

Some Thoughts on Global Warming

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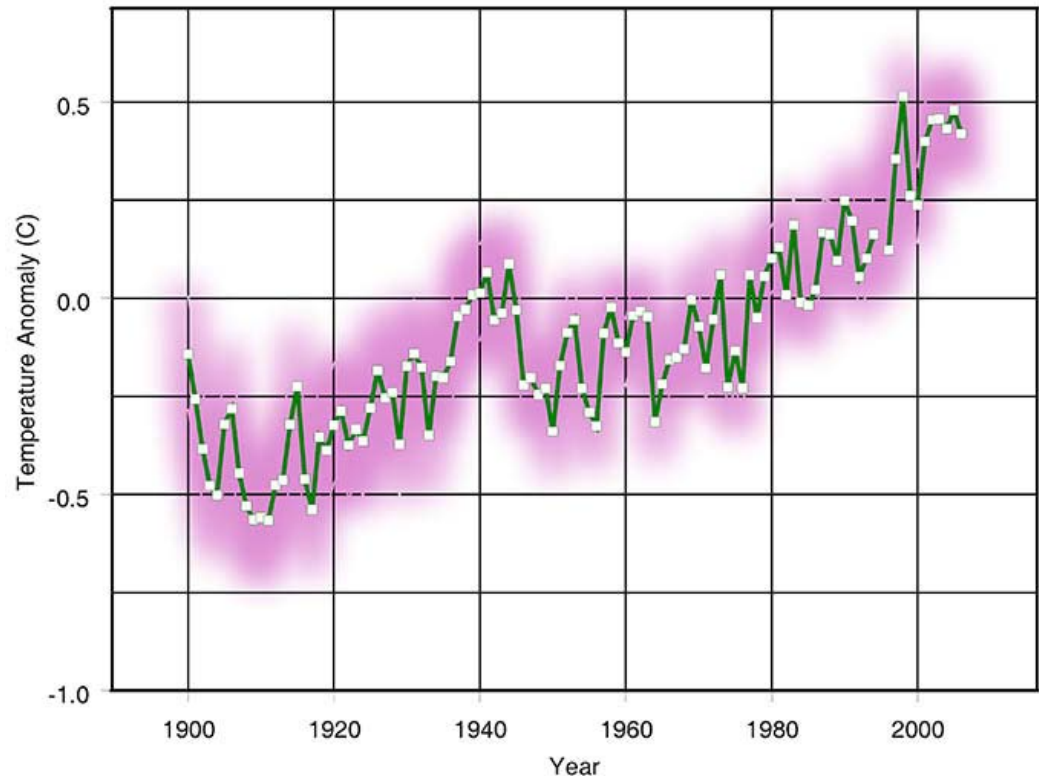
A pdf file of these slides is available on request from rlindzen@mit.edu

What is Global Warming?

'Global warming' generally refers to the increase with time of the globally averaged surface temperature. Since the earth is always warming or cooling, global warming is not usually considered exceptional. In the instrumental record we see two periods of comparable warming (1919-1940 and 1976-1997), and one period of minor cooling (1940-1976). Over the last century, warming has amounted to between about 0.6 and 0.8C. It doesn't pay to argue about the difference between different analyses of the same data since the uncertainty is on the order of at least 0.2C.

**Global Mean Temperature Anomaly (UK Met. Office)
1900-2006**

Uncertainty bounds estimated by UK Met. Office shown in purple



The line represents the actual measurements; the purple fuzz represents the stated uncertainty.

Is this what the public discourse is about?

In part – but only in relatively small part.

In fact, there are three crucial aspects of the public discourse, and they are largely ***disconnected:***

- 1. Global warming itself***
- 2. Climate catastrophes***
- 3. Mitigation policies***

Understanding the nature of these disconnects is more important, I suspect, than understanding the science.

Aspect 1: Global warming itself

Global Warming is, itself, the product of many factors, and its relevance to anything else depends on its ***magnitude***.

Emissions of minor greenhouse gases is a factor, but only one factor (and probably not the most important) among several.

What are other factors? The sun is commonly mentioned, but the fact of the matter is that the climate system does not need any external forcing to fluctuate on the scale that has been observed. The ocean, by constantly but irregularly exchanging heat between deeper and shallower regions is always out of equilibrium with the surface, thus serving as a large source or sink of energy for the atmosphere. In the literature, this variability goes by names like El Niño, the Pacific Decadal Oscillation, and the Atlantic Multi-Decadal Oscillation.

As you can see from the names, ocean processes operate on time scales that are on the order of the length of our instrumental record – and longer.

Don't forget that climate is always changing – and on virtually all time scales.

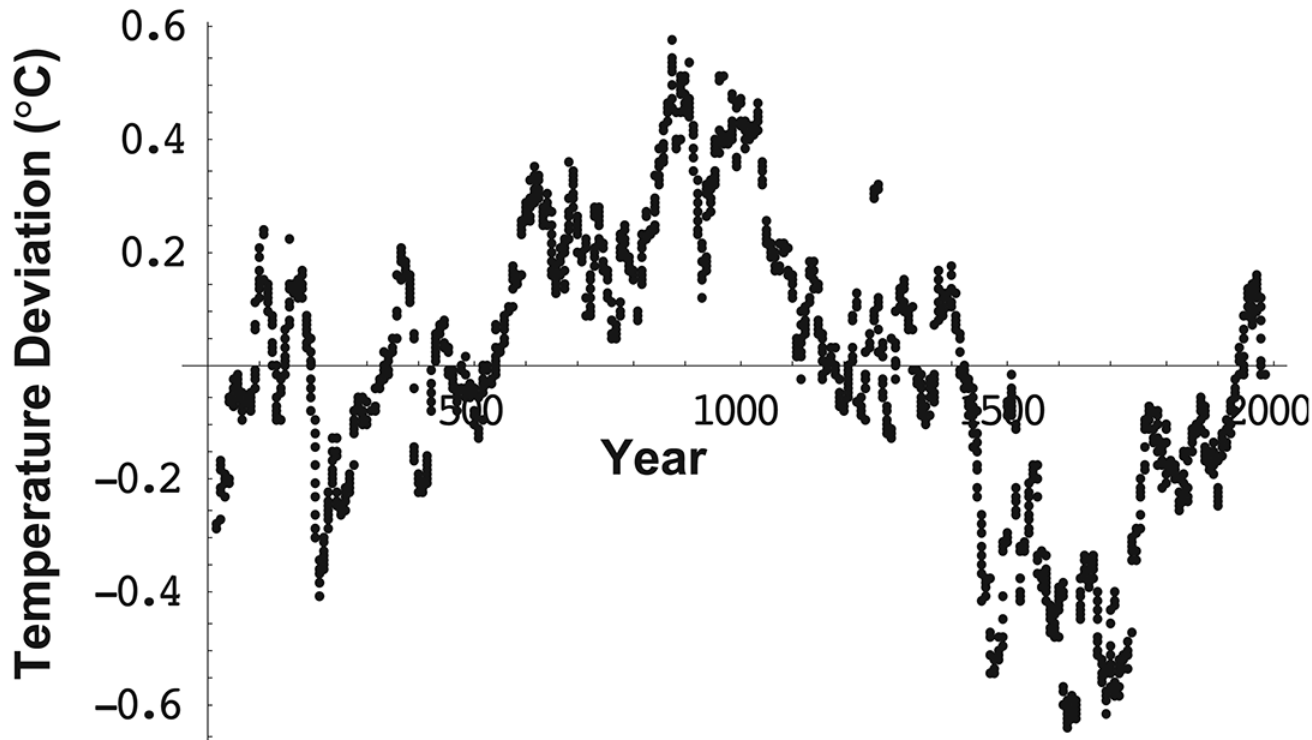


Figure 1. Mean of temperature data for 18 series.

Data archived at <http://www.ncasi.org/programs/areas/climate/LoehleE&E2007.csv>

Here is a recent paleoreconstruction for the past 2000 years.

Most presentations focus on the last 100 years or so (and show the modest warming that we are talking about), but in the context of the past 2000 years, the last 100 years do not appear exceptional.

Data used for reconstruction of temperature history:

The series used were: GRIP borehole ^{18}O temperature (Dahl-Jensen et al., 1998); Conroy Lake pollen (Gajewski, 1988); Chesapeake Bay Mg/Ca (Cronin et al., 2003); Sargasso Sea ^{18}O (Keigwin, 1996); Caribbean Sea ^{18}O (Nyberg et al., 2002); Lake Tsuolbmajavri diatoms (Korhola et al., 2000); Shihua Cave layer thickness (Tan et al., 2003); China composite (Yang et al., 2002) which does use tree ring width for two out of the eight series that are averaged to get the composite, or 1.4% of the total data input to the mean computed below; speleothem data from a South African cave (Holmgren et al., 1999); SST variations (warm season) off West Africa (deMenocal et al., 2000); SST from the southeast Atlantic (Farmer et al., 2005); SST reconstruction in the Norwegian Sea (Calvo et al., 2002); SST from two cores in the western tropical Pacific (Stott et al., 2004); mean temperature for North America based on pollen profiles (Viau et al., 2006); a phenology-based reconstruction from China (Ge et al., 2003); annual mean SST for northern Pacific site SSDP-102 (Latitude 34.9530, Longitude 128.8810) from Kim et al. (2004); and Spannagel Cave (Central Alps) stalagmite oxygen isotope data (Mangini et al., 2005). This gave a total of eighteen series with quite wide geographic coverage (including tropical) and based on multiple proxies.

