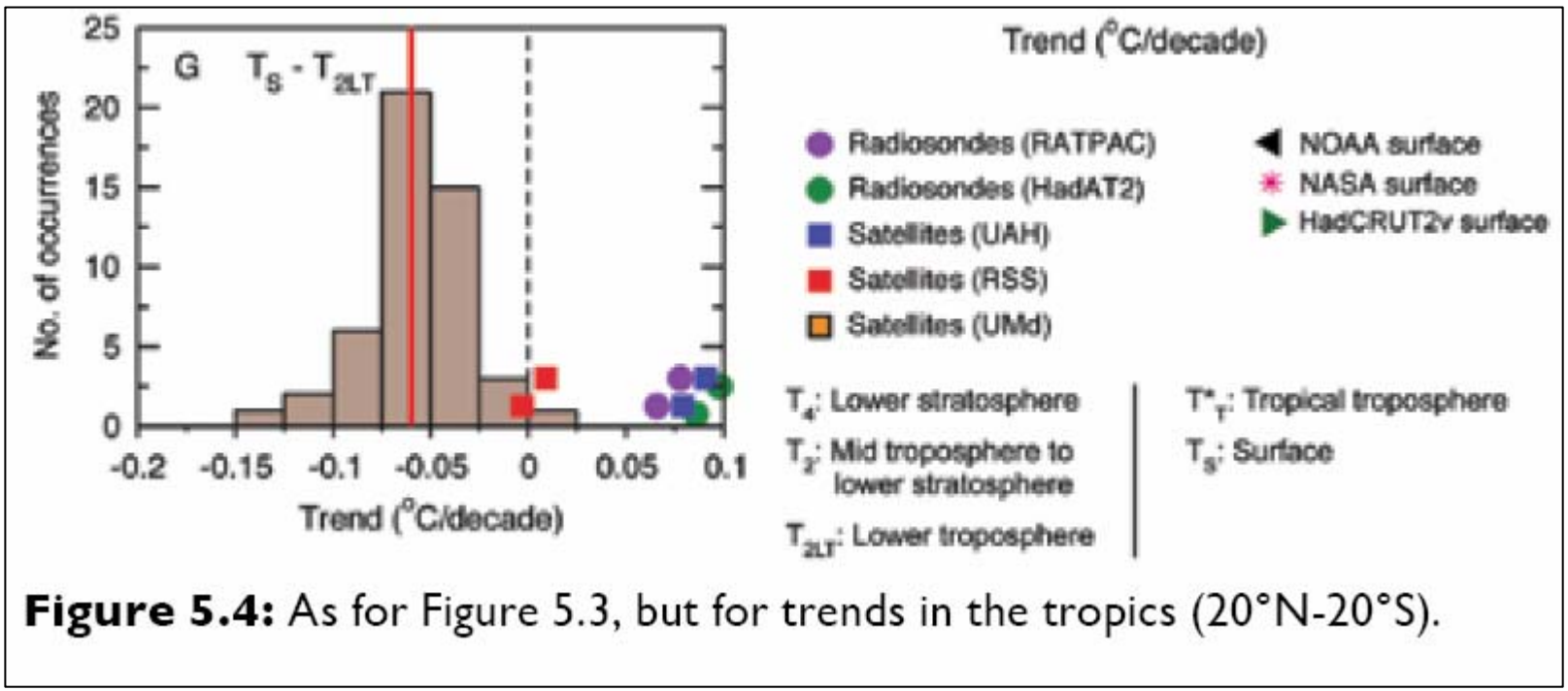


Figure 5.4: As for Figure 5.3, but for trends in the tropics (20°N-20°S).

Source: US CCSP, *Temperature Trends in the Lower Atmosphere*, April 2006, p. 111

Models way off on cloud predictions (1)

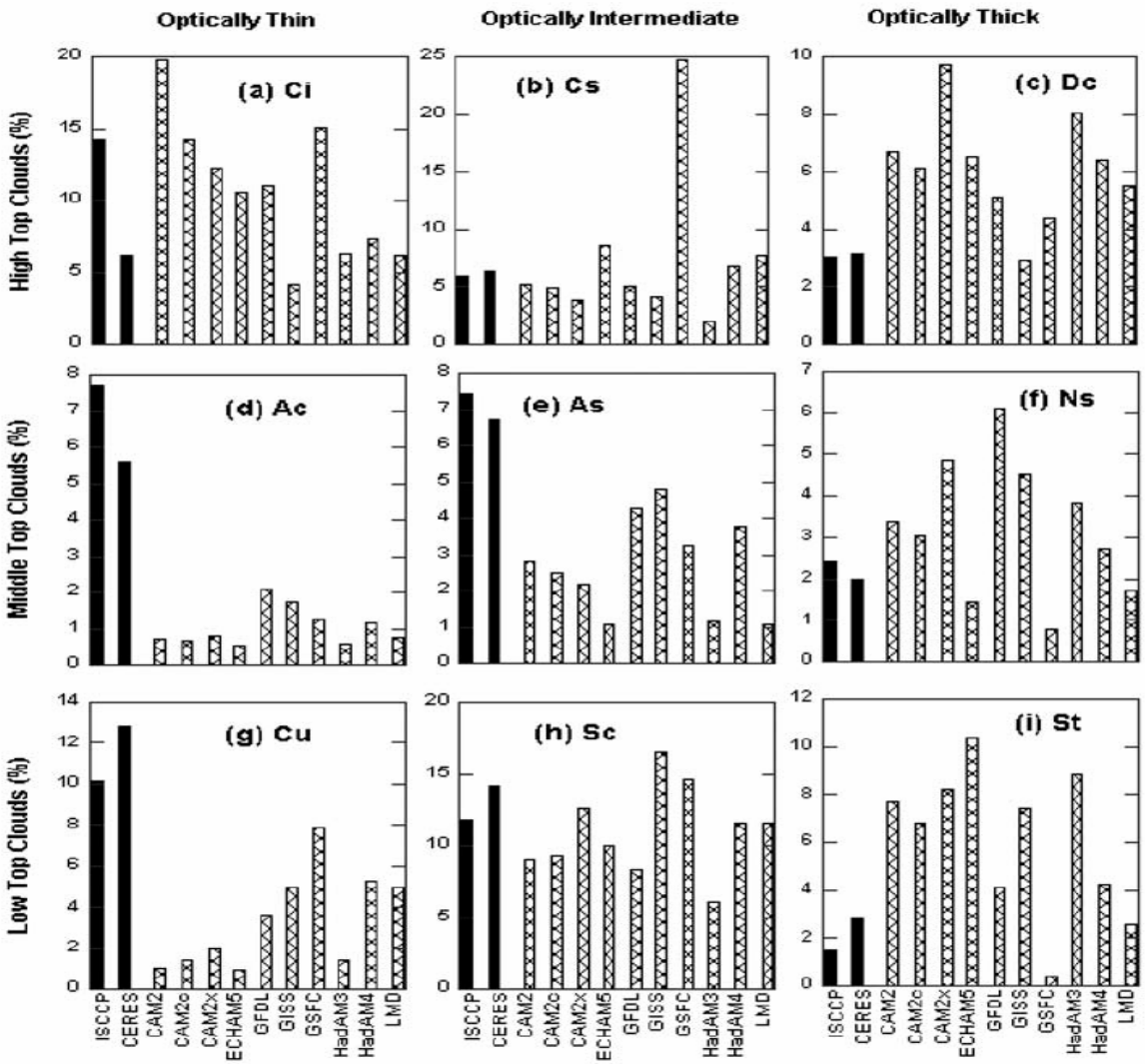


Figure 8. Cloud frequency averaged from 60°N to 60°S in the DJF season for the nine ISCCP cloud types in satellite measurements and in the models.

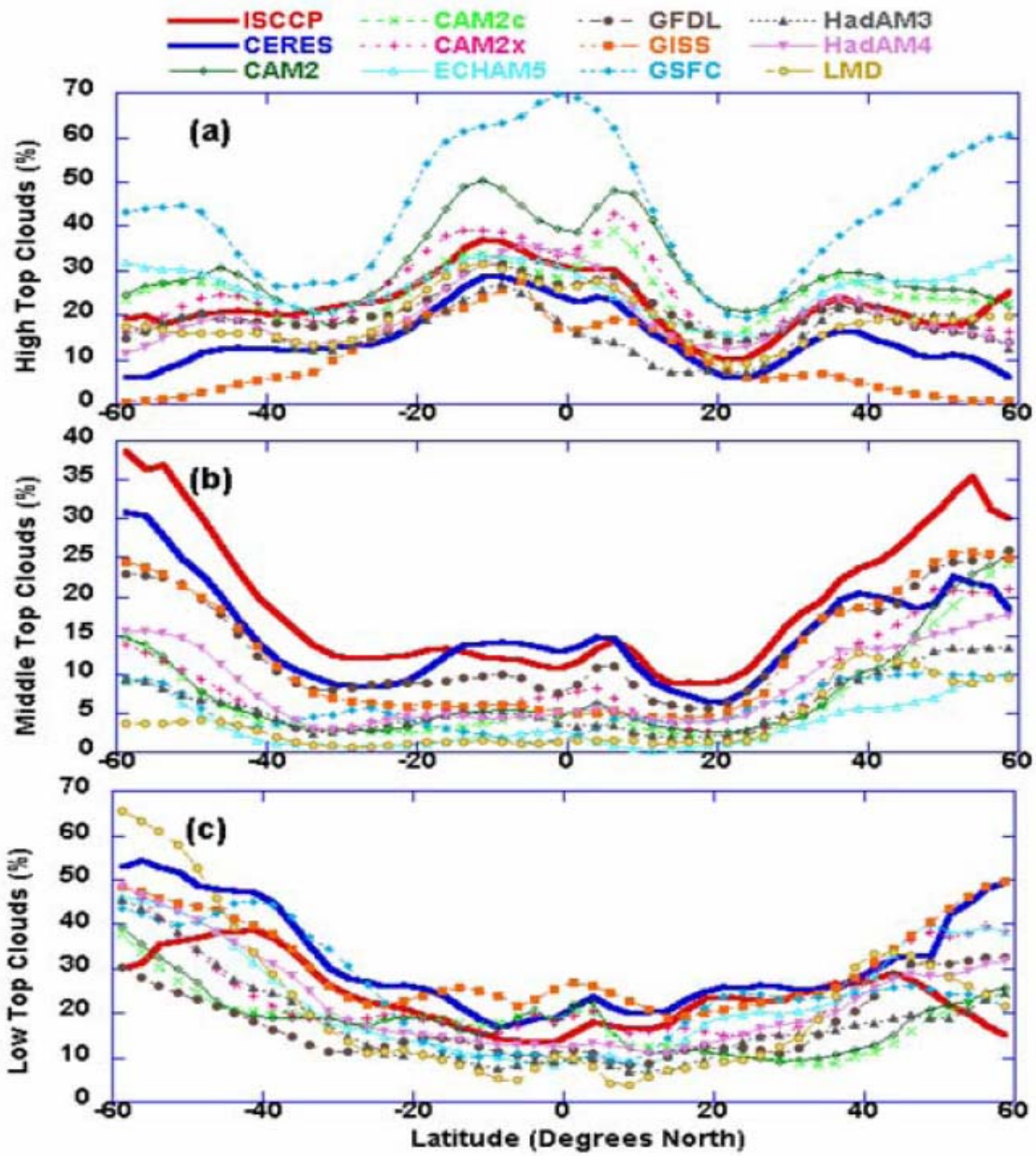
Each graph represents a specific cloud type

Solid bars: cloud measurements from two satellite systems

Pattern bars: predictions of 10 different climate models

Source: Zhang et al., *Journal of Geophysical Research*, 2005

Models way off on cloud predictions (2)



Percent cloud cover by latitude.

Solid lines: satellite measurements

Broken lines: predictions of 10 climate models

Source: Zhang et al., *Journal of Geophysical Research*, 2005

Models omit changes in sun's brightness

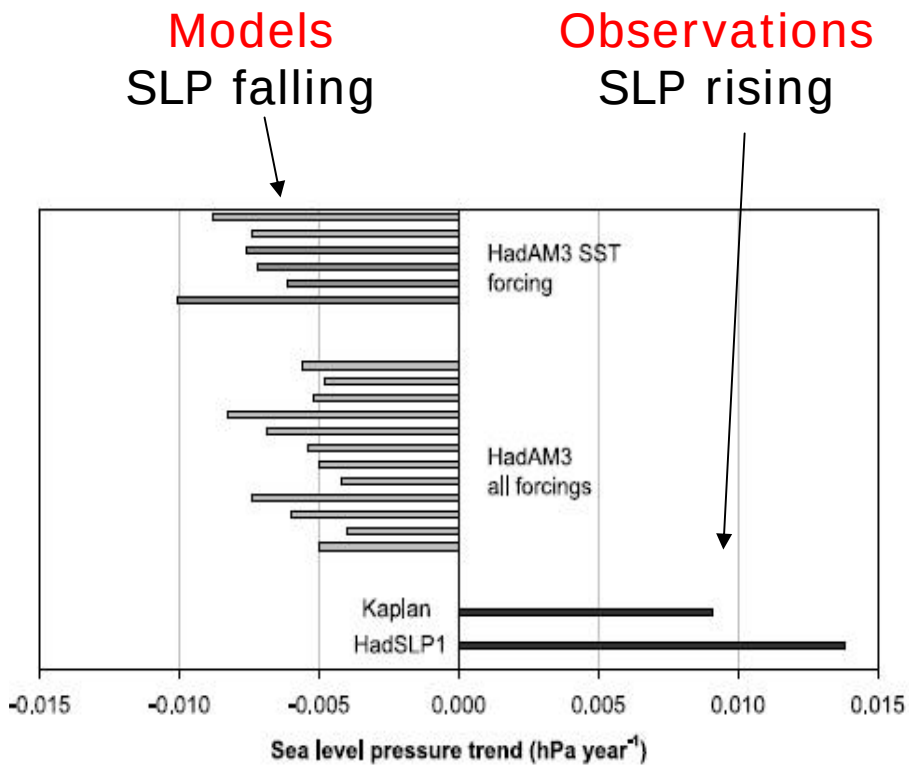
- Changing solar energy output has a bigger effect than previously thought (Scafetta and West, *Geophysical Research Letters*, 2006)
  - "We estimate that the sun contributed as much as 45–50% of the 1900–2000 global warming, and 25–35% of the 1980–2000 global warming. These results, while confirming that anthropogenic-added climate forcing might have progressively played a dominant role in climate change during the last century, also suggest that the solar impact on climate change during the same period is significantly stronger than what some theoretical models have predicted."
  - "In particular, the models might be inadequate: (a) in their parameterizations of climate feedbacks and atmosphere-ocean coupling; (b) in their neglect of indirect response by the stratosphere and of possible additional climate effects linked to solar magnetic field, UV radiation, solar flares and cosmic ray intensity modulations; (c) there might be other possible natural amplification mechanisms deriving from internal modes of climate variability which are not included in the models."

Models opposite of observations on Indian Ocean climate

Important because models say Indian Ocean affects climate in distant regions:

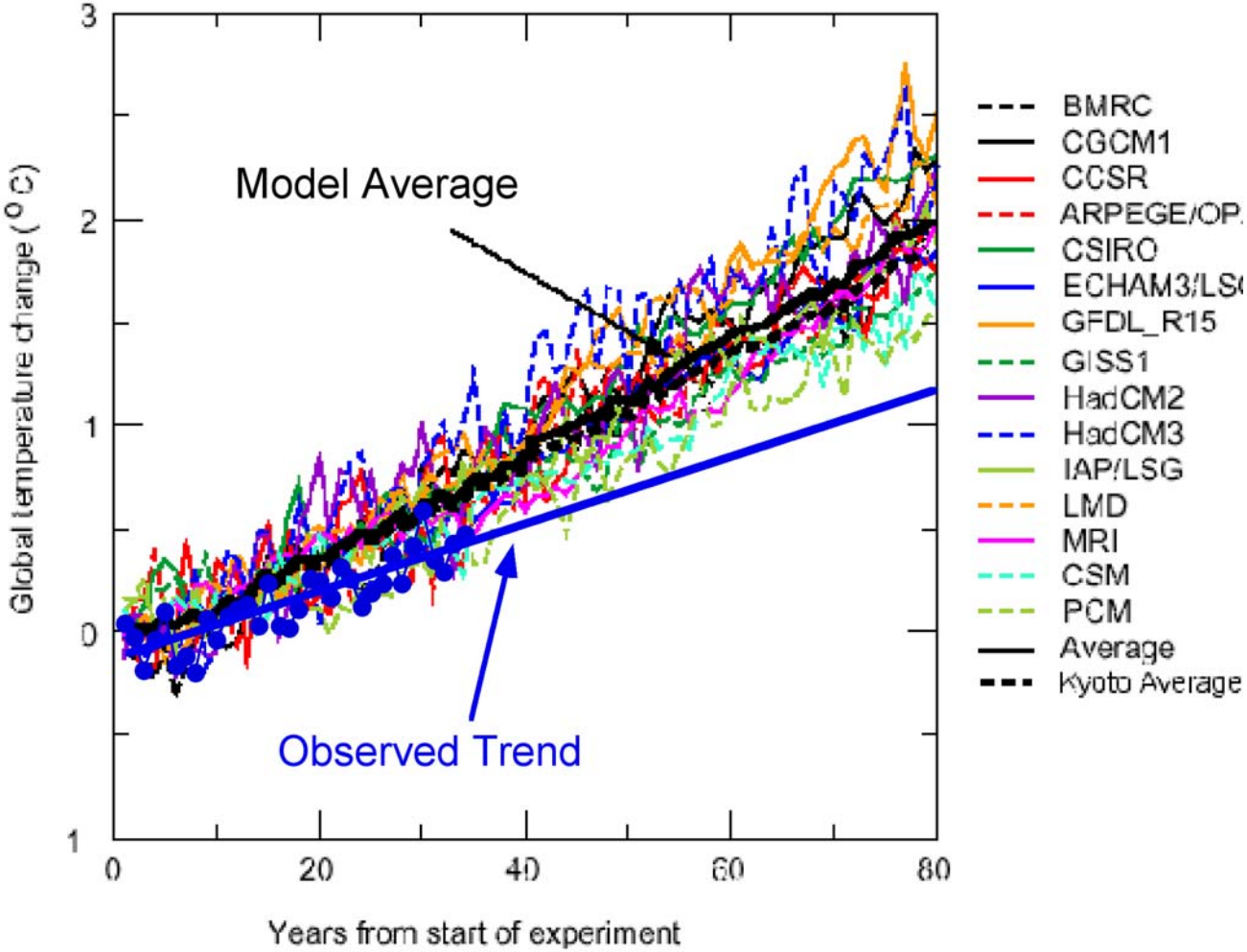
"It has been argued - largely on the basis of experiments with atmospheric GCMs [climate models] - that this rapid warming [of the Indian Ocean] was an important cause of remote changes in climate, in particular an increasing trend in the North Atlantic Oscillation Index and decreases in African rainfall. The clear discrepancy between the observed and simulated trends in SLP suggests that the response of some atmospheric GCMs to the Indian Ocean warming may not provide a reliable guide to the behaviour of the real world."

Indian Ocean Sea-Level Pressure (SLP) Trend



Source: Copsey et al., *Geophysical Research Letters*, 2006

What gives a better prediction of warming—models, or observed trend?



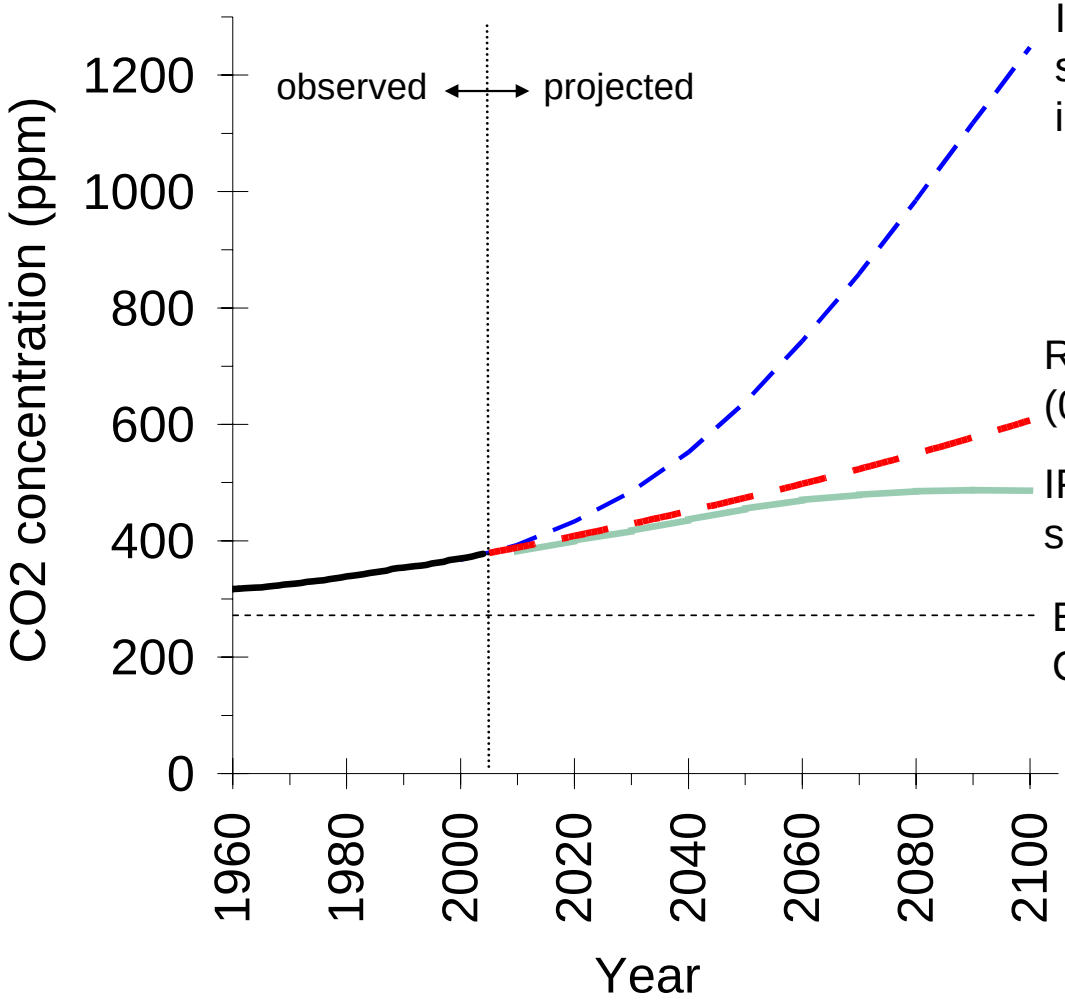
- Models predict linear warming with exponentially increasing CO2
- Extending observed actual temperature trend suggests warming of 1.5°C per century

Source: Pat Michaels and Meehl et al., 2000

So much for models vs. reality

What about assumed vs. actual trends in atmospheric CO2 levels?

Scary IPCC climate scenarios require much more rapid CO2 rise than is actually occurring



IPCC highest CO2 scenario (1.2%/year increase) → IPCC's 5.8°C temp. rise

Recent observed trend (0.5%/year increase) → IPCC's 2°C temp. rise

IPCC lowest CO2 scenario

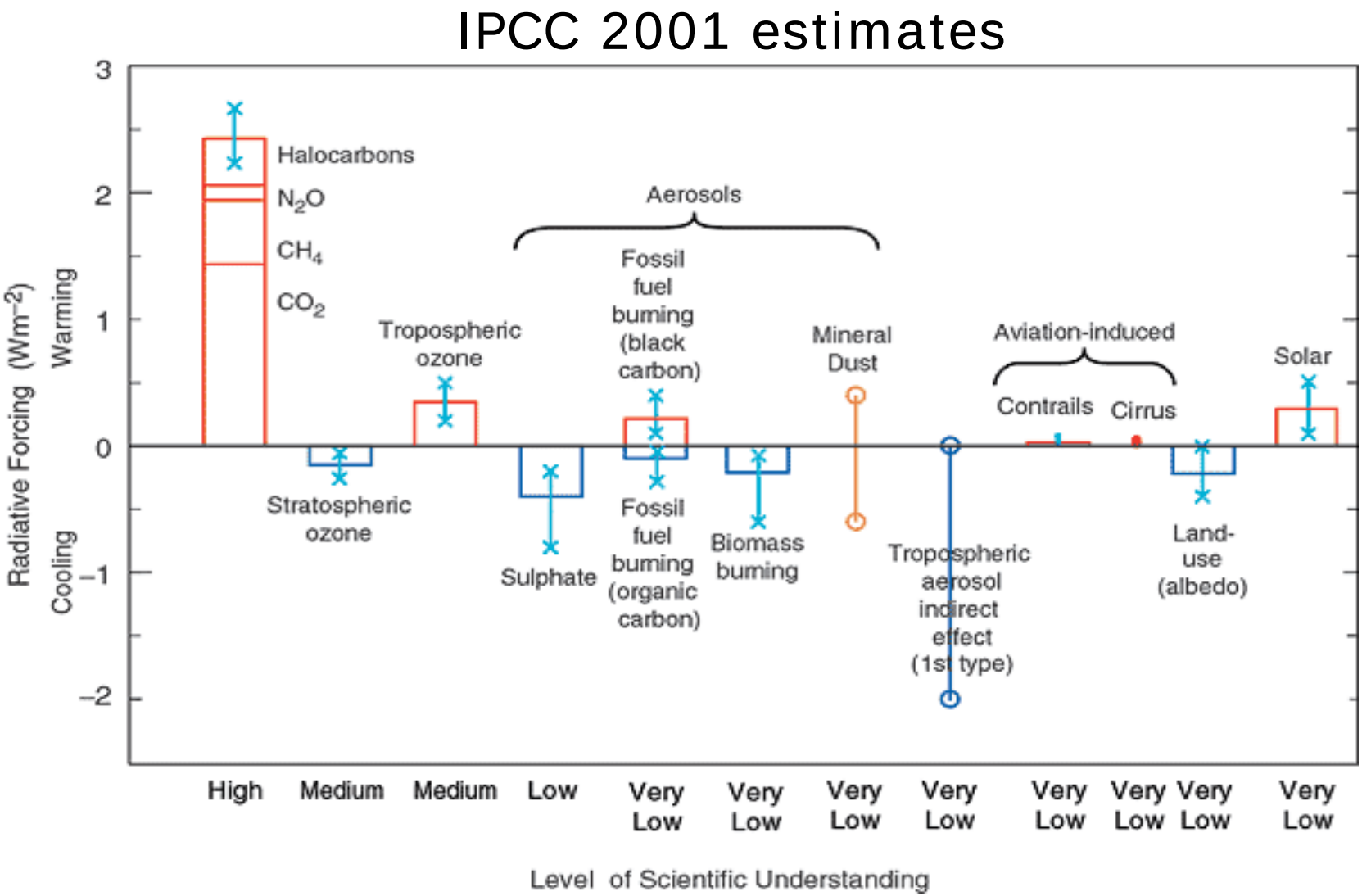
Estimated pre-industrial CO2

"The IPCC predilection for exaggerated growth rates of population, energy intensity, and pollution calls into question the realism of their results." –James Hansen, *Natural Science*, 2003

Sources: IPCC,TAR; CDIAC

How well do scientists understand climate “forcings”?

Climate forcings and their presumed uncertainties



Source: United Nations Intergovernmental Panel on Climate Change, 2001b, p 37

Or maybe methane isn't so well understood…

"To their amazement, the scientists found that all the textbooks written on the biochemistry of plants had apparently overlooked the fact that methane is produced by a range of plants even when there is plenty of oxygen."

BBC News, 1/11/06, reporting on a new paper in *Nature* that found that previously unnoticed methane generation by vegetation could account for 10%-30% of the world's methane emissions.

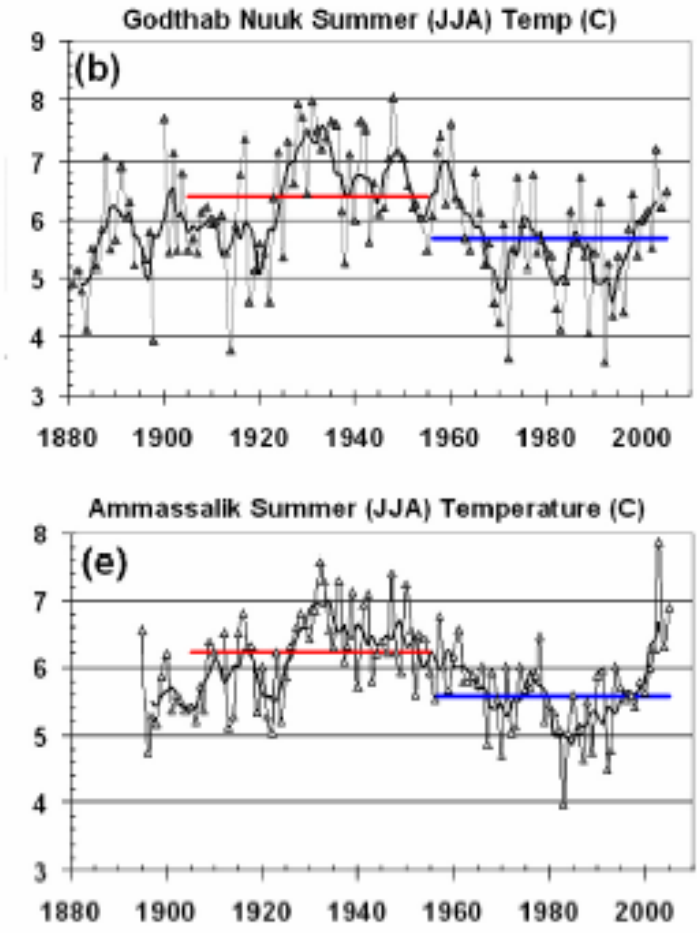
What is the effect of aerosols?

"On the basis of these results, the authors estimate that anthropogenic aerosols increase the global cloud cover by 5%. Assuming a typical cloud albedo [reflectivity] of 0.5, this corresponds to…a forcing on climate that is larger than, and of opposite sign to, that of greenhouse gases.

Source: Francois–Marie Breon, "How Do Aerosols Affect Cloudiness and Climate," *Science*, August 4, 2006

Is the Earth doing what anthropogenic global warming (AGW) theory says it should be doing?

Greenland isn't doing what climate models say it should



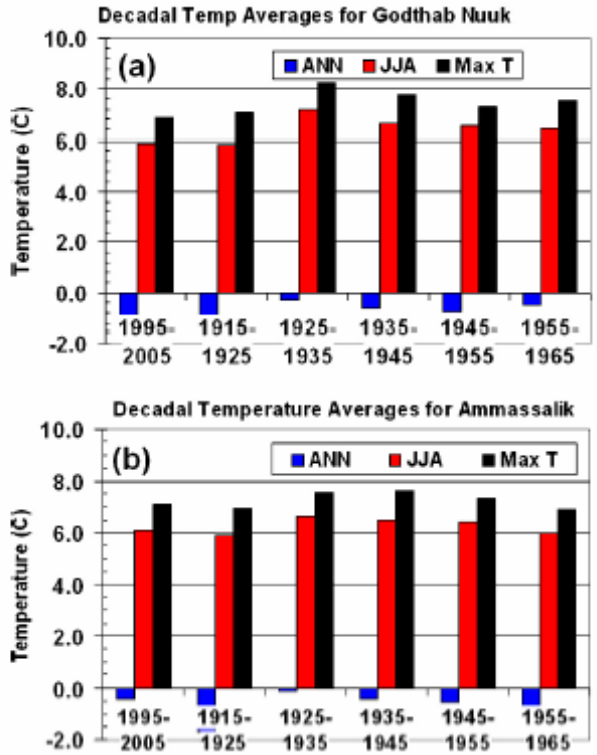
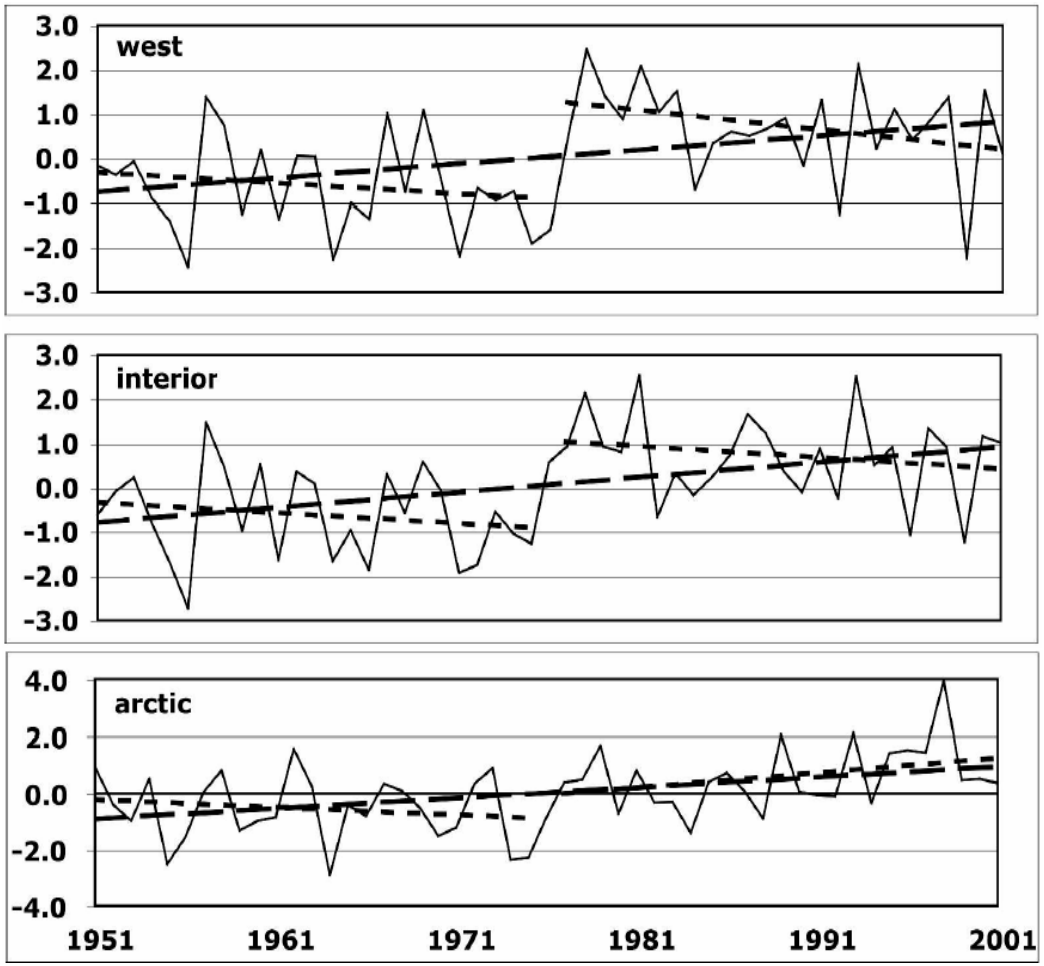


Figure 3. Almost all of the 1915 to 1965 decades at both Godthab Nuuk and Ammassalik were at least as warm as the 1995–2005 average (blue – annual, red – summer, black – warmest month temperature).