Note that tree ring records were intentionally avoided.

Gore attempts to demonstrate CO₂ is the major causal factor in climate by means of an example that violates one of the main canons of scientific discourse: namely, that correlation is not causality.

The gray line shows the world's temperature over the same 650,000 years.

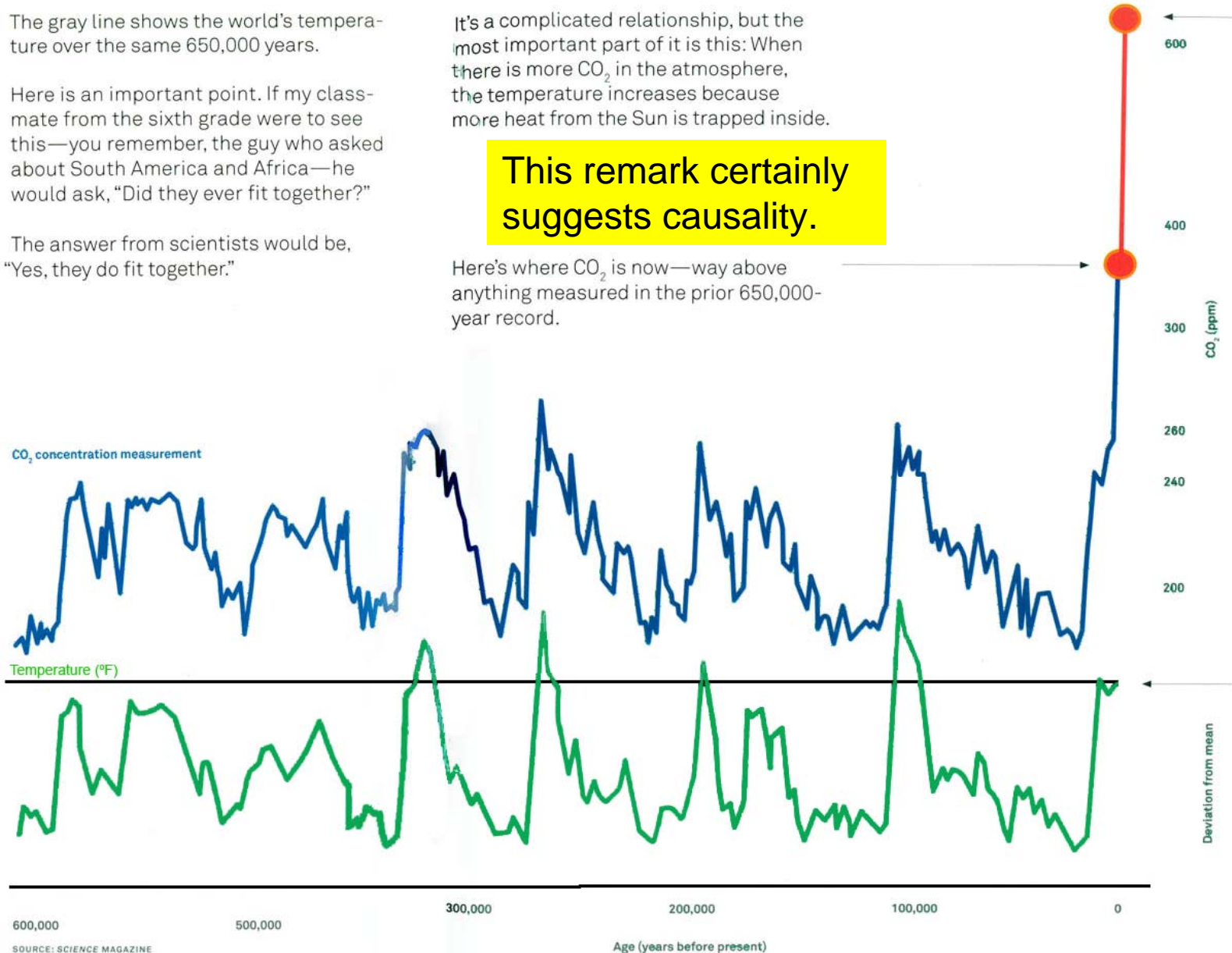
Here is an important point. If my classmate from the sixth grade were to see this—you remember, the guy who asked about South America and Africa—he would ask, “Did they ever fit together?”

The answer from scientists would be, “Yes, they do fit together.”

It's a complicated relationship, but the most important part of it is this: When there is more CO₂ in the atmosphere, the temperature increases because more heat from the Sun is trapped inside.

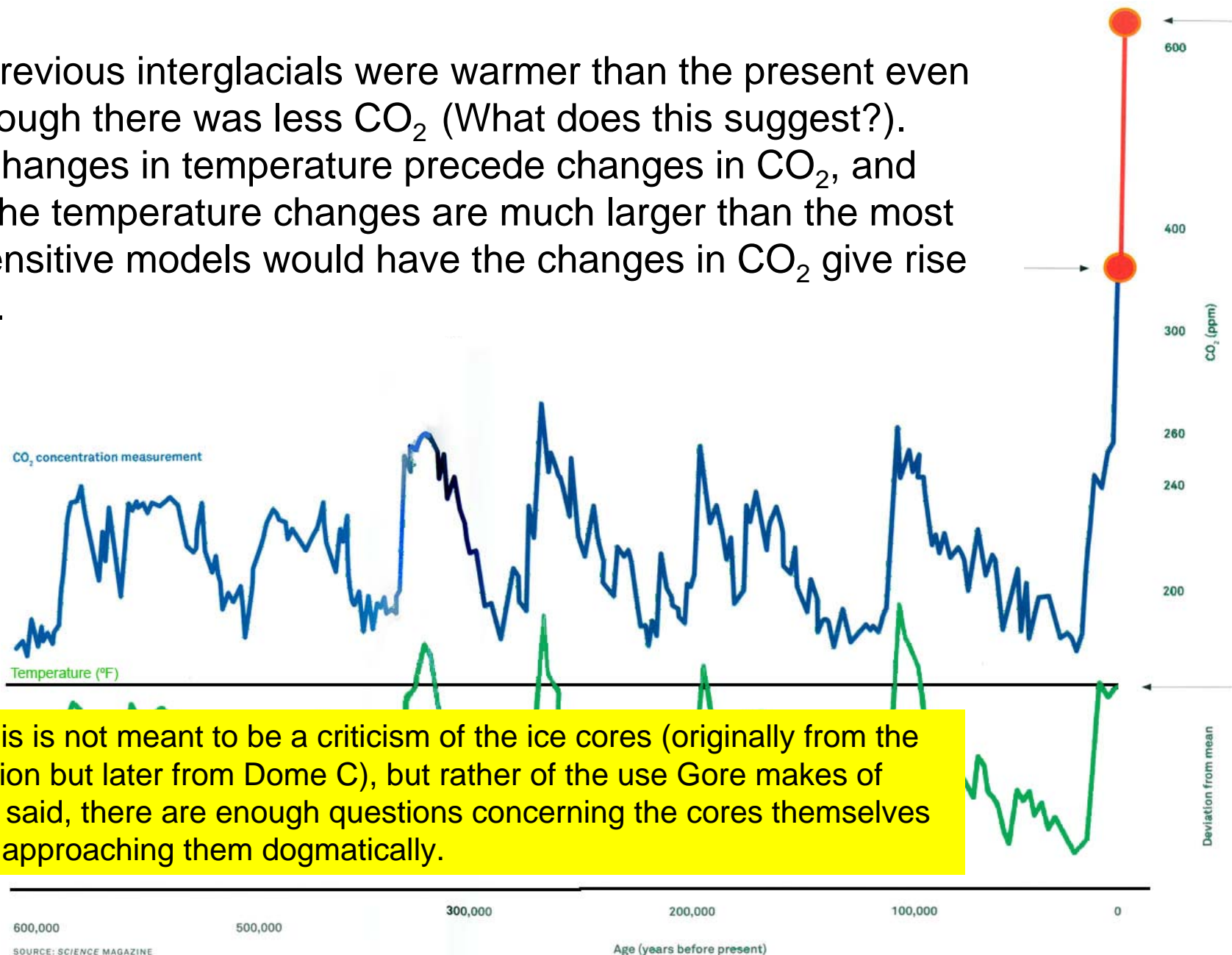
This remark certainly suggests causality.

Here's where CO₂ is now—way above anything measured in the prior 650,000-year record.