Source: Chylek et al., *Geophysical Research Letters*, 2006

"Although the last decade of 1995–2005 was relatively warm, almost all decades within 1915 to 1965 were even warmer…Although there has been a considerable temperature increase during the last decade (1995 to 2005) a similar increase and at a faster rate occurred during the early part of the 20th century (1920 to 1930) when carbon dioxide or other greenhouse gases could not be a cause…The observed 1995–2005 temperature increase seems to be within a natural variability of Greenland climate."

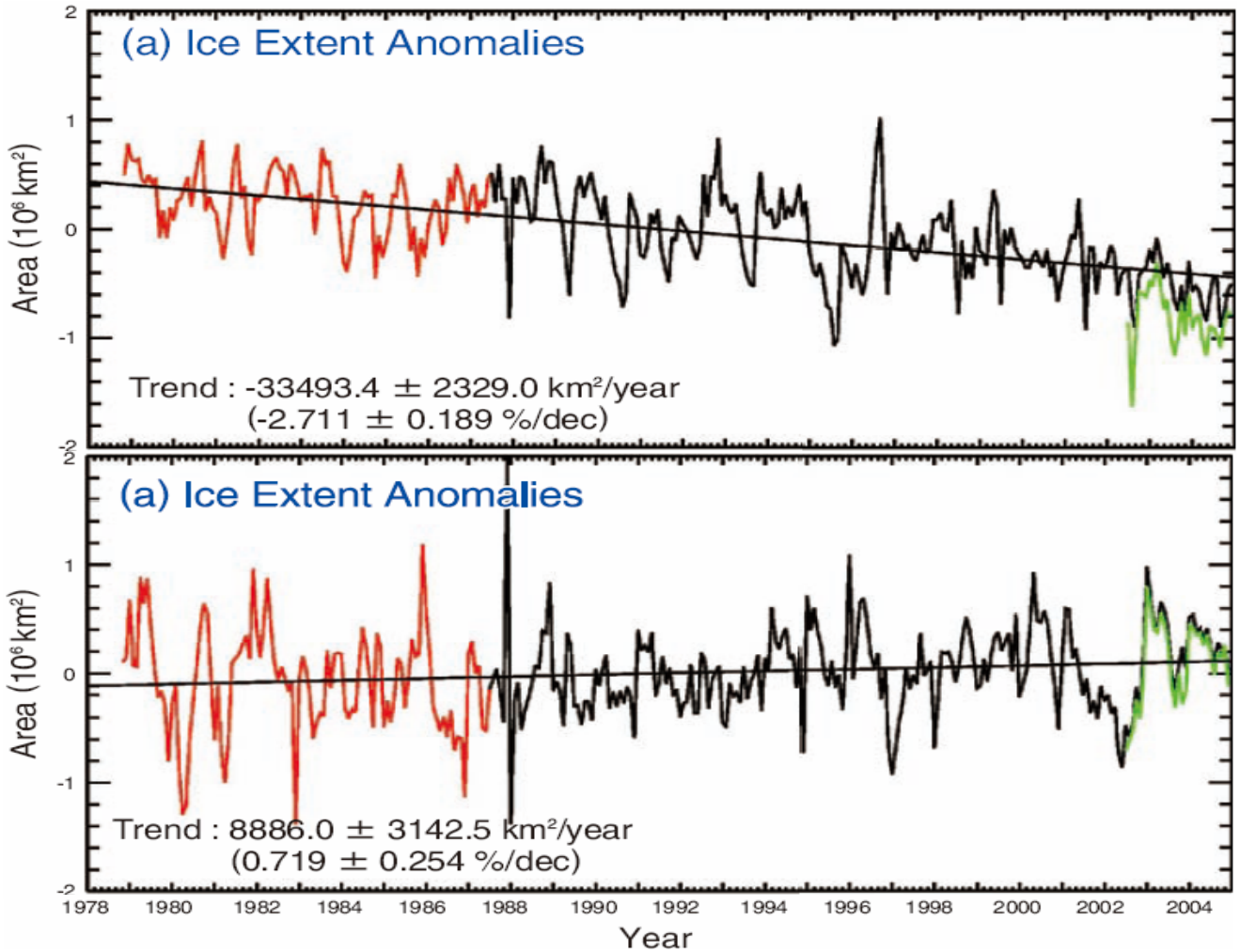
Alaska isn't doing what climate models say it should



- Alaska: temperature jump in 1976 creates false appearance of warming trend.
- 5 of 6 regions of Alaska experienced (statistically insignificant) cooling both before and after 1976 jump.
  - Arctic region of Alaska warmed, but not during winter

Source: Hartmann & Wendler, *J Climate*, 2005

Sea ice is dropping in the Arctic…but rising in the Antarctic



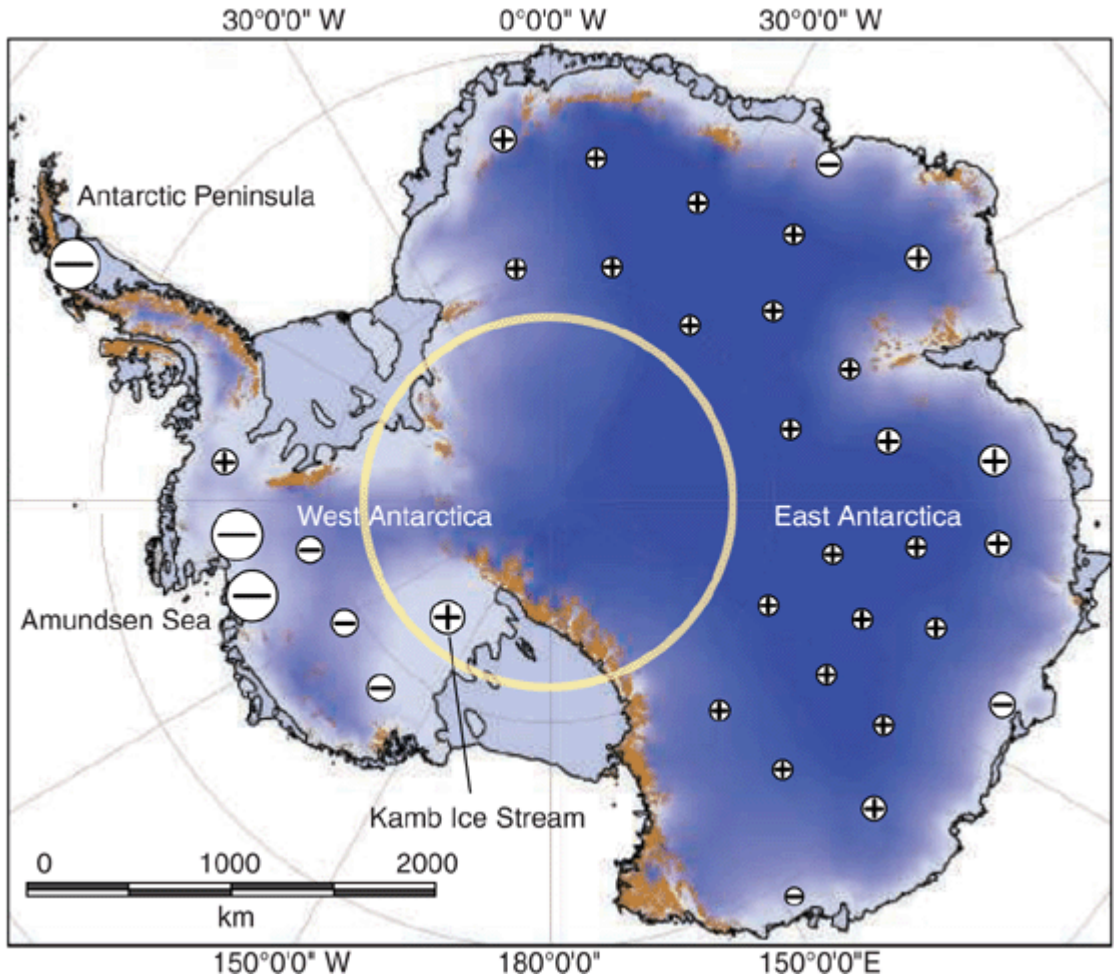
Arctic
sea ice
going down

Antarctic
sea ice
going up

Source: Comiso, IGARSS 2005 cited in Kai & Nishio, 2005

Most of Antarctica's land area is gaining ice too

- Al Gore only mentions loss of ice on Antarctic peninsula.
- Gore omits ice gains over much of the rest of the continent.

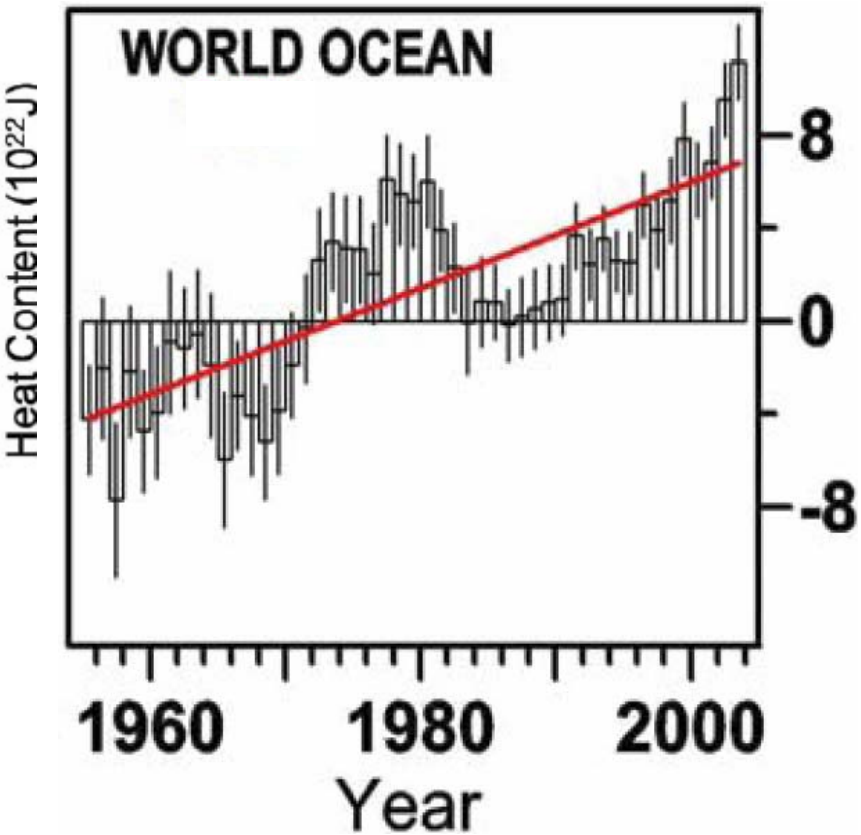


\+ = gaining ice
– = losing ice

Source: Vaughan, *Science*, 2005

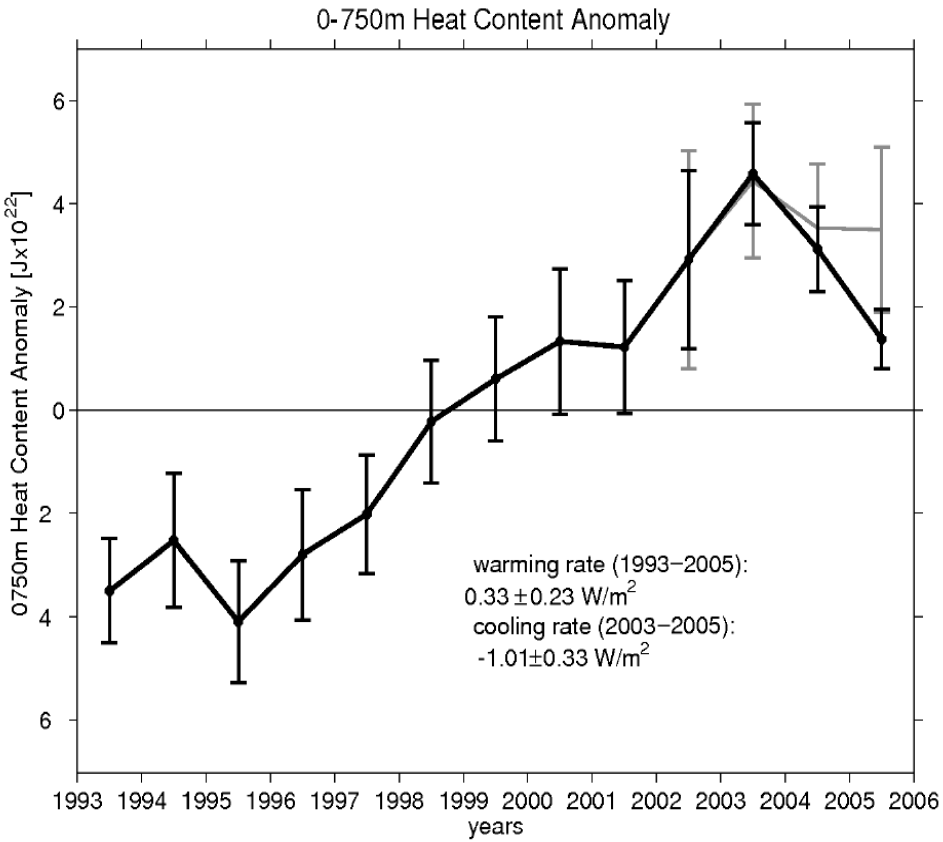
From 2003-2005, oceans lost 20% of energy gained during 1955-2003

1955-2003



Source: Levitus et al., *Geophysical Research Letters*, 2005

1993-2005



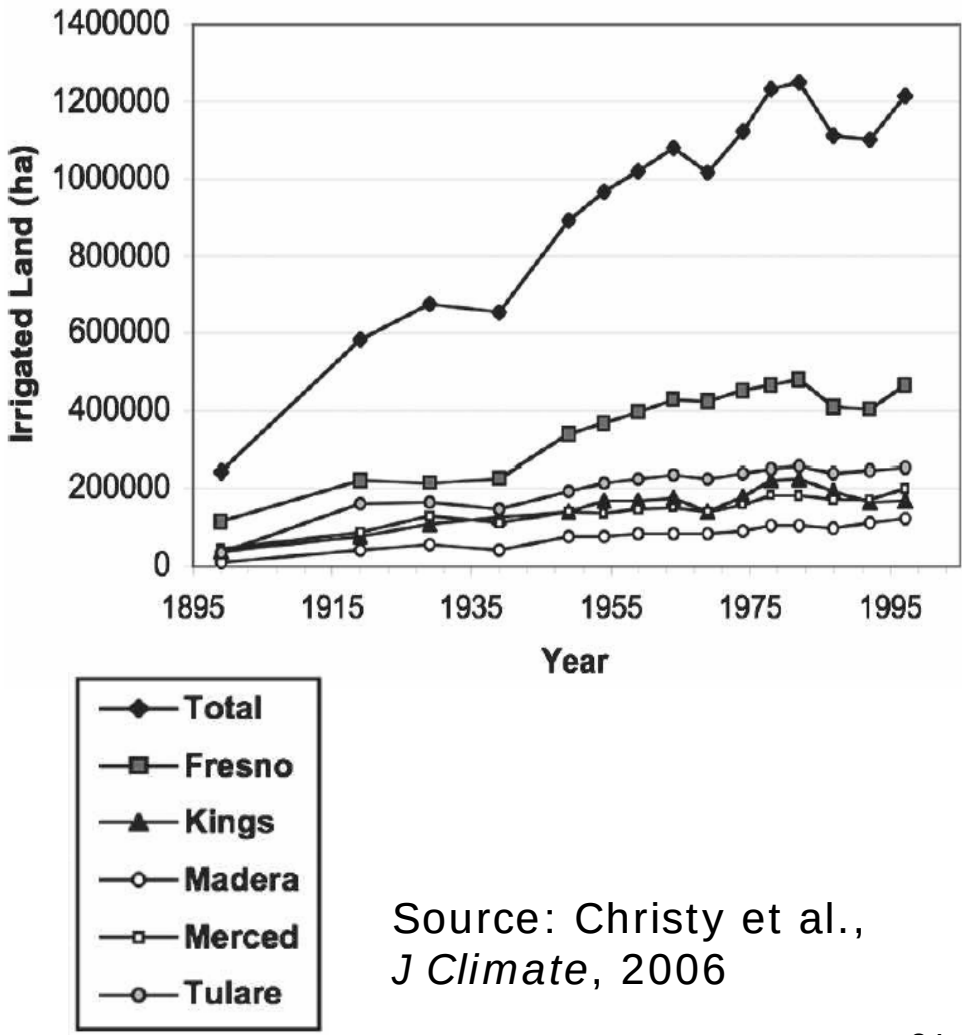
Source: Lyman et al., *Geophysical Research Letters*, 2006

California isn't warming the way human-caused-greenhouse theory & models say it should

San Joaquin Valley is warming, but Sierra Nevada isn't. Recent study provides evidence SJV warming is due to land-use change (farming) and not greenhouse effect.

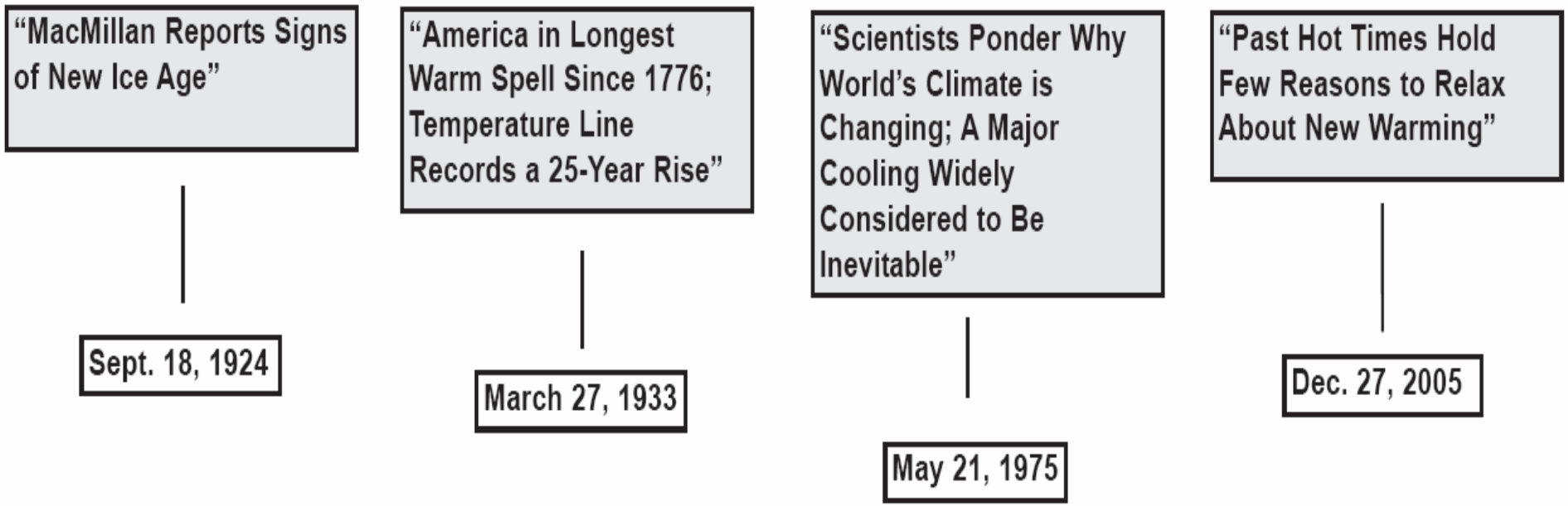
- "the central San Joaquin Valley has experienced a significant rise of minimum temperatures (~3°C in JJA and SON), a rise that is not detectable in the adjacent Sierra Nevada. Our working hypothesis is that the rapid valley warming is caused by the massive growth in irrigated agriculture. Such human engineering of the environment has changed a high-albedo desert into a darker, moister, vegetated plain…[This] suggests a regional inconsistency compared with twentieth-century simulations of climate forced by human influences other than land use changes." Christy et al., 2006

Trend in irrigated SJV land, 1895-1995



Source: Christy et al., *J Climate*, 2006

Excerpts from the *New York Times*
A century of ill-fated climate predictions



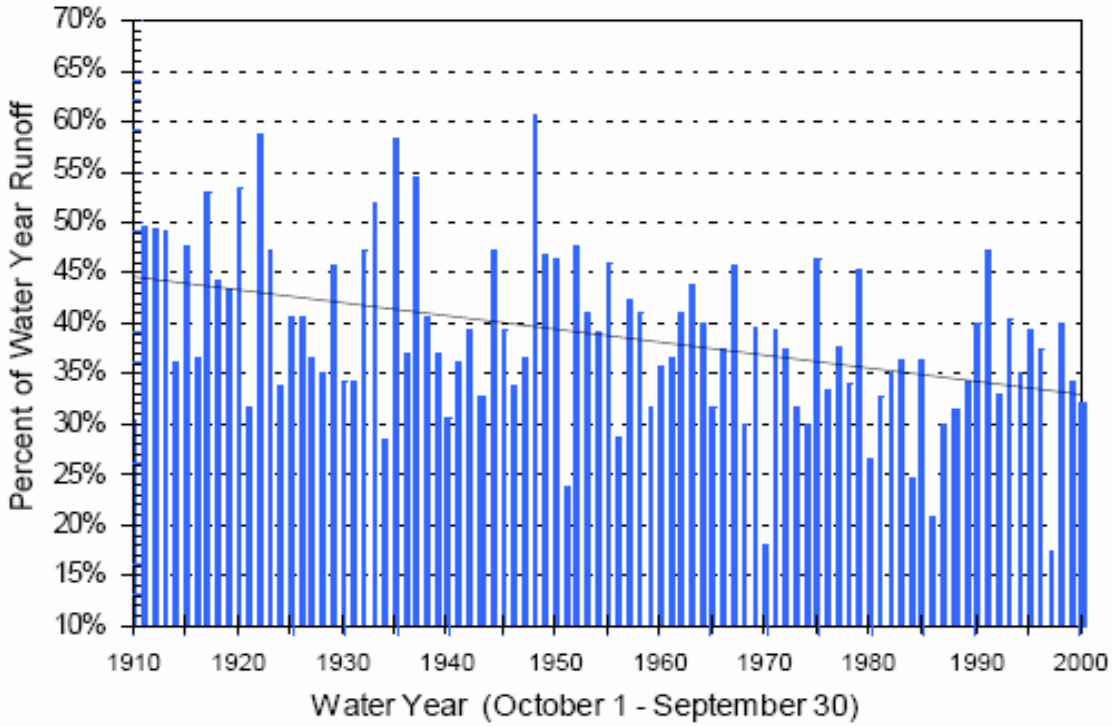
Source: Fire and Ice, Business & Media Institute, May 2006

What harm can we expect from climate change?

- Water shortages?
- Sea level rise?
- Increased Heat deaths?
- Air pollution deaths?
- Melting ice caps?
- Increasing hurricanes?

According to Cal-EPA...

Our Principal Reservoir – The Sierra Snow Pack – Is Shrinking



Warmer Winters Have:

- **Reduced snow pack**
- **Led to earlier snow melt**
- **Decreased spring runoff by 10%**
- **Major effects on water supply, Cal Fed, and Delta system**

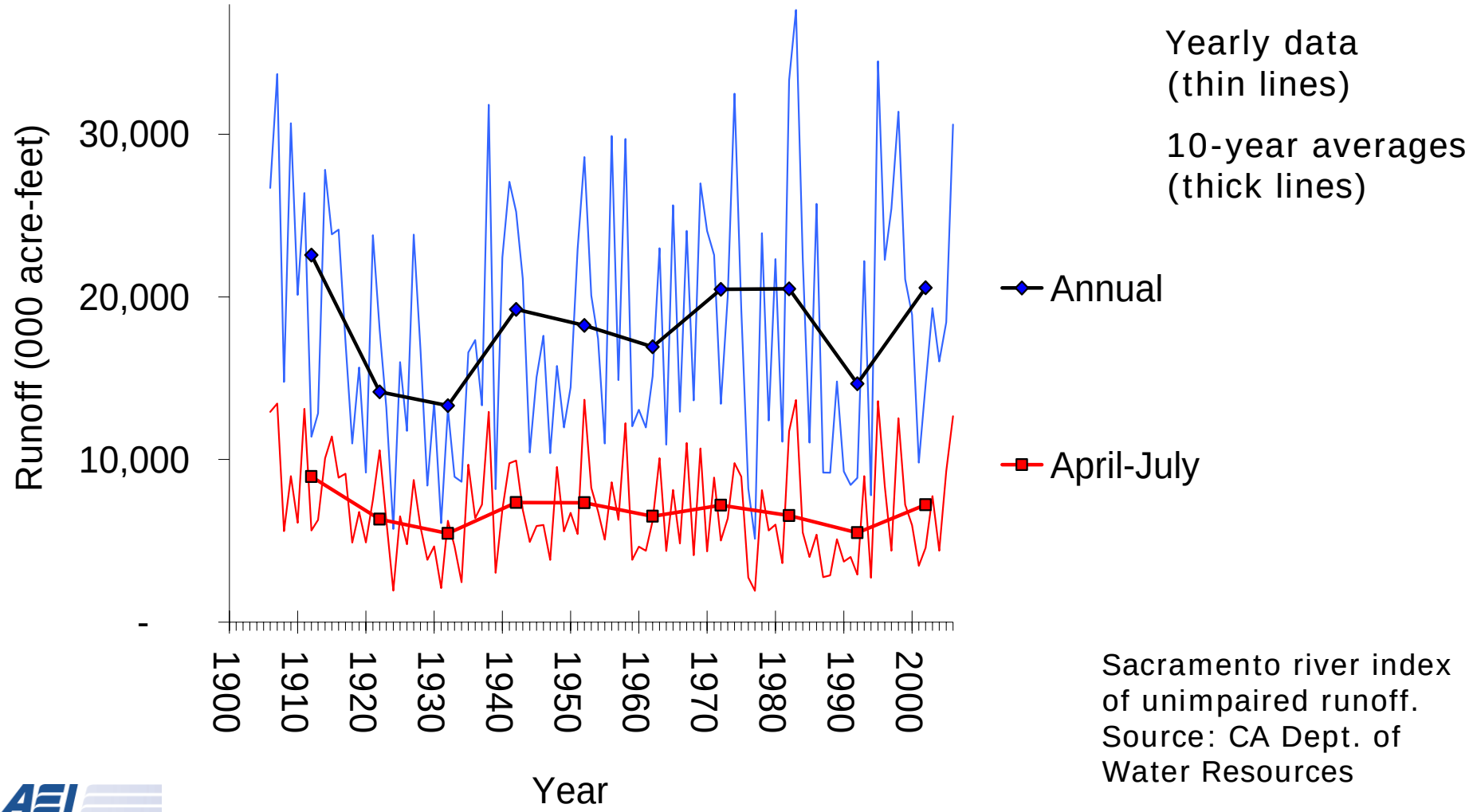
Sacramento River Runoff (1910-2000) - April to July as a Percent of Total Runoff

Source: California Environmental Protection Agency, Environmental Protection Indicators for California, 2001

But note that decline is not *volume* of runoff, but *percent* of total runoff occurring from April-July (Source: Cal-EPA AB1493 briefing package)

Reality: California's Water Supply Is Not Shrinking

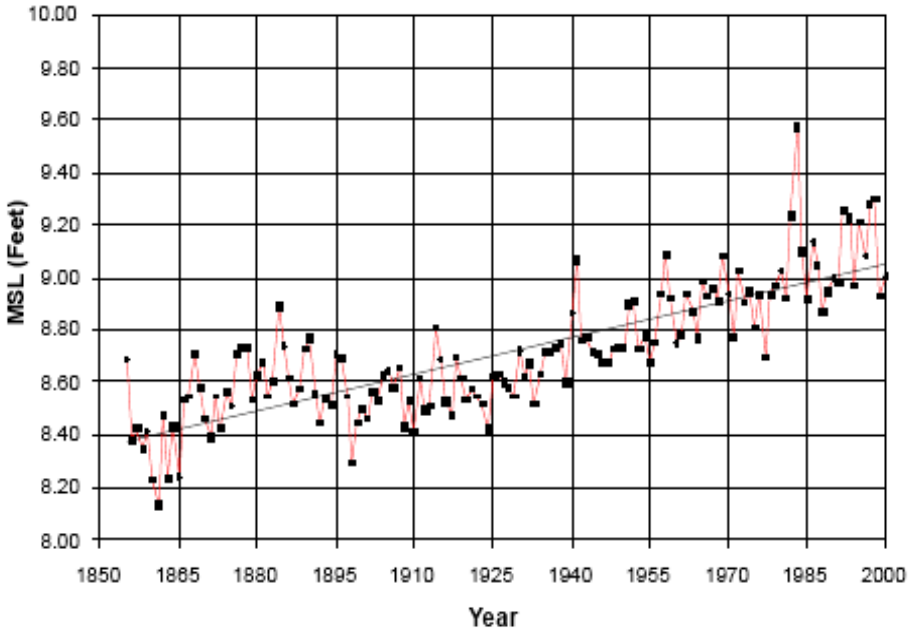
- Total Sacramento river runoff has risen on average.
- Spring runoff declined slightly from 1940s-1990s but has risen in last decade.
- 1997-2006 was one of the wettest decades on record



Sacramento river index of unimpaired runoff. Source: CA Dept. of Water Resources

According to Cal-EPA…

Sea Level Is Rising Along California's Coast



San Francisco Yearly Mean Sea Level (1855-2000)

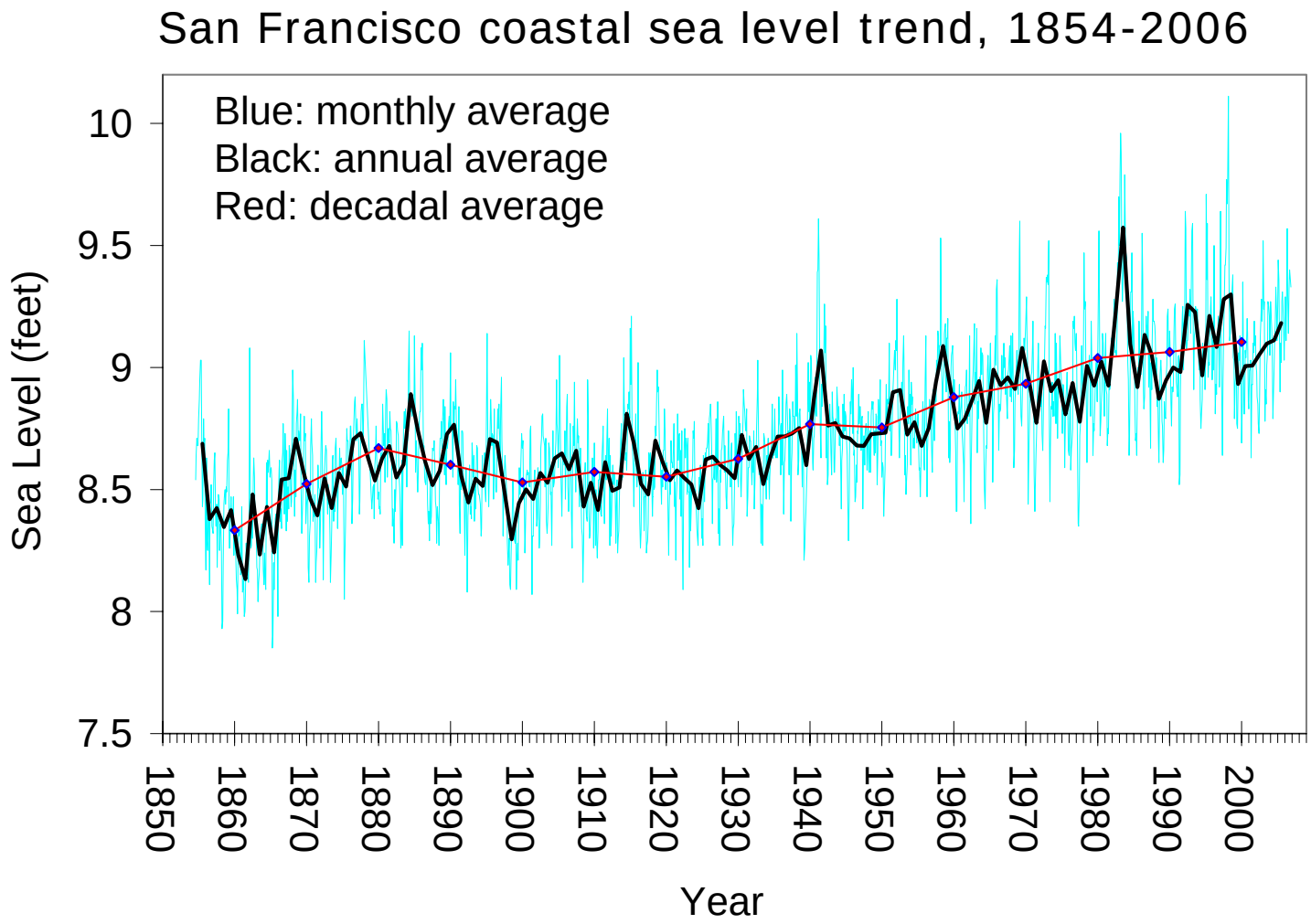
Source: California Environmental Protection Agency, Environmental Protection Indicators for California, 2001

- **CA has already seen a 7″ rise in 150 years**
- **Concerns over levee stability and salt water intrusion**
- **IPCC projects 4–35″ sea level rise by 2100**
- **Present Delta system may not be viable at upper end of range**

Source: Cal-EPA, AB 1493 briefing

True, but sea level has been rising since the 1920s—decades before humans emitted enough GHGs to affect the climate. Cal-EPA's own graph shows this. In fact, the graph shows sea level rose as much from 1860-1885 as it did from 1950-2000.