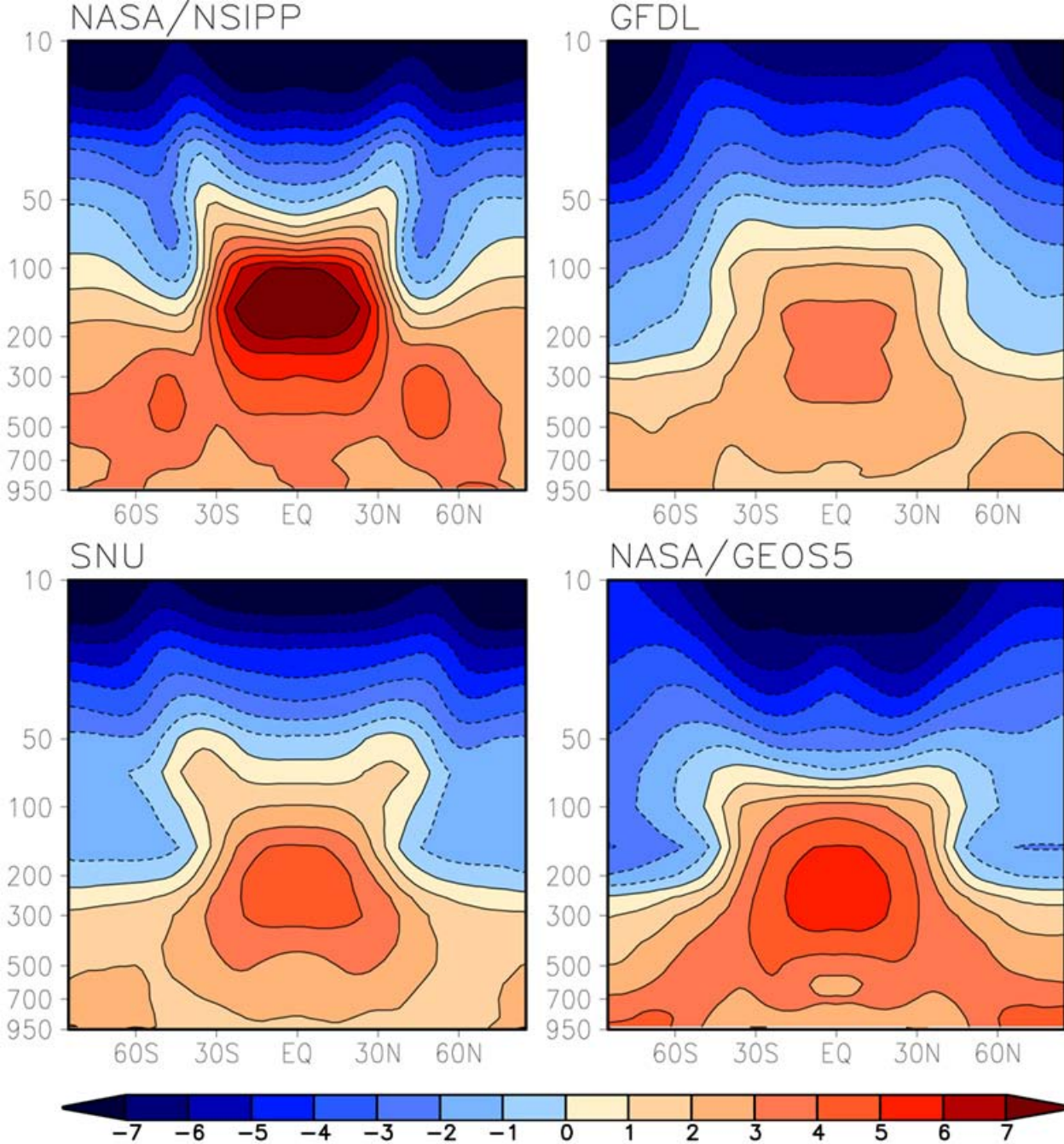
He fails to note that

- Previous interglacials were warmer than the present even though there was less CO₂ (What does this suggest?).
- Changes in temperature precede changes in CO₂, and
- The temperature changes are much larger than the most sensitive models would have the changes in CO₂ give rise to.



Note that this is not meant to be a criticism of the ice cores (originally from the Vostok Station but later from Dome C), but rather of the use Gore makes of them. That said, there are enough questions concerning the cores themselves to preclude approaching them dogmatically.

Contrary to what has been suggested, the science behind the picture of 'dangerous' global warming is hardly simple. Time does not permit going into detail, but a crucial methodological principle is that ***any prediction (especially a fundamental prediction) must be testable.***

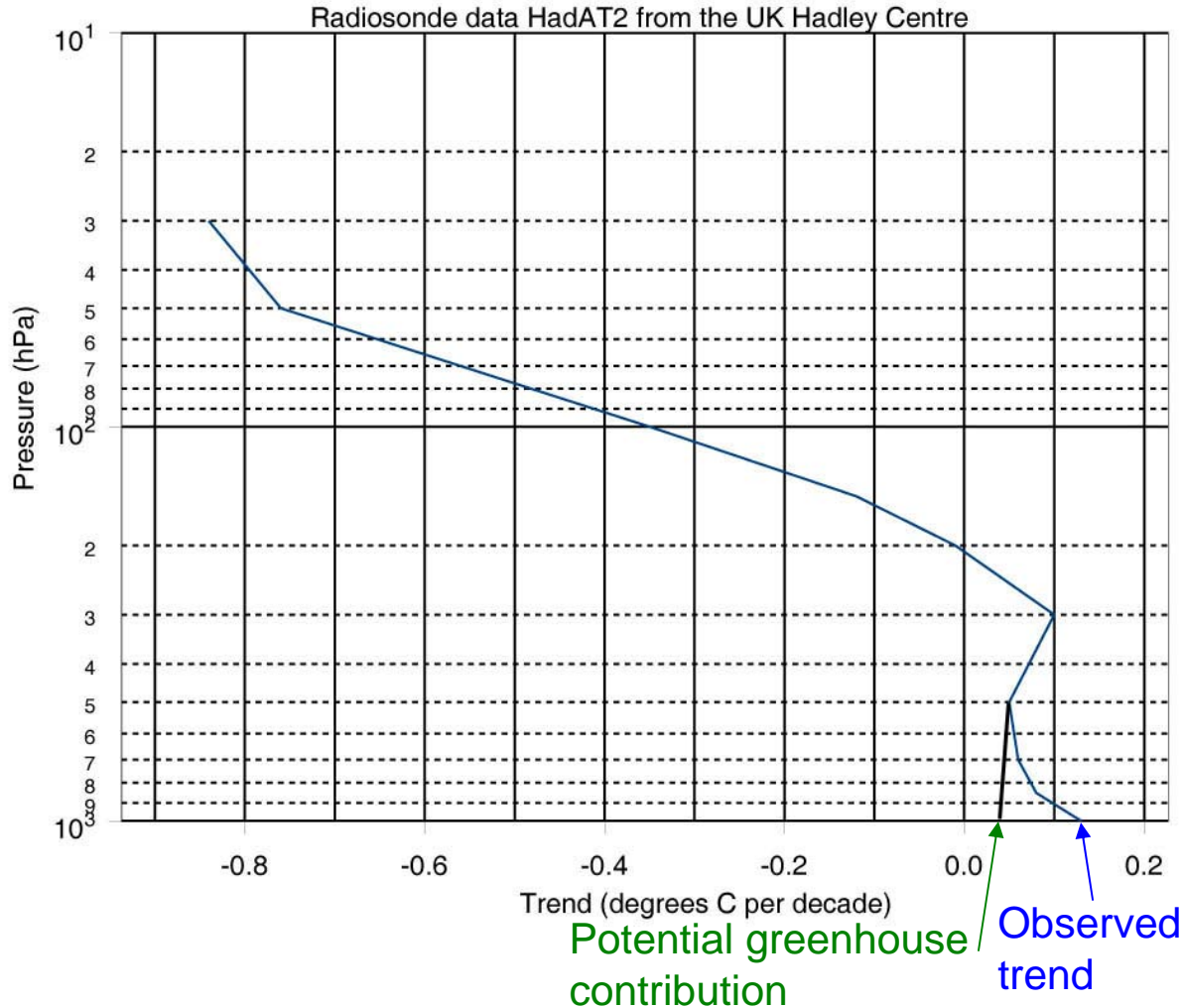


Here are very recent results for four state of the art models subject to a doubling of CO₂ (Lee et al 2007). Despite differences between the models, all show that warming is strongly concentrated in the tropical troposphere rather than at the surface. This is, in fact, ***the real fingerprint of greenhouse warming***. Although each model has a different sensitivity, **they all show about 2.5 times as much warming at the characteristic emission level than at the surface.** This is far more robust than the oft claimed polar magnification.

Zonal mean distributions of temperature change (2×CO₂–Control). Units are Kelvin.

What does the data show?

Temperature trend between 1979 and 2006 for 20S to 20N



Here are the measured trends from balloon data analyzed by the Hadley Centre in the U.K. We do see a local maximum near the characteristic emission level (of about 0.1C/decade, but the trend at the surface is larger (about 0.13C/decade) rather than smaller.

The correct theory tells us that no more than about a third of the surface warming can be greenhouse warming.

Note that this provides a bound for climate sensitivity: namely, about 0.4C for a doubling of CO₂. This is much below the bottom of the IPCC guesstimates, but more consistent with observations.

This modestly opposes the iconic claim of the IPCC (that it is likely that most of the warming over the past 50 years is due to man).