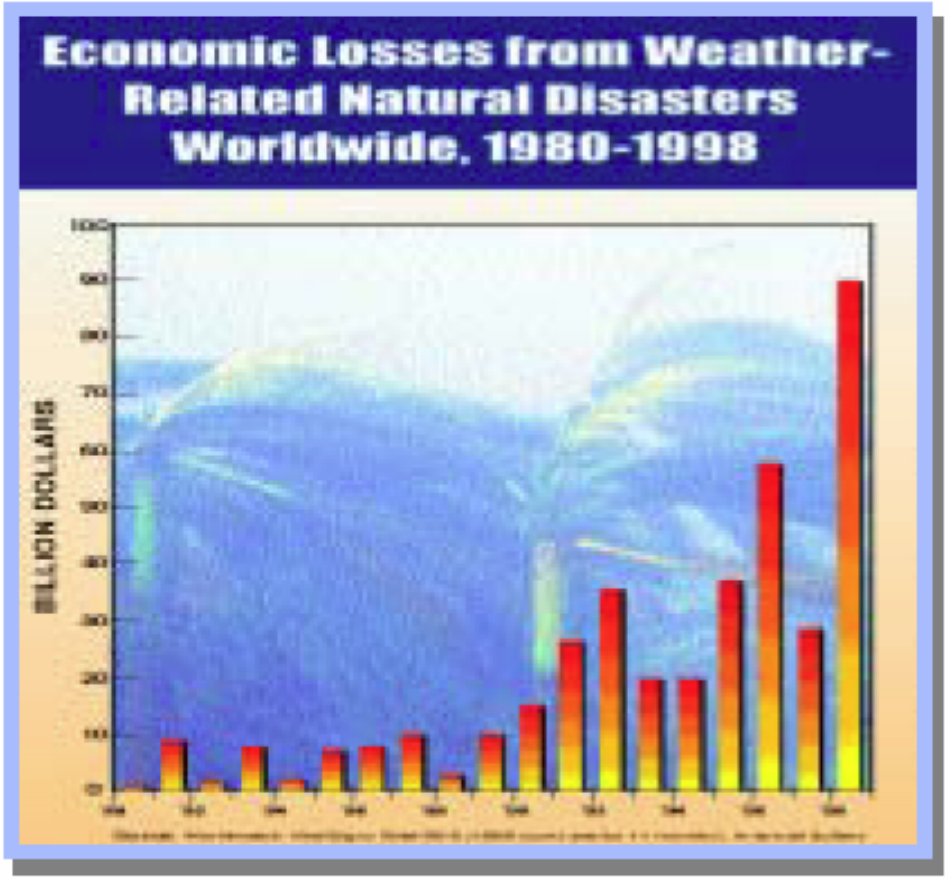
Sea level rise has slowed or stopped since mid-1980s



Source: NOAA, Historic Tide Data

According to Cal-EPA...

Extreme Weather Events Are Increasing



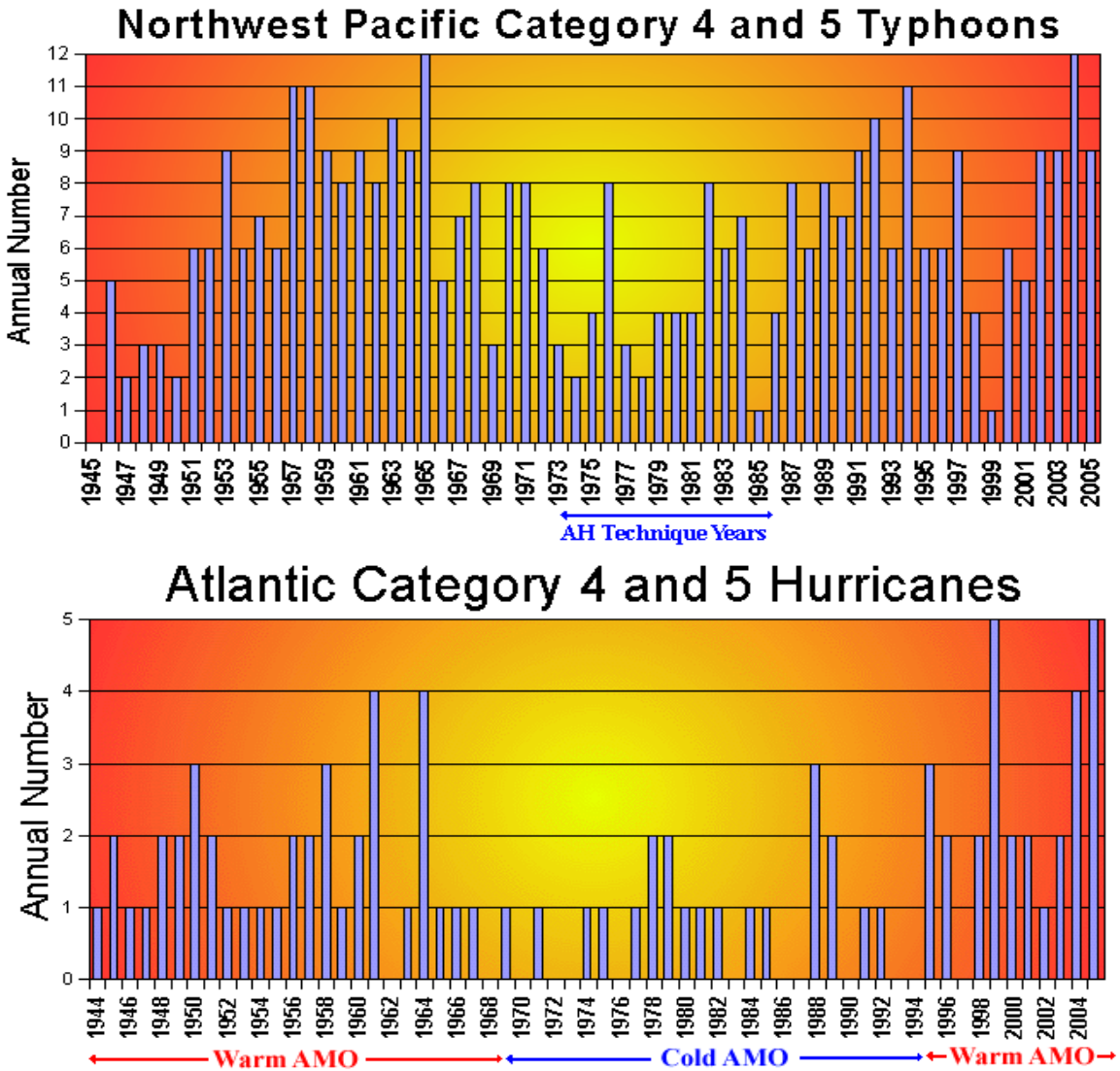
Source: World watch Vital Signs Brief 98-5 (1998 costs are for 11 months). In actual dollars.

Causing Billions of Dollars in Damages

Source: Cal-EPA, AB 1493 briefing

But note: graph shows economic losses by year, not actual weather. Economic losses are increasing because of (1) increasing wealth, and (2) huge increases in coastal development

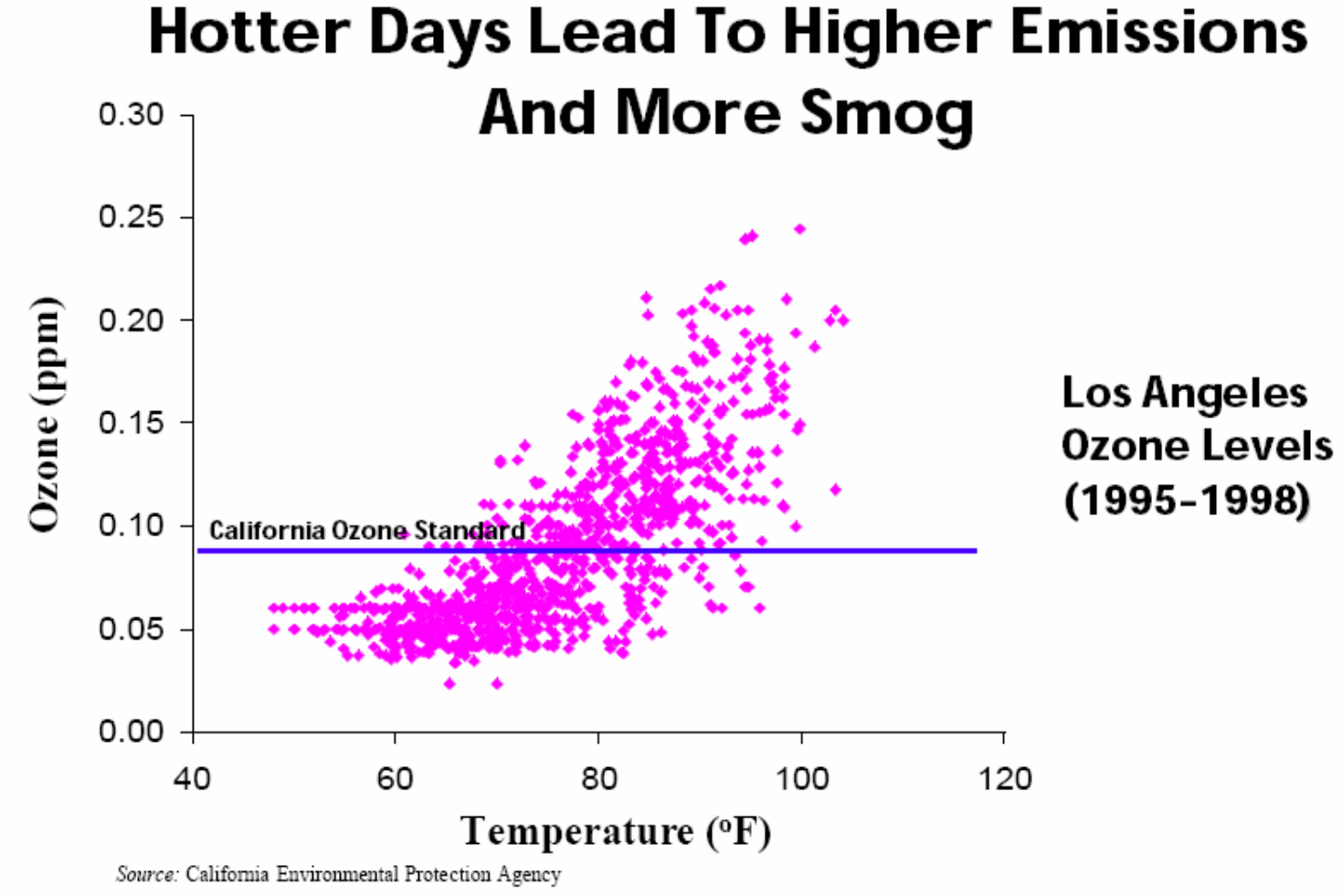
Are Hurricanes increasing; if so, is AGW the cause?



- Number of strong storms was about same in 1950s-60s as in last decade.
- Alarmists often show data only from 1970s onward, creating misleading appearance of steadily increasing trend.
- Dip in 1970s might not actually be real. Some hurricane experts now believe measurement technique used at that time understated number of strong storms.

Sources: Jeff Masters; National Hurricane Center; Joint Typhoon Warning Center

According to Cal-EPA, climate change will increase air pollution

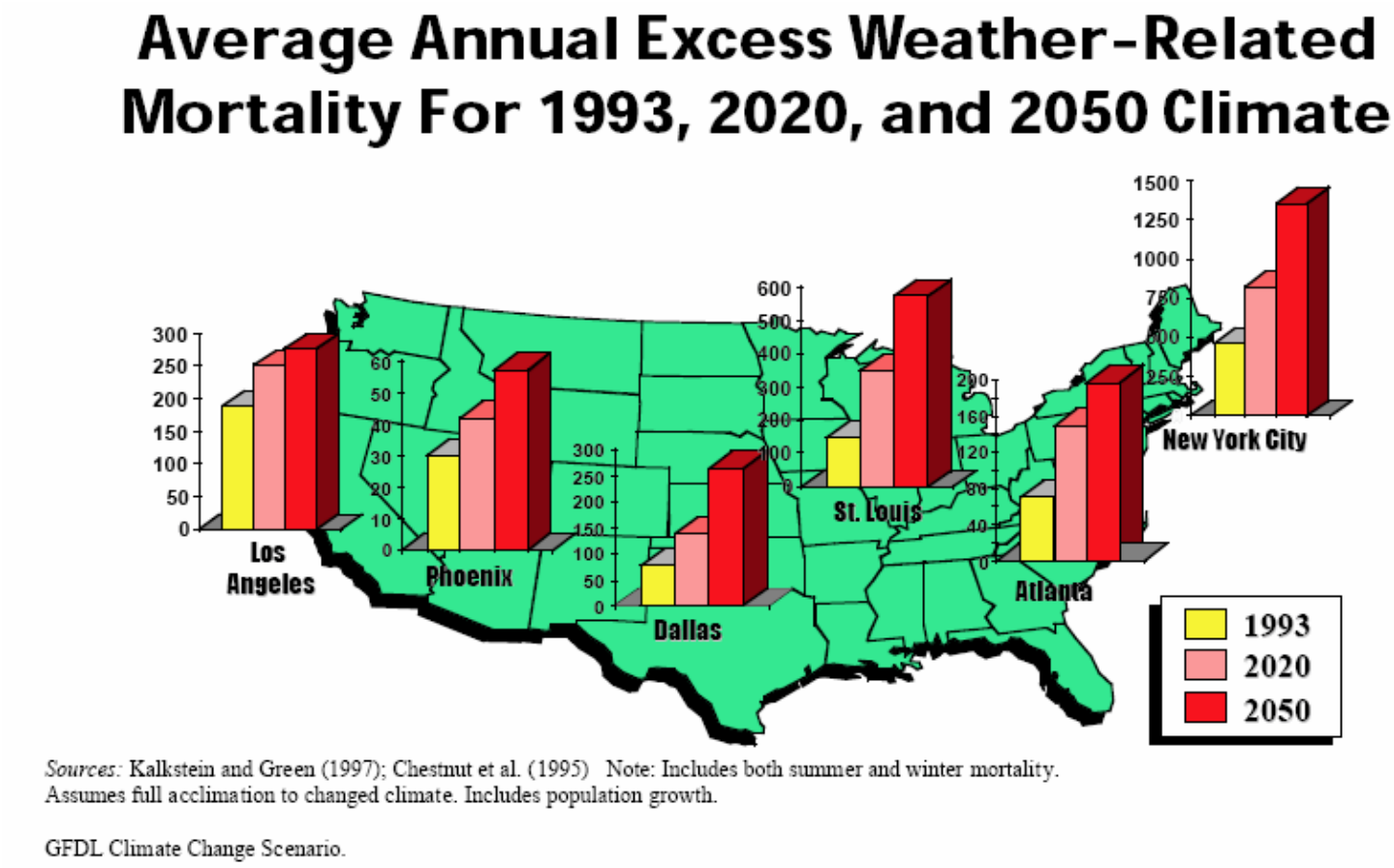


Source: Cal-EPA, AB 1493 briefing

Reality: Air pollution has dropped as climate has warmed

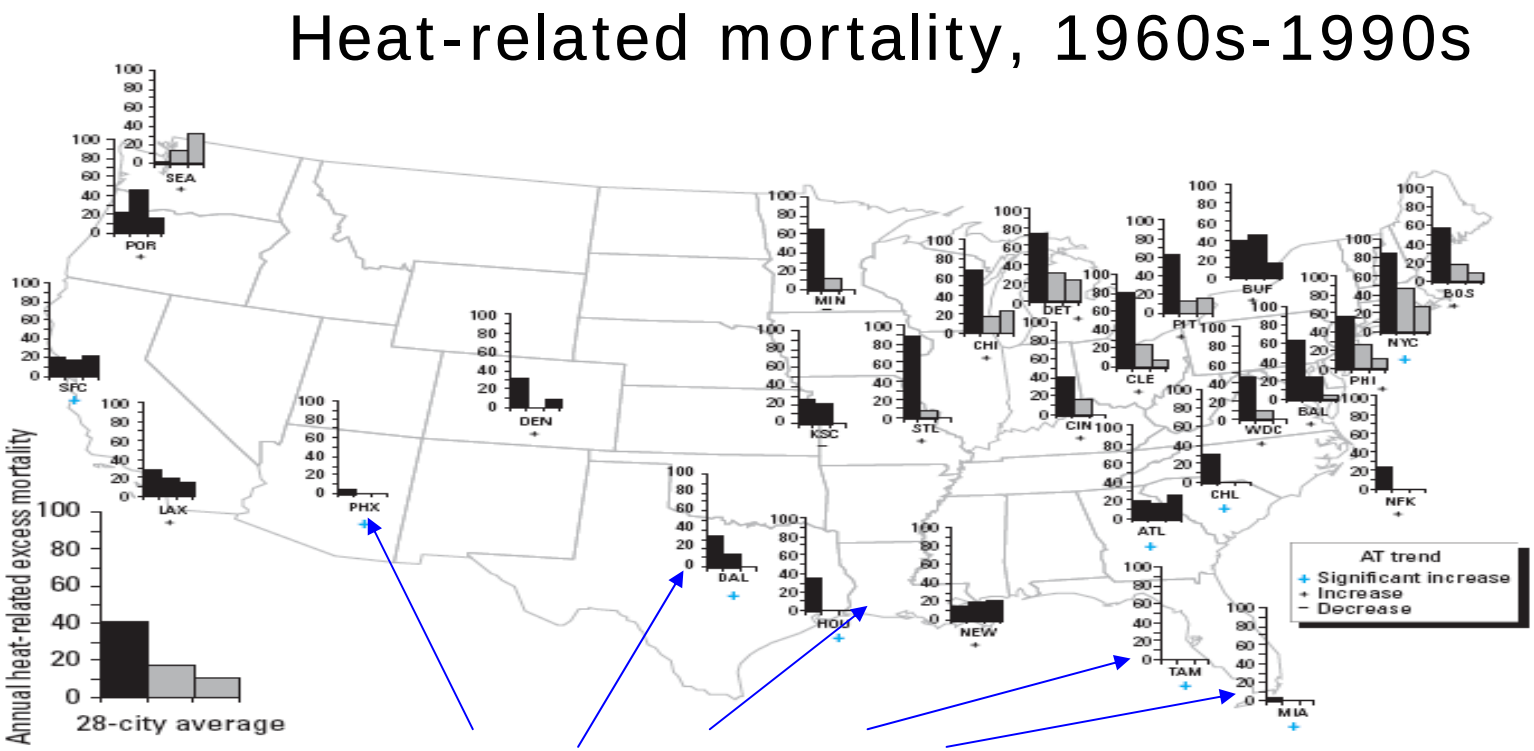
- Cal-EPA's claim is a little true, a lot false, and a lot misleading, all at the same time
- The true part: all else equal, higher temperatures mean more ozone
- The false and misleading parts: Cal-EPA creates the misleading impression that warming will increase smog.
  - South Coast has reduced peak ozone more than 50% in last 25 years and has eliminated the vast majority of 8-hour and 1-hour ozone exceedances, despite warming. Same is true for all of California and the nation—higher temperatures, lower ozone.
  - Likelihood of a 1-hour ozone exceedance on a >90F day dropped more than 95% in last 25 years; 75% drop for 8-hour.
  - Higher temperatures = lower PM2.5, because semi-volatile species evaporate or don't condense as temp. rises. Aw & Kleeman (JGR, 2003) predict 25% drop in peak PM2.5 in South Coast with 8^{o}F temperature rise. Cal-EPA ignores PM2.5 benefits of warming.
- Reality: Air pollution will continue to decline, with or without warming, because already-adopted measures will eliminate the vast majority of remaining ozone- and PM-related emissions.