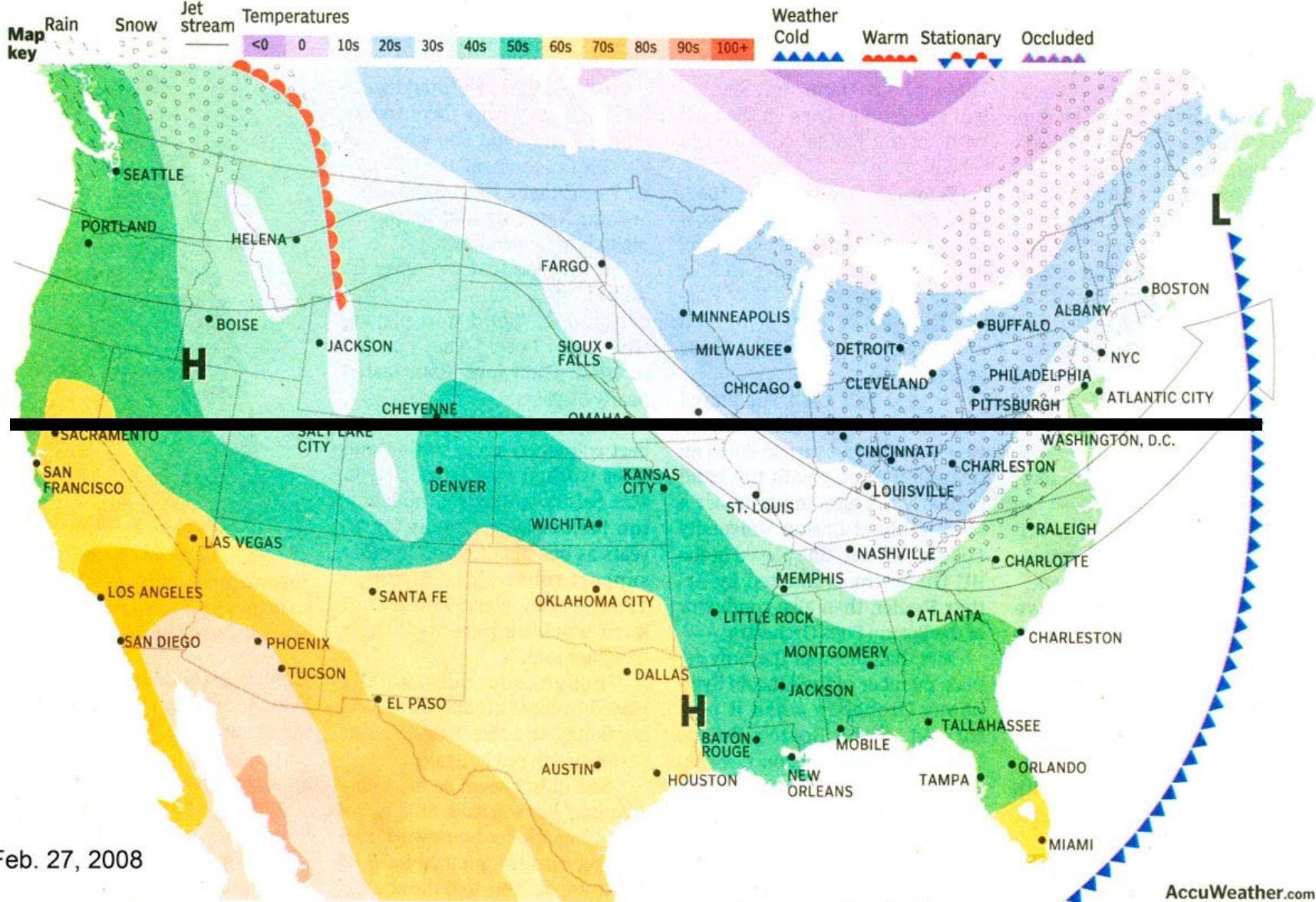
The IPCC argument is based on the bizarre claim that modelers are unable to think of anything else – an argument that is similar in nature but much weaker than the argument for ‘intelligent design.’

‘Modestly’ is appropriate. My argument suggests about 1/3 of observed warming over last thirty years might be due to greenhouse. The IPCC claims ‘most’ which might mean a little over 1/2. The crucial point is not that man has caused this, but that the warming involved is really ***small.***

Henny Youngman joke: How’s your wife. Response: Compared to what?

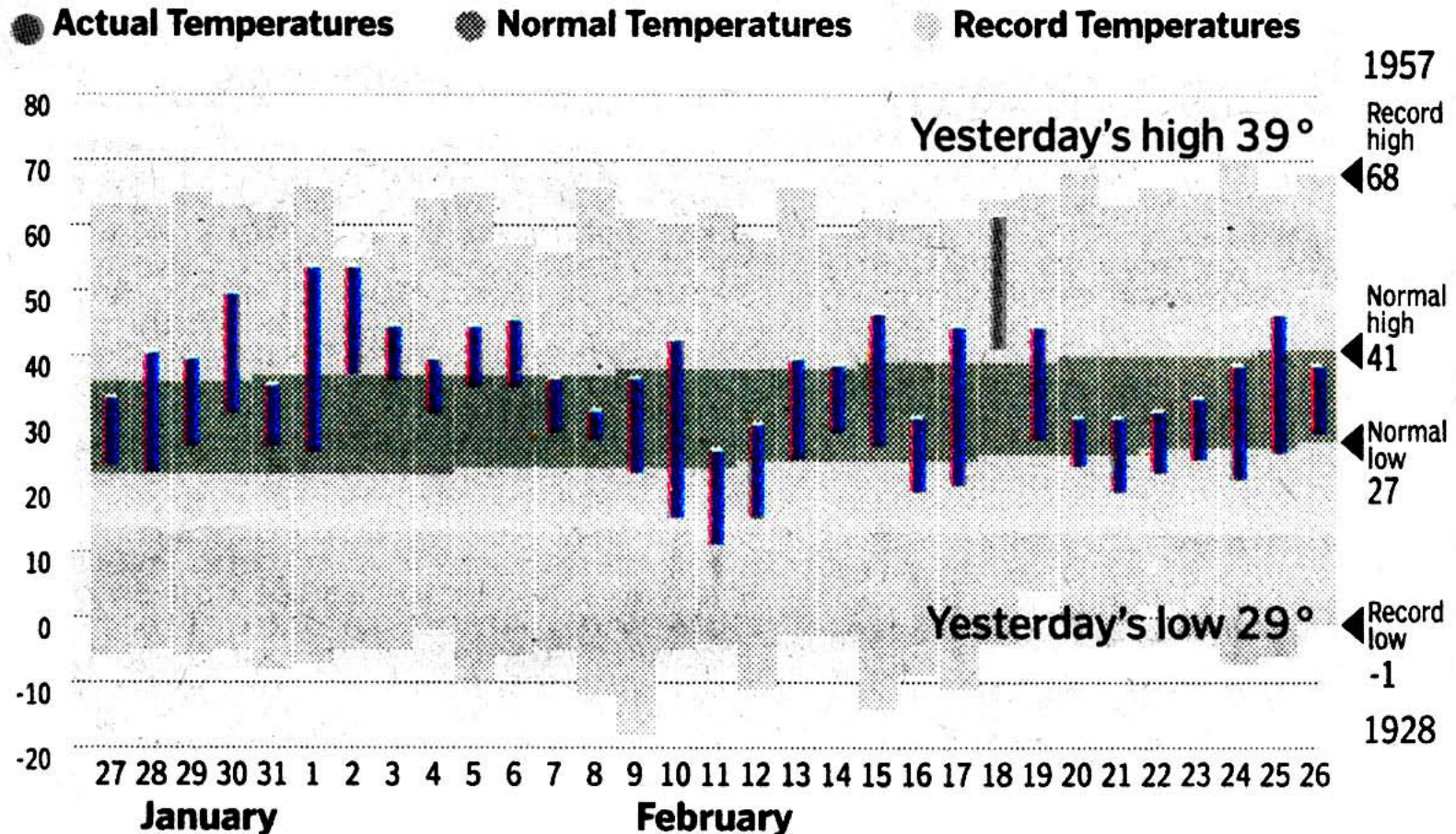
“Compared to what?” is a terribly important question.

It pays to keep a perspective on the magnitude of the temperatures. The following brief tutorial on weather based on the daily newspaper should help. Remember that global warming is measured in tenths of a degree.



Feb. 27, 2008

As far as Boston goes, nothing is particularly out of the ordinary, but few of us were around in 1928 and 1957.



Can you relate the record highs and lows to the preceding map?

As you have seen, *big* and *small* don't mean anything unless you have something to compare with.

For example, is a megaton of carbon dioxide a lot?

Can you estimate the weight of carbon dioxide in the atmosphere?

What is the total weight of the atmosphere?

Surface pressure ~ 14.7 pounds per square inch. The weight of air will be this times the area of the earth.

How about the area of the earth?

Taking the earth to be a sphere of radius, r , the area will be $4 \pi r^2$.

$r \sim 6.4 \times 10^6 \text{m}$ $1 \text{ in} \sim 0.025 \text{ m}$ $r \sim 2.56 \times 10^8 \text{ in}$ $a \sim 8.235 \times 10^{17}$
square inches.

Wt. of the atmosphere ~ 1.211×10^{19} pounds ~ 6.053×10^{15} tons

What is the composition of the atmosphere?

Nitrogen (78.1%), Oxygen (20.9%), CO_2 (380 ppmv)

Molecular weight of $\text{N}_2 \sim 28$ Molecular weight of $\text{O}_2 \sim 32$ Molecular weight of $\text{CO}_2 \sim 44$

Weight of $\text{CO}_2 = 6.053 \times 10^{15} \times 380 \times 10^{-6} \times (44/29)$ tons ~ 3.573×10^{12} tons

In addition, less than half of what is emitted appears in the atmosphere.

But things don't end there. After all, our concern with CO₂ is due to its impact on the greenhouse effect (or, more correctly, the earth's radiative budget).

Normally, there is a rough balance between net incoming solar radiation (ie, the incoming radiation minus the part that is reflected by the surface and clouds) and the outgoing infrared (or thermal or outgoing long wave) radiation. Each amounts to about 200 watts per square meter.

Each doubling of CO₂ reduces the OLR by about 3.5 watts per square meter, which is a bit less than 2%. What this means is that each unit of CO₂ that we add does less than its predecessor.

For example, starting from the preindustrial value of 280 ppmv, we would have to add 280 ppmv to get 3.5 watts per square meter. This would bring us to 560 ppmv. To get another 3.5 watts per square meter, we would have to add another 560 ppmv and not another 280 ppmv.

While Global Warming is sometimes what we hear about, what is usually stressed are 'catastrophic' or emotionally affecting alleged consequences of warming .



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Explore, enjoy and protect the planet

*We need your immediate
help to save the endangered
Polar Bear.*

Dear Friend,

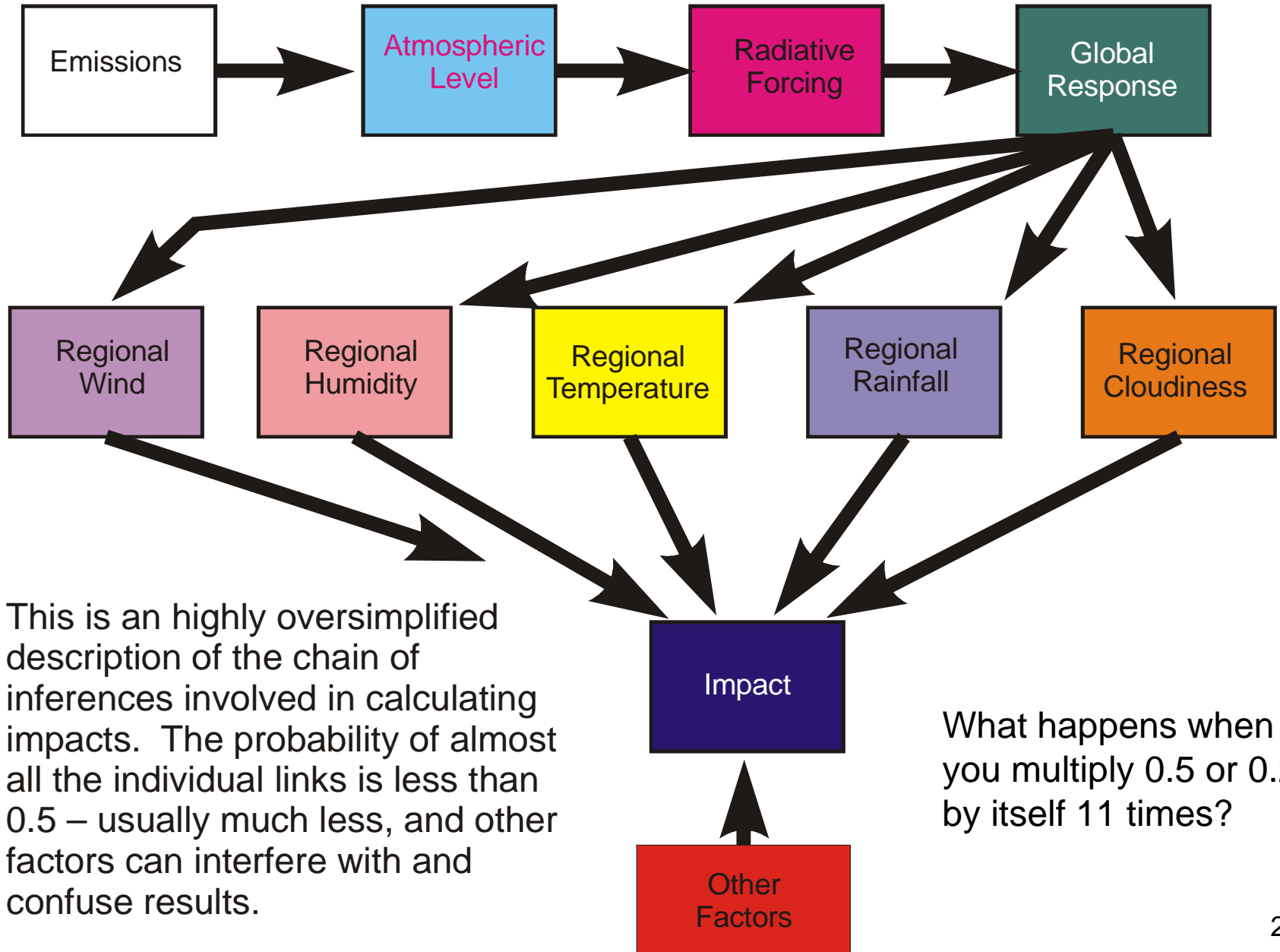
Naysayers declare that global warming is not real. And the big oil companies want you to believe that drilling in ecologically sensitive areas will not affect the wildlife that lives there.



Aspect 2: Catastrophes

Putative catastrophes associated with global warming never result from global warming alone, but depend on the confluence of many factors almost all of which are essentially unpredictable. The catastrophes emphasized in the environmental propaganda are selected on the basis of marketing research and focus groups – not climate science. Catastrophic forecasts are essentially always wrong (viz predictions of resource depletion, mass starvation, global cooling, Y2K, etc.). ***Why is this so?***

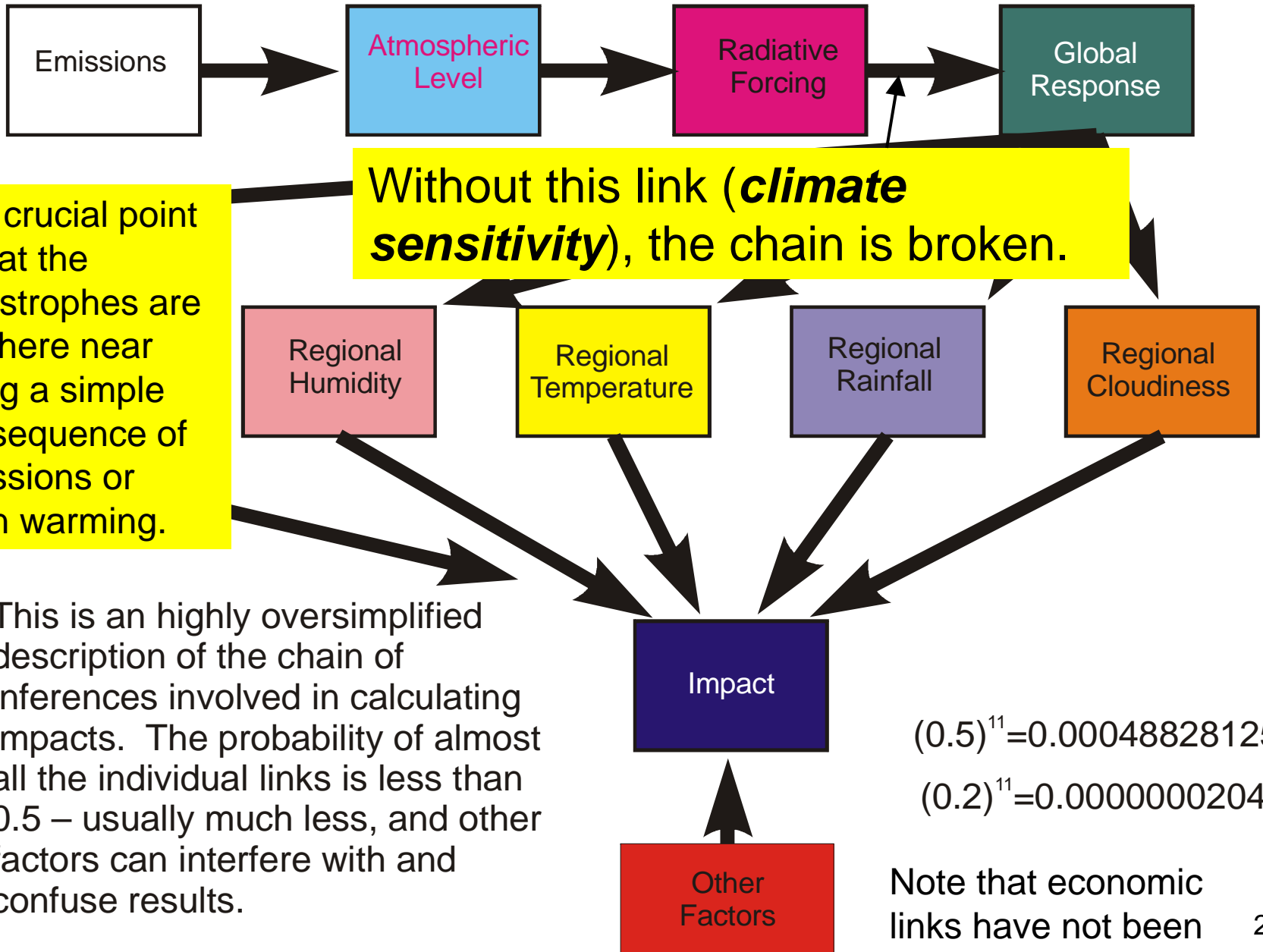
Impacts as a Chain of Inferences



This is an highly oversimplified description of the chain of inferences involved in calculating impacts. The probability of almost all the individual links is less than 0.5 – usually much less, and other factors can interfere with and confuse results.

What happens when you multiply 0.5 or 0.2 by itself 11 times?

Impacts as a Chain of Inferences



Former Vice President Al Gore said at a "Stewardship of the Earth" luncheon Jan. 31 during the New Baptist Covenant Celebration in Atlanta:

"The evidence is there," he said. "The signal is on the mountain. The trumpet has blown. The scientists are screaming from the rooftops. The ice is melting. The land is parched. The seas are rising. The storms are getting stronger. Why do we not judge what is right?"