According to Cal-EPA, climate change will cause more deaths due to heat stress



Source: Cal-EPA, AB 1493 briefing

Reality: Higher temperatures…lower heat risks



- Average heat-related mortality risk dropped 75% in the U.S. from the 1960s to the 1990s.
- Heat-related mortality is rarest in hottest cities (blue arrows).
- Cal-EPA fails to explain why future will be opposite of past. Actually, Cal-EPA appears unaware of past trends.

Source: Davis et al., *Environmental Health Perspectives*, 2003

Catastrophic sea-level rise? (1) Greenland: A case study in fear-mongering

- "Greenland ice sheet shrinking fast, NASA," *Reuters*, 10/19/06
  - Greenland losing a net of 27 cubic miles of ice each year.
- NASA press release
  - "detailed satellite measurements to show that ice losses now far surpass ice gains in the shrinking Greenland ice sheet"
  - "With this new analysis we observe dramatic ice mass losses"
  - "Greenland's massive ice sheet has lost nearly 100 gigatons of ice annually recently"
  - "annual net loss of ice equal to nearly six years of average water flow from the Colorado River"
  - No context on actual sea level effects
- What neither NASA scientists nor Reuters say:
  - Annual loss of less than 0.004% of total Greenland ice
  - Equivalent to sea-level rise of about 1.2" per *century*
- Does this sound like catastrophic ice-cap melting?

Catastrophic sea-level rise? (2) Antarctica

- Recent studies suggest Antarctic ice is probably roughly in balance

Antarctic Ice Balance from Recent Studies

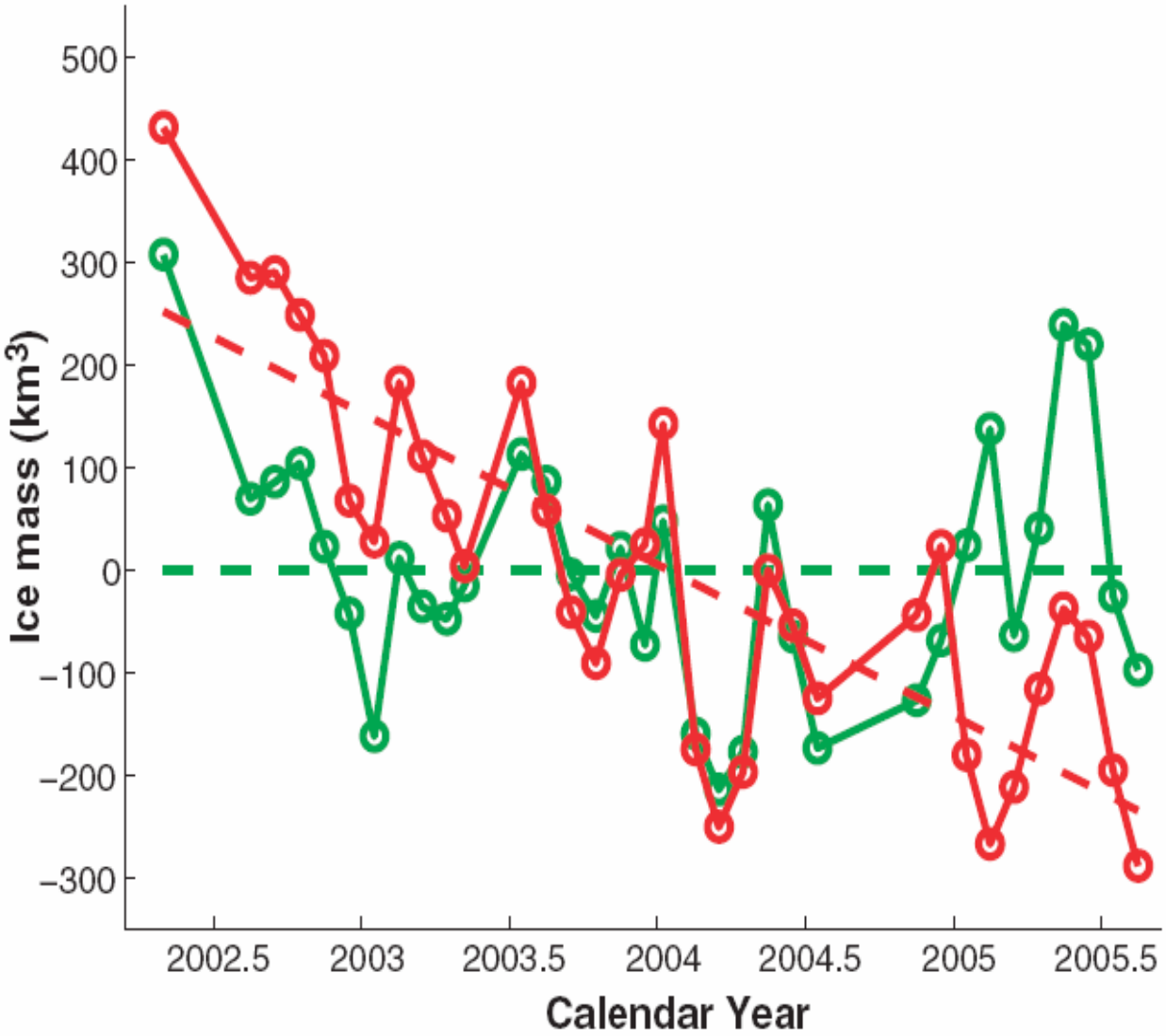
Antarctic ice change* (gigatonnes/year)	Sea-level change* (inches/century)	Source
-60	0.7	Wingham et al., *Science* (1998)
-26	0.3	Rignot & Thomas, *Science* (2002)
45	-0.5	Davis et al., *Science* (2005)
27	-0.3	Wingham et al., *Phil Trans Royal Soc* (2005)

* Negative values mean decreases in ice and sea level, respectively

- "The result [increasing ice mass] exacerbates the difficulty of explaining twentieth century sea-level rise." Wingham et al. (2005)
  - Does this sound like a climate change consensus?
- "Remote satellite platforms offer the only prospect for estimating the sea level contribution due to Antarctica…Today, there are limitations to both the scope and accuracy [of satellite-based approaches]." Wingham et al. (2005)
  - Does this sound like the "science is settled" on sea levels or polar ice?

Recent *Science* paper reports Antarctic is losing ice. But used only three years of data.

Fig. 3. Monthly ice mass changes and their best-fitting linear trends for WAIS (red) and EAIS (green) for April 2002 to August 2005. The GRACE data have been corrected for hydrology leakage and for PGR.

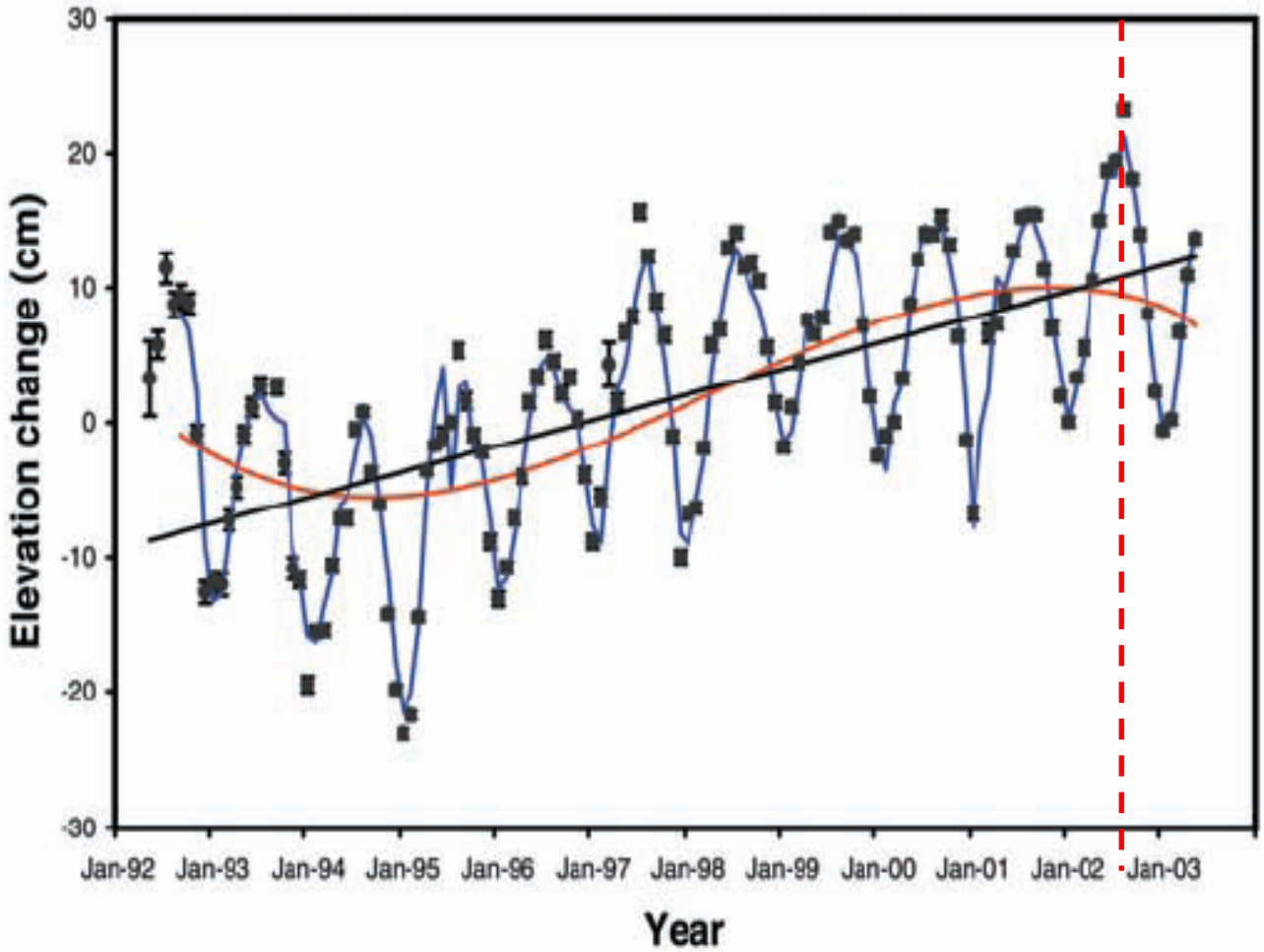


Ice loss rate: Sea-level rise of 1.6” per century.

Source: Velicogna & Wahr, *Science*, 2006

Longer-term data show mid-2002 was a peak for East Antarctic Ice Sheet

Fig. 1. Elevation-change (black circles) time series from 1992 to 2003 for ~7.1 × 10^6 km^2 of the East Antarctic ice-sheet interior. The seasonal and interannual cycle (blue line) and long-term trend (red line) are modeled as described in the text. The average rate of change (black line) for the entire time period is 1.8 cm/year after adjustment for isostatic uplift. A steady increase in elevation since about 1995 is apparent. The average rate of change from 1995 to 2003 is 2.2 cm/year after adjustment for isostatic uplift.



Source: Davis et al., *Science*, 2005

Increased infectious disease?

- From Professor Paul Reiter, mosquito-borne disease specialist, Institut Pasteur, Paris, in a memorandum to the British House of Lords
  - During the little ice age (15th to early 18th Century), "malaria was what we would today call a 'serious public health problem' in many parts of the British Isles, and was endemic, sometimes common throughout Europe as far north as the Baltic and northern Russia… Malaria persisted in many parts of Europe until the advent of DDT."
  - "…malaria is not an exclusively tropical disease, and is not limited by cold winters! Moreover, although temperature is a factor in its transmission…there are many other factors—most of them not associated with weather or climate—that have a much more significant role."
  - "The [IPCC] third assessment report [Human Health Chapter] listed more than 65 lead authors, only one of which—a colleague of mine—was an established authority on vector-borne disease…My colleague and I repeatedly found ourselves at loggerheads with persons who insisted on making authoritative pronouncements, although they had little or no knowledge of our speciality. At the time, we were experiencing similar frustration as Lead Authors of Health Section of the US National Assessment."
  - "It will be interesting to see how the [human] health chapter of the [IPCC's] fourth report is written. Only one of the lead authors has ever been a lead author, and neither has ever published on mosquito-borne disease. Only one of the contributing authors has an extensive bibliography in the field of human health. He is a specialist in industrial health, and all his publications are in Russian. Several of the others have never published any articles at all…both [lead authors] have been co-authors on publications by environmental activists."
- From "Global warming and malaria: A call for accuracy," *Lancet*, June 2004
  - "much of the decline of malaria in Europe took place without control measures during a period when the climate was warming."
  - "We understand public anxiety about climate change, but are concerned that many of these much publicised predictions are ill informed and misleading."

Is there a scientific “consensus” on climate change?

- Many observations and analyses are not compatible with (1) anthropogenic greenhouse warming theory, (2) climate model results, and/or (3) alarming claims by regulators, activists, journalists, and scientists
  - see above for a few examples
- But there are more reasons to distrust claims of “consensus”

Just what is there consensus about?

- Level of consensus changes based on the claims being made
  - Climate is warming
  - Human GHG emissions are (major; minor; insignificant) cause
  - Climate will warm (1^{o}C; 2^{o}C; 5^{o}C) during the 21st Century
  - Warming will cause (tiny; great; catastrophic) harm
  - We should (increase energy efficiency; (lightly; heavily) tax carbon; enact (mild; strong) rationing on fossil-fuel energy use
- Ambiguous use of “consensus”
  - Calling it all “consensus” creates a false appearance that “consensus” applies to the most extreme and scary claims.
  - In fact, the most extreme claims are where you’ll find the *least* consensus

Is there a consensus? (1) Jim Hansen

- "The IPCC predilection for exaggerated growth rates of population, energy intensity, and pollution calls into question the realism of their results." – Hansen, *Natural Science*, 2003
  - But you need those "exaggerated growth rates" to get high GHG emissions that the models need to predict large temperature increases
- "Future global warming can be predicted much more accurately than is generally realized…we predict additional warming in the next 50 years of ¾ºC ± ¼ºC, a warming rate of 0.15ºC ± 0.05ºC per decade." Hansen et al., *Proc Nat'l Acad Sci*, 2001
  - Assumes current emissions growth rate continues unchanged
  - This is *one-fourth* the top rate of warming projected by the IPCC's third assessment
  - So just what is there "consensus" on? Certainly not on the most extreme scenarios.
- "Emphasis on extreme scenarios may have been appropriate at one time, when the public and decision-makers were relatively unaware of the global warming issue. Now, however, the need is for demonstrably objective climate…scenarios consistent with what is realistic under current conditions." –Hansen, *Natural Science*, 2003

Consensus? (2) *NY Times* article

"In Ancient Fossils, Seeds of a New Debate on Warming," *New York Times*, November 7, 2006

> [Robert Giegengack, geologist at U. of Penn.] and other doubters say the planet is clearly warming today, as it has repeatedly done, but insist that no one knows exactly why. Other possible causes…include changes in sea currents, Sun cycles and cosmic rays that bombard the planet.
>
> Jan Veizer, an expert on Phanerozoic climates at the University of Ottawa, said, [data] "point to the Sun and stars as the dominant driver."
>
> If carbon dioxide concentrations double from preindustrial levels…Many climatologists see an increase of as much as 8 degrees Fahrenheit. The skeptics, drawing on Phanerozoic data, tend to see far less, perhaps 2 or 3 degrees.
>
> The Phanerozoic dispute, fought mainly in scholarly journals and scientific meetings, has occurred in isolation from the public debate on global warming. Al Gore in "An Inconvenient Truth" makes no mention of it.
>
> Skeptics say CO2 crusaders simply find the Phanerozoic data embarrassing and irreconcilable with public alarms. "People come to me and say, 'Stop talking like this, you're hurting the cause,'" said Dr. Giegengack.

New York Times, November 7, 2006 (continued)

In 1992, a team from the University of New Mexico reported that ancient soils showed…carbon dioxide 440 million years ago…roughly 16 times higher than today. Surprisingly, the scientists said, this appeared to coincide with wide glaciation…

In 2002, Daniel H. Rothman of the Massachusetts Institute of Technology also raised sharp Phanerozoic questions after studying carbon dioxide clues teased from marine rocks. Writing in The *Proceedings of the National Academy of Sciences* he said that with one exception — the recent cool period of the last 50 million years — he could find "no systematic correspondence" between carbon dioxide and climate shifts.

In 2003, Dr. Veizer joined Nir J. Shaviv, an astrophysicist at the Hebrew University of Jerusalem, to propose a new climate driver...The Phanerozoic record of cosmic-ray bombardment showed excellent agreement with climate fluctuations, trumping carbon dioxide, they wrote.