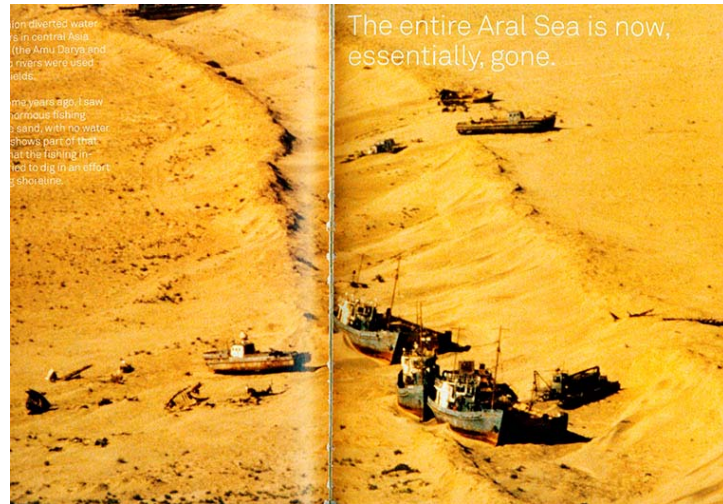
"I think there is a distinct possibility that one of the messages coming out of this gathering and this new covenant is creation care -- that we who are Baptists of like mind, in attempting in the best of our human abilities to glorify God, are not going to countenance the continued heaping of contempt on God's creation."

Among the effects Gore cited of increased carbon dioxide levels in the atmosphere are floods, tornados, hurricanes and droughts. Global warming, he claims, affects the poorest people of the world most. He cited three factors responsible for recent increased levels of Greenhouse gases -- population growth, the science and technology revolution and errant thinking by humans.

Some salient facts:

1. The 'signs' involve phenomena that many of the listeners have probably never experienced or studied.
2. The claims are often untrue as far as observations go.
3. The claims involve phenomena that current climate models admit they do not deal with. This is especially the case with ice sheets, but it is also mostly true for precipitation.
4. Gore's conclusion is basically a restatement of the Ehrlich-Commoner-Holdren infamous PAT formula: Environmental damage = Population x Affluence x Technology. This gives you some idea of where he is coming from.

Gore's movie contains some extraordinarily blatant examples of disasters that are known to have no connection to global warming, and which Gore never claims are connected. He simply leaves the viewer to conclude what he, himself, does not say. Here are but a few examples.



HURRICANE RITA AFTERMATH,
CAMERON, LA, SEPTEMBER 2005



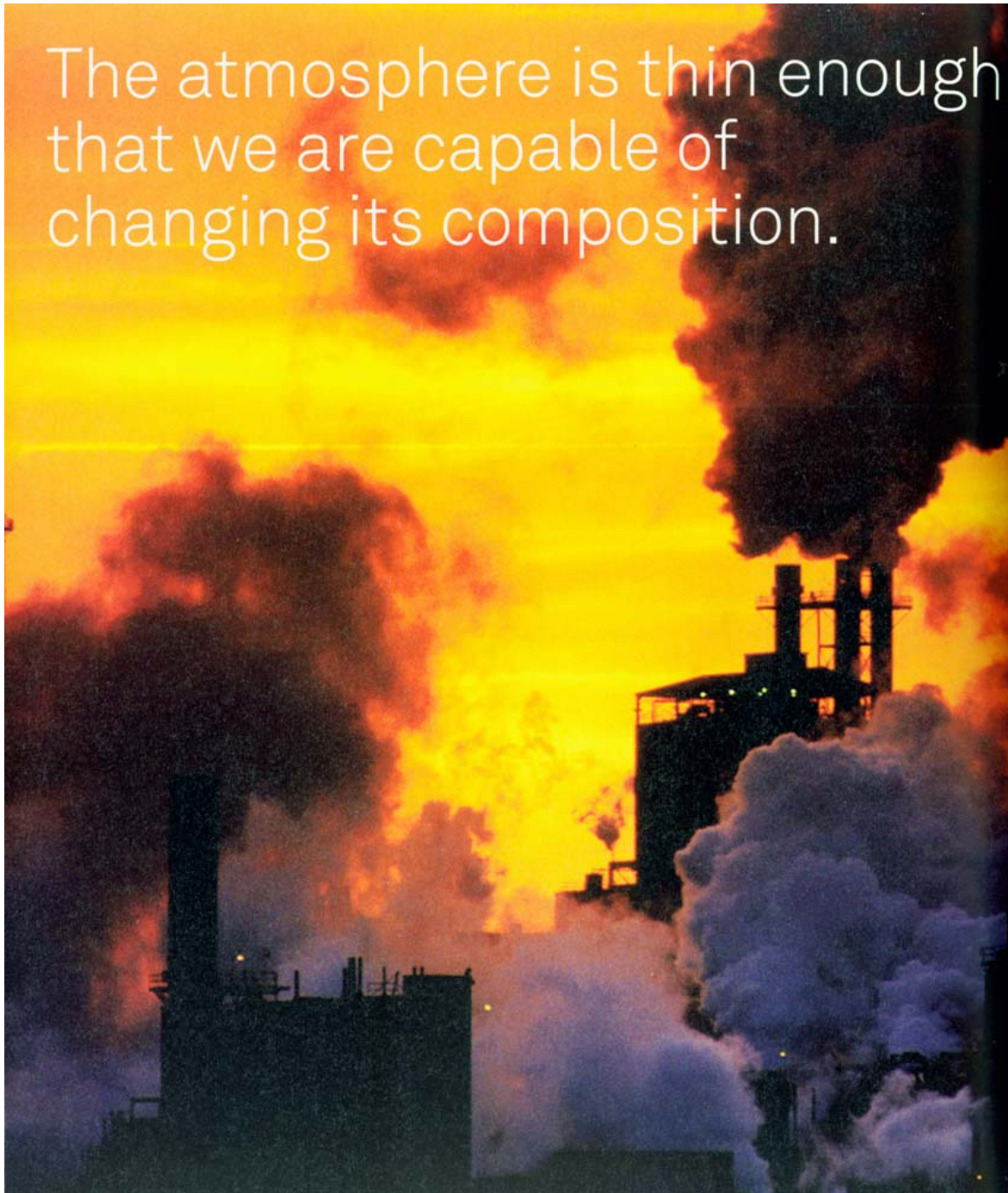
FLOOD DAMAGE, BRIENZ,
SWITZERLAND, AUGUST 2005



A friend of mine, Carl Page, flew over
Mount Kilimanjaro in 2005 and brought
back this picture.



The atmosphere is thin enough that we are capable of changing its composition.



What color is CO₂?

When and where was this picture taken?

What point is Gore trying to make?

Why is Gore doing this?

There are probably many reasons, but one is fairly clear. Global warming is about observations of small warming coupled with poorly supported claims about the future. The proposed actions will be costly in both economic and human terms. Actions that will actually stabilize CO₂ at levels held to be acceptable will, in effect, return us to the pre-industrial condition. Such harmful actions can only be promoted in an atmosphere of crisis. You are, therefore, led to believe that disasters, that occur all the time, are now due to human induced global warming. This involves dishonesty at a very high level.

Gore is careful (if duplicitous) compared to the media.

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LE FIGARO

« Sans la liberté de blâmer, il n'est point d'éloge flatteur » Beaumarchais



Solitaire

Michel Desjoyeaux, vainqueur de la 2^e étape, à Brest, peut viser le triplé.
Page 8

Climat : l'année des extrêmes



Manille (Philippines), 8 août.



Oxford (Grande-Bretagne), 25 juillet.



Johannesburg (Afrique du Sud), 27 juin.



Boretto (Italie), 25 juillet.



Tsar Kaloyan (Bulgarie), 7 août.



Bihar (Inde), 7 août.

Le constat alarmant de l'ONU

2007 sera l'année des records et des extrêmes météorologiques, selon un rapport de l'ONU. Ce dérèglement va s'aggraver avec le réchauffement de la planète. Pages 7, 28 et notre éditorial page 11

La France entre pluies et chaleur

LA MÉTÉO française passe d'un extrême à l'autre. Après un début d'année et un mois d'avril exceptionnellement doux, le nord du pays bat cet été des records de pluviométrie. Page 7

Mousson meurtrière en Inde

APRÈS vingt jours de pluie, les dégâts de la mousson en Inde et au Bangladesh sont catastrophiques : au moins 1 400 morts et 20 millions de personnes touchées par les inondations. Page 7

Le Figaro accompanied this illustration with an editorial maintaining that **no intelligent person could any longer fail to associate these events with fossil fuel burning** (despite the wide professional recognition that no particular event can be attributed to global warming regardless of one's views about warming – nor is there evidence that such events are increasing).

Aspect 3: Mitigation Policies

Almost all suggested '***mitigation***' policies are essentially irrelevant to climate, but rather comprise regulatory wedges, unstated agendas, and expensive symbolism. Kyoto (if adhered to) would, for example, delay any predicted warming for 2100 by months, and switching from coal fired electricity generation to natural gas, to hybrid cars, and to compact fluorescent bulbs, while making maximum feasible use of wind and solar, are still unlikely to even bring us into compliance with Kyoto. Cap and trade is an invitation to corruption as seen in the case of ENRON. It is also suggested by the eagerness of corporations like Duke Energy to 'get a seat at the table.' Confusion and conflation of energy and climate policy is endemic.

In many ways, the proposed policies are profoundly immoral.

Proper hospitals are not being funded in Africa because they are not using renewable energy sources – even though such sources do not permit the hospital to function.

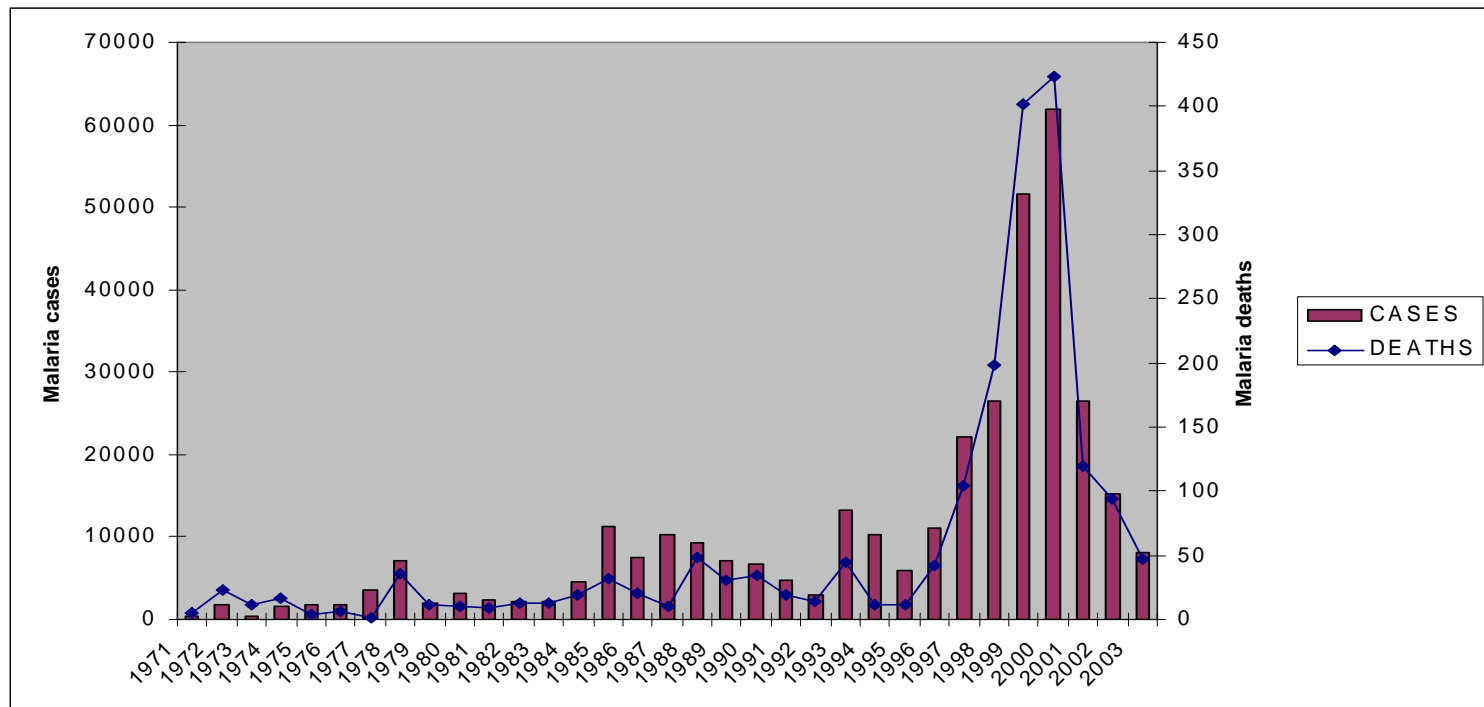
Ethanol mandates are increasing food prices for the poor throughout the world while doing nothing about carbon.

Proposed trade restrictions based on carbon usage threaten the ability of billions of people to rise out of desperate poverty.

A deep lack of concern for people has often characterized the environmental movement; frequent expressions of concern for the poor represent little beyond cynicism.

South Africa malaria history

Malaria Cases and Deaths, South Africa, 1971 - 2003



Comparable U.S. malaria rates

If the United States had malaria rates comparable to Africa's:

- 100 million sick
- 250,000 dead children



Some environmentalists have considered all this to be a good thing.



“To stabilize world populations, we must eliminate 350,000 people a day.”
Jacques Cousteau

“People are the cause of all the problems. We have too many of them, and banning DDT is as good a way to get rid of some of them as any.”

Charles Wurster, former chief scientist with Environmental Defense Fund



Combining the science, the alarmism, and the proposed policies in a single pot and claiming a consensus for the whole brew, represents a conscious effort to mislead. Each of the preceding factors can be largely dismissed (as bases for serious concern for the first two items, and as bases for response for the third item), but each argument over any particular aspect adds to the public perception that the argued aspect is crucial for the other aspects. This is by and large far from being the case.

Misuse of language is central to the public discourse

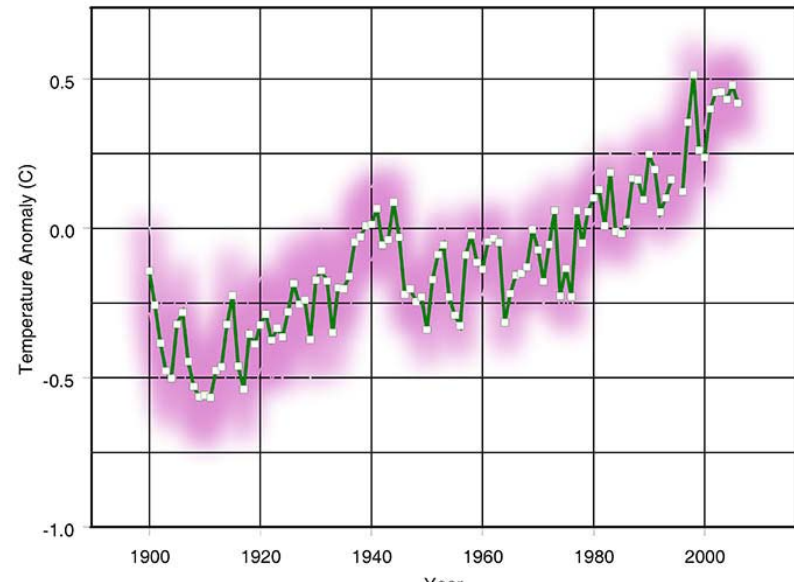
For example, we are currently in a warm period, but there has been no warming trend for ten years. Normal year to year fluctuations in temperature does imply that many of the last ten years to be among the warmest in the record, but this has nothing to do with trends.

Keep this in mind the next time you hear someone respond to the fact that there has been no trend over the past ten years with the assertion that x of the last y warmest years occurred since 1996.

I suspect that this cessation of warming may also be responsible for the tsunami of hysterical climate propaganda of the past 2 years. The issue has been prominent for almost a generation, during which time many agendas have developed. There may be a fear that these agendas must be achieved now or never.

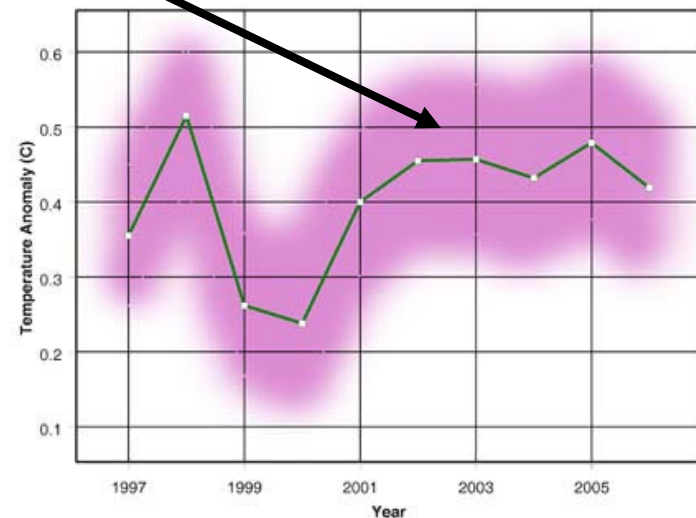
Global Mean Temperature Anomaly (UK Met. Office)
1900-2006

Uncertainty bounds estimated by UK Met. Office shown in purple



Global Mean Temperature Anomaly (UK Met. Office)
1997-2006

Uncertainty bounds estimated by UK Met. Office shown in purple



Similarly, it is often claimed that we are now warmer than we have been for the past thousand years. Though the claim is almost certainly false, even if it were true, it would not alter the fact that current warming is small (indeed much smaller than the models that are used to project alarm say it should be; claims to the contrary involve using various unknown processes to cancel much of the warming).

Gore actually offers a more subtle example:

In support of his assertion of consensus, he claims that almost all scientists agree that the earth is warming and that man's activity causes warming.

It is true (within the uncertainty of the observations) that the earth is warming, and it is also true that adding CO₂ to the atmosphere should lead to **some** warming – but ***this says nothing about whether the two are significantly related, and whether the warming is meaningfully significant.***

And, of course, the catastrophism and the appropriateness of proposed 'mitigation' remain disconnected from the two points of agreement.

We have already seen that the connection between the two is very modest indeed. Under the circumstances, it is interesting to see how the IPCC dealt with this in order to reach their conclusion that it is probable that man has accounted for most of the warming of the past 50 years.

The following (admittedly unintelligible) chart from the IPCC shows that anthropogenic greenhouse forcing is already about 85% of what one would expect from a doubling of CO₂. It also shows guesstimates for the impact of aerosols that it acknowledges are unknown.