Carbon dioxide skeptics and others see the reconstructions [of past climate] of the last 15 years as increasingly reliable, posing fundamental questions about the claimed powers of carbon dioxide. Climatologists and policy makers, they say, need to ponder such complexities rather than trying to ignore or dismiss the unexpected findings.

Consensus? (3) Scientists resign from government climate panels

- Roger Pielke, Sr., a Colorado State climate scientist, resigned from a US Climate Change Science Program panel after the editor of a report on surface vs. atmosphere temperature trends removed and replaced the chapter that Pielke was in charge of (that report is discussed in slide #6)
  - "The process that produced the report was highly political, with the Editor taking the lead in suppressing my perspectives, most egregiously demonstrated by the last-minute substitution of a new Chapter 6…[This] enforced the narrow perspective of the Chair of the Committee." Roger Pielke, Sr., 1/4/06
- Chris Landsea, a NOAA hurricane expert, resigned from the Intergovernmental Panel on Climate Change (IPCC), charging that IPCC leaders exaggerate the influence of global warming on hurricanes.
  - "I am withdrawing because I have come to view the part of the IPCC to which my expertise is relevant as having become politicized. In addition, when I have raised my concerns to the IPCC leadership, their response was simply to dismiss my concerns." Landsea, 1/17/05

Consensus? (4) A mainstream climate scientist criticizes alarmism and extremism

Mike Hulme, Director, Tyndall Centre for Climate Change Research (UK)

"Climate change is a reality, and science confirms that human activities are heavily implicated in this change. But over the last few years a new environmental phenomenon has been constructed in this country - the phenomenon of catastrophic' climate change.

It seems that mere 'climate change' was not going to be bad enough, and so now it must be 'catastrophic' to be worthy of attention. The increasing use of this pejorative term - and its bedfellow qualifiers 'chaotic', 'irreversible', 'rapid' - has altered the public discourse around climate change.

This discourse is now characterised by phrases such as 'climate change is worse than we thought', that we are approaching 'irreversible tipping in the Earth's climate', and that we are 'at the point of no return'.

I have found myself increasingly chastised by climate change campaigners when my public statements and lectures on climate change have not satisfied their thirst for environmental drama and exaggerated rhetoric. It seems that it is we, the professional climate scientists, who are now the (catastrophe) sceptics. How the wheel turns.

Why is it not just campaigners, but politicians and scientists too, who are openly confusing the language of fear, terror and disaster with the observable physical reality of climate change, actively ignoring the careful hedging which surrounds science's predictions?

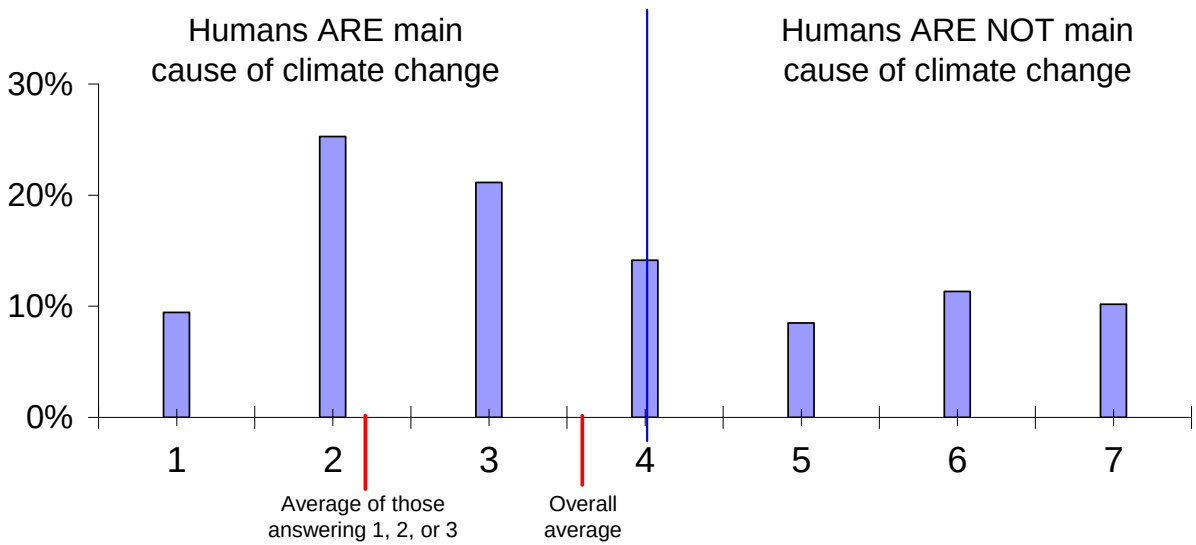
the discourse of catastrophe allows some space for the retrenchment [i.e., an increase] of science budgets. It is a short step from claiming these catastrophic risks have physical reality, saliency and are imminent, to implying that one more 'big push' of funding will allow science to quantify them objectively.

To state that climate change will be 'catastrophic' hides a cascade of value-laden assumptions which do not emerge from empirical or theoretical science."

Mike Hulme, *BBC News*, November 4, 2006

Consensus? (5) Not in a survey of climate scientists

- "To what extent do you agree or disagree that climate change is mostly the result of anthropogenic causes? A value of 1 indicates 'strongly agree' and a value of 7 indicates 'strongly disagree'"
  - May have been response bias favoring skeptics
  - But even among those who agree climate change is mostly human-caused (answer = 1, 2, or 3), the vast majority answered 2 or 3, indicating only "medium" or "slight" agreement.



Source: Bray, 2004

Does it matter if there's a consensus?

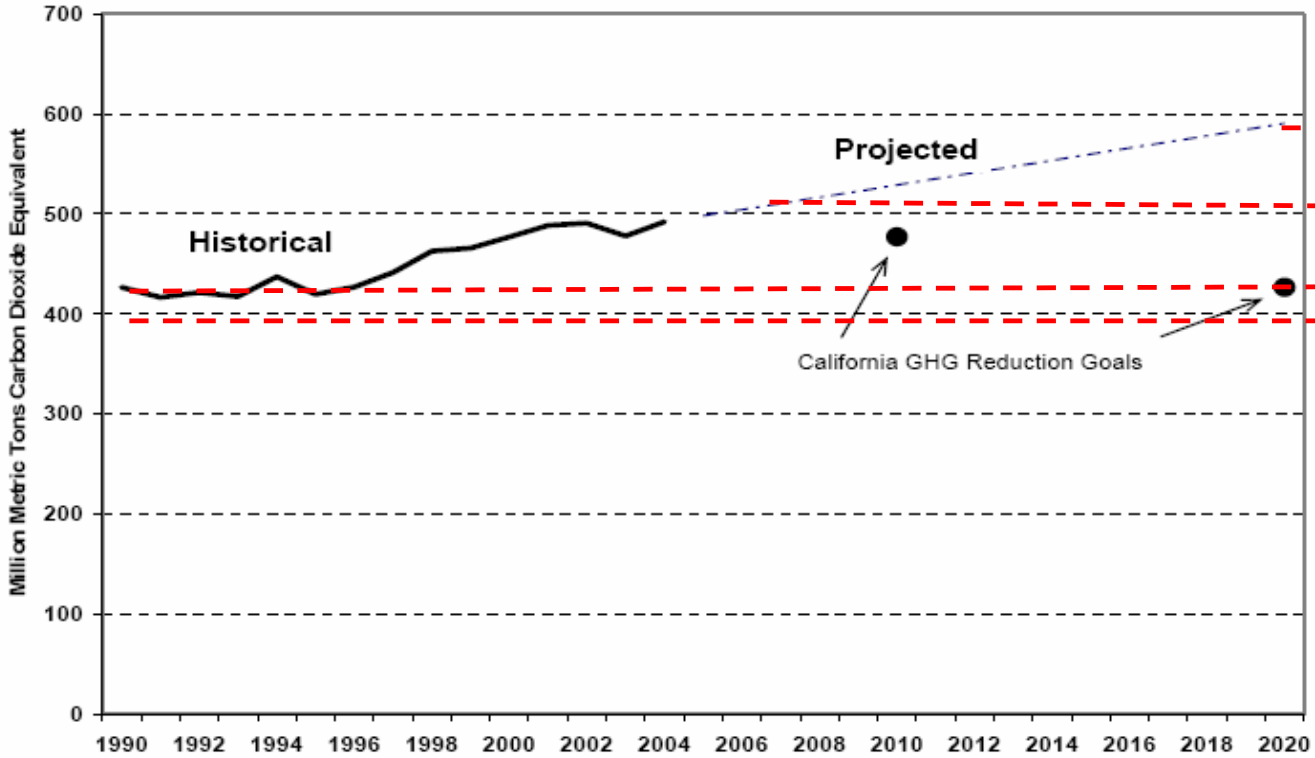
- Confirmation and falsification of scientific hypotheses and models are not symmetric activities
  - Repeated confirmations make a hypothesis more likely to be true.
  - But it takes only one incompatible or conflicting observation to sink a model or theory

What does all this mean in the context of California's greenhouse activism?

- Governor Schwarzenegger: "the debate [over human-caused global warming] is over. We know the science, we see the threat and we know the time for action is now."
- California's political rush into AB 1493 and AB 32 was driven by wish (and a Governor's reelection strategy) rather than reality.
- But we're stuck with AB 1493 and AB 32, at least for now
  - What will it mean for Californians' health, welfare, and prosperity?

AB 32 Requires 27% reduction below 2020 BAU

Figure 12 -- Historical and Projected California GHG Emissions
(Includes electricity imports and excludes international bunker fuels)



AB 32 target:

15% below 2006

27% below 2020

Source: California Energy Commission

Source: CEC, 2006

Also realize that stabilizing global GHG concentrations even at *current* levels will require much larger worldwide percentage reductions in GHGs than AB 32 or Kyoto require.

Unlike Kyoto, AB 32 has teeth!

- Europe's CO2 emissions continue to grow in spite of Kyoto. Most EU countries expect to exceed their Kyoto GHG targets by a large margin. Canada and Japan say they'll exceed their targets too.
  - Kyoto has no real enforcement mechanism and governments have been unwilling to impose the costs and restrictions on their citizens that would be necessary to meet Kyoto targets.
- AB 32 is different. The target is a law. The regulatory mechanism is under the control of the most powerful air regulatory agency in the world.
  - If California really goes through with AB 32, it will require imposing substantial costs and lifestyle restrictions on Californians
  - Potential alternatives
    - Invoke safety valve, raise or eliminate GHG cap
    - ZEV approach: Impose lots of convoluted requirements that create a patina of doing something without actually reducing emissions and then declare victory.

Climate activists claim GHG reduction mandates will increase Californians' incomes

- Governor's climate action team:
  $4 billion net increase in GSP in 2020 from AB 32 target
- UC Berkeley Climate Change Center:
  $74 billion/year net increase in GSP in 2020 ($1,700/year per person!) from AB 32 target
  - Due mainly to energy efficiency savings and new technologies
- CARB: $1,700 NPV savings per new car for AB 1493 (30% automobile GHG reduction)

What would have to be true for government-imposed GHG reductions to make people better off?

- $74 billion is just sitting on the table, waiting to be claimed through energy efficiency and technological advancement. But America's entrepreneurs and venture capitalists are refusing to claim these riches. In other words, California regulators need to adopt mandatory GHG controls in order to overcome capitalists' stubborn refusal to get rich.
- Regulators, legislators, and UC Berkeley professors know more than businesspeople, entrepreneurs, and investors about the best way to deploy capital to maximize wealth and investment returns.
- Every time a car is sold in California, motorists worried about gasoline costs and automakers in cut-throat competition for market share are nevertheless leaving $1,700 sitting on the table. They need government regulators to show them how to achieve these savings.
- These are ridiculous claims, yet this is what we have to believe if we assume that forced GHG reductions will make Californians wealthier.
- Actually, there's one other possibility: maybe there are some GHG reductions that would save money on net, but there are laws or regulations that stand in the way.
  - But if that's true, the appropriate policy response is for the government to get out of the way, rather than to impose GHG caps that will make people worse off.

The fallacy of job creation and economic growth through regulation

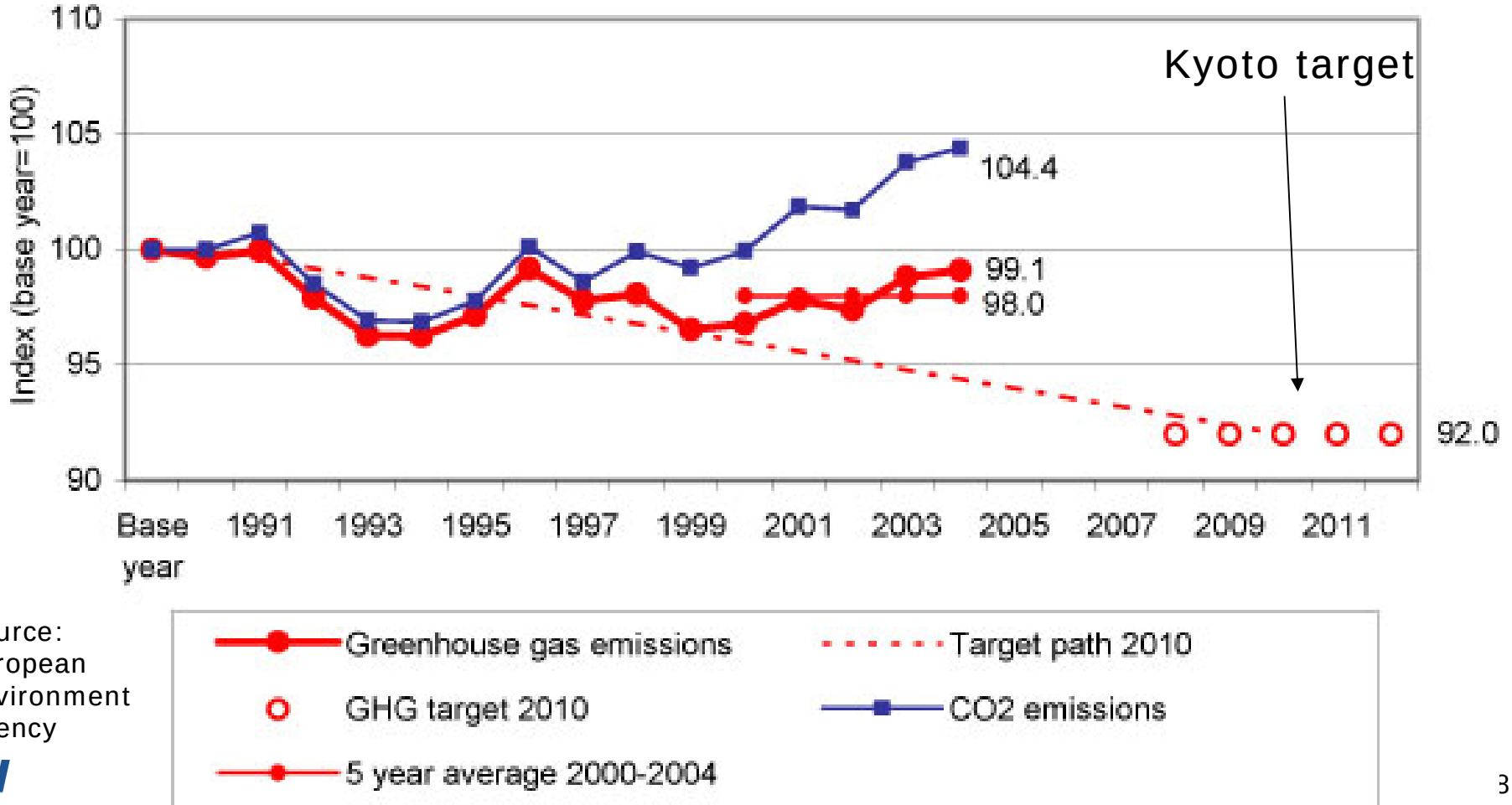
"In short, if we can rise to the challenge, the permanent abolition of the wheel would have the marvelously synergistic effect of creating thousands of new jobs—as blacksmiths, farriers, grooms and so on—at the same time as it conserved energy and saved the planet from otherwise inevitable devastation."

— Catherine Bennett, *The Guardian* (UK), 2004

We’re kidding ourselves if we think reducing CA’s GHG emissions, or even substantially slowing emissions growth, is not going to require substantial sacrifices

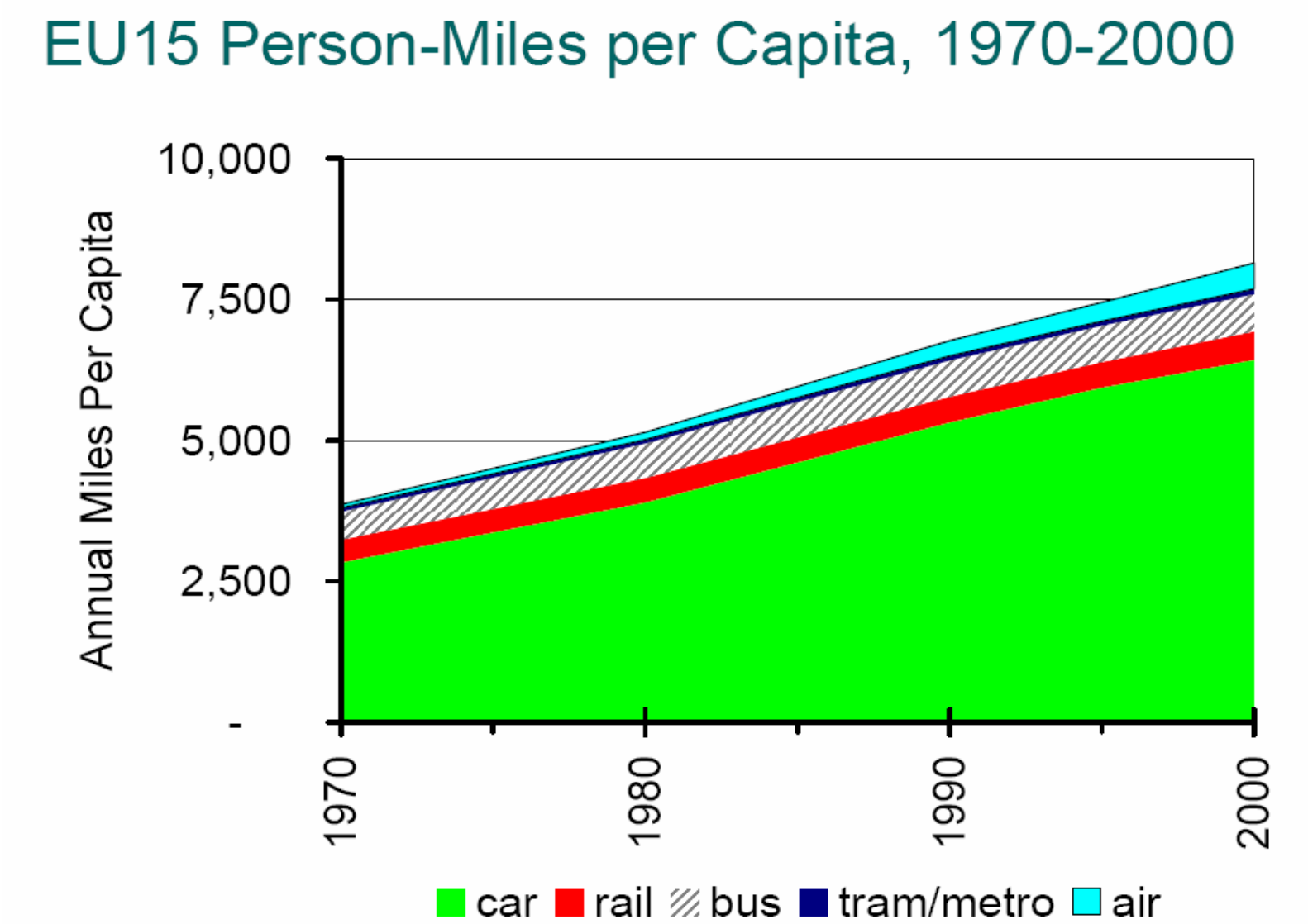
Europeans already know this. Their GHG emissions continue to rise.

It's hard to give up the prosperity and quality-of-life brought by fossil fuel energy



Source: European Environment Agency

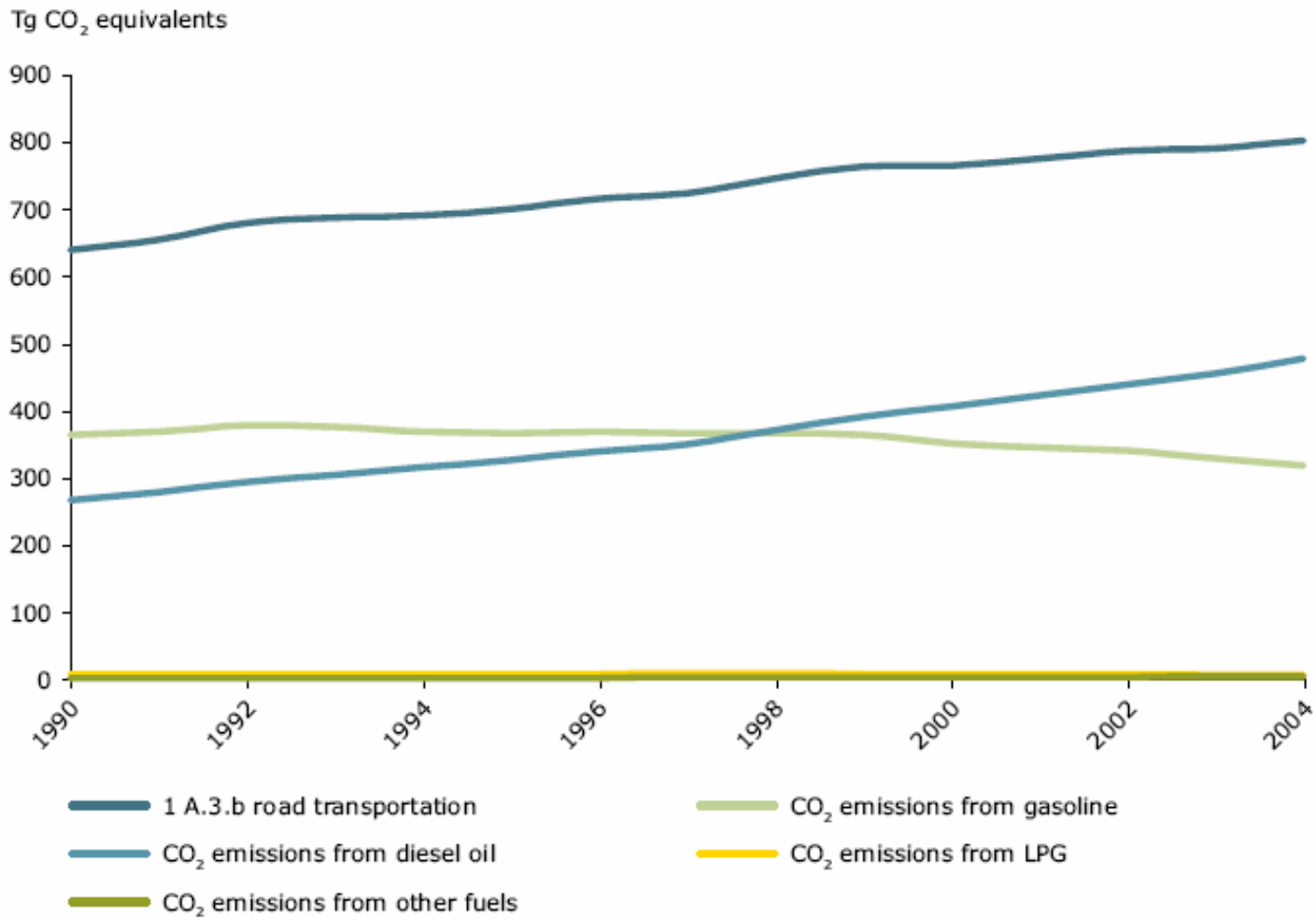
Europeans like car and air travel too



Source: European Environment Agency

Europe's Road GHG Emissions Continue to Rise

Figure 3.45 CO_2 Emission trend from 1.A.3.b 'Road transport'

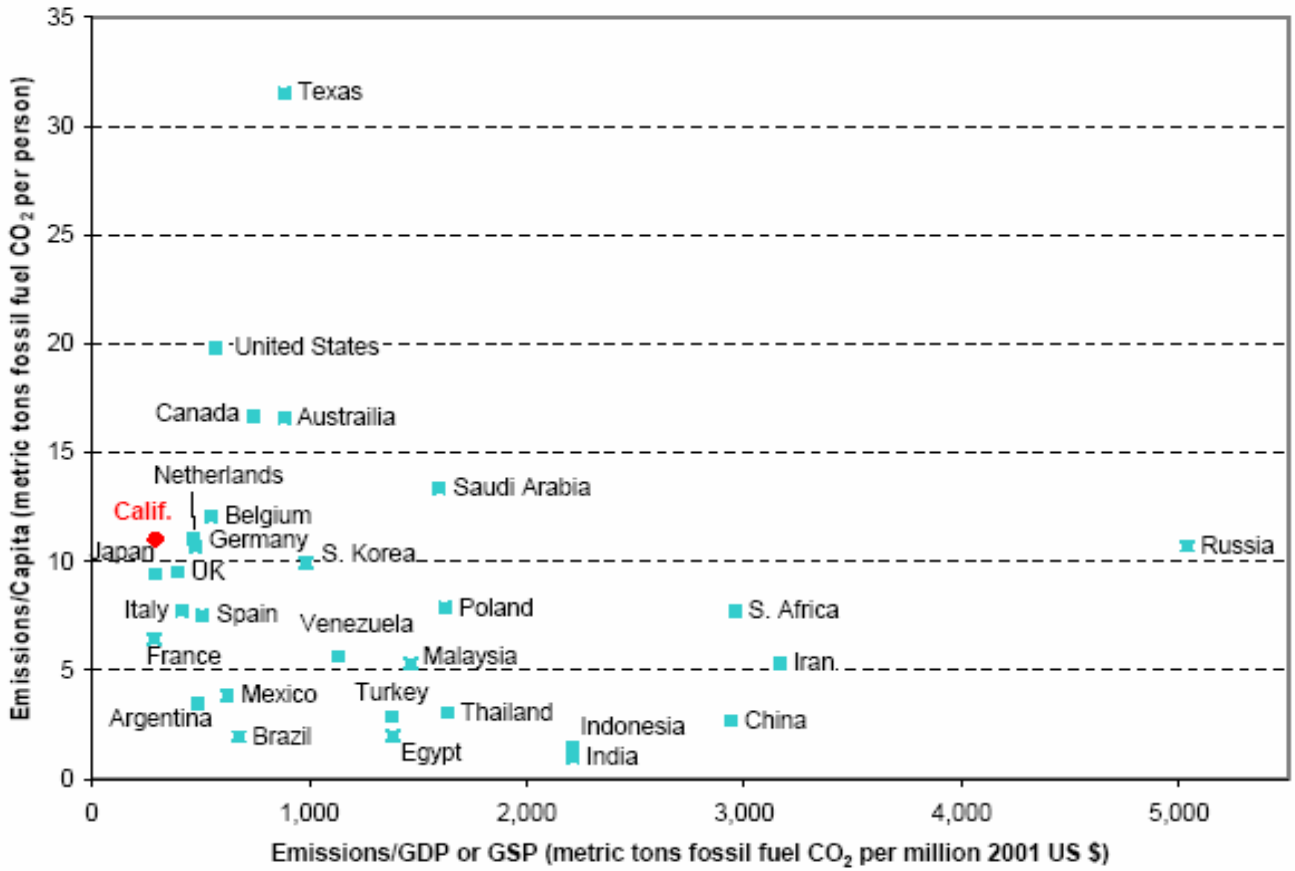


CO2 emissions from road transport, 1990-2004

Source: European Environment Agency

CA already has low GHG emissions/person

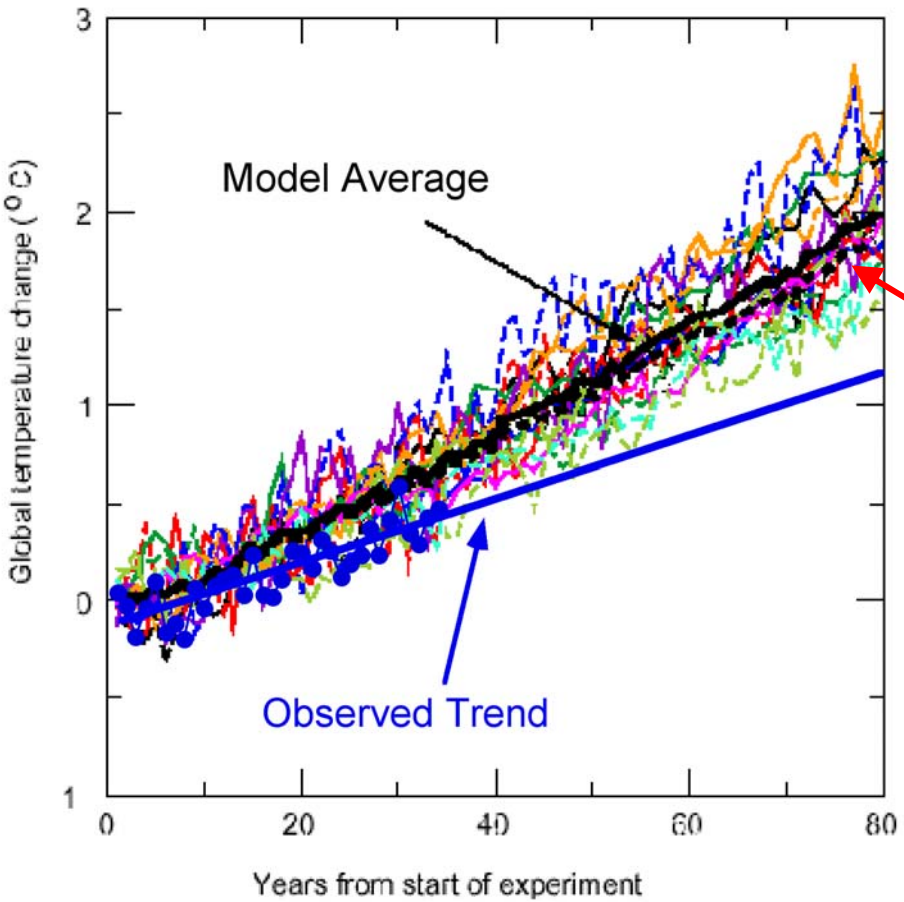
Figure 11 – 2001 Emissions Intensities for California, Texas and Top 30 GHG Emitting Countries



Source: California Energy Commission (country data from World Resources Institute and United Nations; state data from U.S. EPA and U.S. Department of Commerce)

Source:
CEC, 2006

And remember that Kyoto, even if fully implemented, would eliminate only 0.07ºC of warming in 2050



Stabilizing atmospheric GHGs at *current* concentrations would require several Kyotos

Kyoto's modeled effect on temperature (dashed black line)

Source: Pat Michaels and Meehl et al., 2000

Inexpensive energy is the “master resource”

- Fossil fuel energy is among cheapest to produce, transport, and use. Alternatives are still much more expensive.
- Energy gives us choices in where and how we live and work by giving us the freedom to travel when we want and where we want.
- Energy is fundamental for creating and enhancing wealth
  - Increasing productivity; Developing new technologies; Transporting goods
- Energy underlies continuing improvements in health and welfare in the U.S. and around the world.
- These realities are why wealthy countries are loath to restrict fossil-fuel energy and why developing countries are rapidly increasing fossil-fuel energy use.

Environmentalism: The real agenda is…

- Less of everything: less energy, fewer choices, less freedom
- Environmentalists in their own words
  - "Isn't the only hope for the planet that the industrialized civilizations collapse? Isn't our responsibility to bring that about?" – Maurice Strong, Secretary General of the 1992 UN Conference on Environment and Development (the "Earth Summit") held in Rio de Janeiro.
  - Human happiness [is] not as important as a wild and healthy planet…It is cosmically unlikely that the developed world will choose to end its orgy of fossil-energy consumption, and the Third World its suicidal consumption of landscape. Until such time as Homo sapiens should decide to rejoin nature, some of us can only hope for the right virus to come along. – David Graber, Forest Service Biologist, *Los Angeles Times*, 10/22/89
  - "What we've got to do in energy conservation is try to ride the global warming issue. Even if the theory of global warming is wrong, to have approached global warming as if it is real means energy conservation, so we will be doing the right thing anyway in terms of economic policy and environmental policy." —Timothy Wirth, former Senator, 1988

- “The only hope for the world is to make sure there is not another United States: We can’t let other countries have the same number of cars, the amount of industrialization, we have in the U.S. We have to stop these Third World countries right where they are. And it is important to the rest of the world to make sure that they don’t suffer economically by virtue of our stopping them.”

  —Michael Oppenheimer, Environmental Defense Fund
- “As long as it [carbon storage] doesn't displace support for efficiency and renewable energy programs,’ said David Hawkins of the Natural Resources Defense Council. ‘The first line of defense should be minimizing the creation of CO2 in the first place.’"
  – David Hawkins, NRDC, New York Times, 6/17/01
- "Giving society cheap, abundant energy would be the equivalent of giving an idiot child a machine gun." — Paul Ehrlich, Stanford Professor
- “it’d be a little short of disastrous for us to discover a source of clean, cheap, abundant energy because of what we would do with it. We ought to be looking for energy sources that are adequate for our needs, but that won’t give us the excesses of concentrated energy with which we could do mischief to the earth or to each other.” — Amory Lovins, The Mother Earth–Plowboy Interview, Nov/Dec 1977, p.22

The path of resilience: Let's not shoot ourselves in the foot

- Climate alarmists want us to buy an insurance policy likely to cost nearly as much as the "house" we're trying to protect
  - Yet if the IPCC models are right, the most probable outcome is mild climate change.
  - Many research results conflict with "orthodox" greenhouse theory, suggesting our understanding of what's driving the climate is relatively limited and that factors unrelated to human GHG emissions are the major drivers of climate.
  - This creates a substantial risk that measures intended to reduce climate change will fail.
  - And remember that environmentalists have a larger social agenda of energy restriction and paternalism geared toward overriding people's real preferences and aspirations. Climate change activism is just the latest manifestation of this larger social agenda.
- A better way: build societal resilience by
  - Taking "no regrets" actions—things you should do anyway, regardless of climate change concerns
  - Encouraging continued economic growth. Greater wealth and improved technology means greater ability to deal with both foreseen and unforeseen risks.

Don’t give up the fight

- Dozens of studies have presented climate observations that conflict with predictions of human-caused greenhouse theory and more appear every month
- Human GHG emissions are causing less warming and less harm than you’ve been led to believe
- There really isn’t a “consensus” among scientists on the catastrophe scenarios that are driving the current rush into bad policies. In any case, it’s the observations that matter, not the consensus.
- The politics of climate change activism are inimical to humankind’s prosperity, health, safety, and freedom.

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