Summary of the relative impact of different man-made and natural influences on the environment and their current “level of scientific understanding” (LOSU) of each Global-average radiative forcing components in 2005

Remember:
Doubling
CO₂ gives
you about
3.5 Wm⁻²

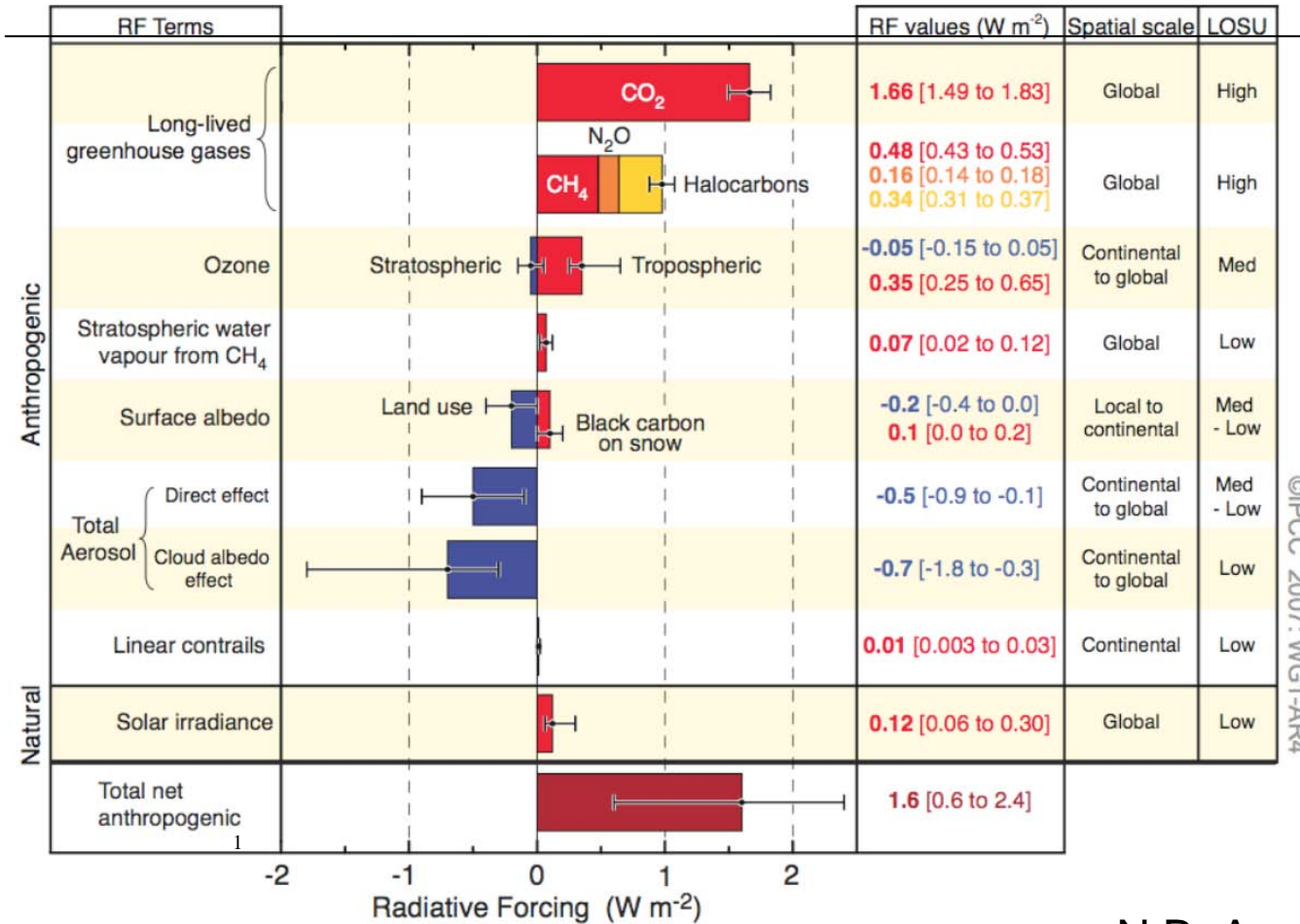


Chart taken from the IPCC’s “Climate Change 2007: The Physical Science Basis – Summary for Policymakers”, released February 2, 2007.

Quotes:

- “Additional forcing factors not included here are considered to have a very low LOSU”
- “Volcanic aerosols contribute an additional natural forcing but are not included in this figure due to their episodic nature”
- “Range for linear contrails does not include other possible effects of aviation on cloudiness”

©IPCC 2007: WG1-AR4

N.B. Averaging does not reflect what actual models did.

1 Not equal to simple addition of components, as uncertainty estimates are asymmetric
Source: IPCC, “Climate Change 2007: The Physical Science Basis – Summary for Policymakers”

Recall that without feedbacks, a doubling of CO₂ should cause about 1°C warming, but models predict 1.5-4.5°C because water vapor and clouds in models act as positive feedbacks. On the other hand, we have only seen a few tenths of a degree of warming.

In order to account for temperature changes of the past 30 years, the coupled atmosphere-ocean models used by the IPCC had to

- (1) allow each model to cancel as much greenhouse warming as necessary with alleged aerosols, and
- (2) assume that the models had somehow properly incorporated natural internal unforced variability (ie, things like El Nino, the Pacific Decadal Oscillations, the Atlantic Multidecadal Oscillations, etc.).

However, Smith et al (2007) at the Hadley Centre have shown that their model most certainly did not properly incorporate natural internal unforced variability, and Tsonis et al (2007) have shown that such variability can account for the temperature record of the past century. It is even being suggested that aerosols may be largely in the form of soot which heats rather than cools (Ramanathan, V., 2007). Finally, only a couple of months ago, a paper appeared (Chylek et al, 2007, Limits on climate sensitivity derived from recent satellite and surface observations, *J. Geophys. Res.*, doi:10.1029/2007JD008740) that shows that reflecting aerosols have been decreasing at a rate which implies that radiative forcing is double what the IPCC assumed.

An easier solution is that the climate sensitivity is greatly exaggerated by current models, but Occam's Razor has little sway in the world of climate science.

Much of my own research of late has focused on delineating the nature of negative feedbacks. In particular, we have discovered what we have called the Iris Effect which appears to be strong enough to turn total feedbacks significantly negative.

Aside on the Iris Effect:

In the tropical half of the earth (30S-30N), heat and moisture transport from the surface to the atmosphere is dominated by cumulonimbus convection. The convective elements consist in deep, rapidly ascending cumulus towers. Although these towers occupy a relatively small area, the ice detrained from these towers is responsible for the extensive cirrus decks in the tropics, and the evaporation of precipitation from these decks is the major source of water vapor for the tropical atmosphere. Moreover, both the water vapor and the cirrus decks are very powerful greenhouse substances.

The amount of ice available to form cirrus and humidify the atmosphere depends on the efficiency of precipitation formation within the towers. The more efficiently precipitation forms in the towers, the less ice is available for producing cirrus. Precipitation efficiency appears to increase with temperature. Thus, warming leads to contracting cirrus coverage while cooling leads to expanded cirrus. This effect, which is called the Iris Effect (by analogy with the behavior of the eye's iris), powerfully resists changes of temperature. In other words, it provides a strong negative feedback.

As I have already noted, the basis for the IPCC claim is, ultimately, that modelers cannot think of any other cause for the surface temperature rise of the past 30 years.

Here is the explicit statement of Alan Thorpe, head of NERC, the main UK funding agency for climate research:

"The size of the recently observed global warming, over a few decades, is significantly greater than the natural variations in long simulations with climate models (if carbon dioxide is kept at pre-industrial levels). Only if the human input of greenhouse gases is included does the simulated climate agree with what has been recently observed. Measurements prior to the modern instrumented record are probably insufficiently frequent and detailed to say whether such a global warming over a few decades has occurred before. However in any case, the real issue is whether human activity is causing the current warming because, if so, then we are able to do something about it.

Climate models attempt to include all the natural factors that might lead to significant climate variations on the time scales of interest, i.e. years to decades to centuries. Clearly factors currently unknown to science can't be included, but we have no reason to suppose they exist."

The issue is thus reduced to essentially religious faith modulated by policy relevance. It is no accident that various agencies refer to the fact that scientists *believe* that recent warming is due to man. It is also clear that phenomena like the medieval optimum clearly contradict Thorpe's supposition.

At some level, none of this is really new. Perceived climate change has probably always been cause for alarm (and alarm is commonly the excuse for more government control).

The New York Times has featured such climate threats at least a half dozen times over the past century or so. And here is an example from *Novellae Theodosiani* in 438 CE as the Western Roman Empire was disintegrating and the dark ages were beginning:

“Shall we endure longer that the succession of the seasons be changed, and the temper of the heavens be stirred to anger, since the embittered perfidy of the pagans does not know how to preserve these balances of nature? For why has the spring renounced its accustomed charm? Why has the summer, barren of its harvest, deprived the labouring farmer of his hope of a grain harvest? Why has the intemperate ferocity and the winter with its piercing cold doomed the fertility of the lands with the disaster of sterility? Why all these things, unless nature has transgressed the decree of its own law to avenge such impiety?”

(Interestingly, *Theodosiani* regarded pagans as being incapable of preserving the balances of nature. In the 19th Century, the Sierra Club took a similar view of immigrants.)

Warnings of climate disasters as punishments for evil ways have also had a long history. Here is an eloquent example from the biblical book of Deuteronomy:

“The Lord will smite thee ... with fiery heat, and with drought, and with blasting (wind), and with mildew; and they shall pursue thee until thou perish. And thy heaven that is over thy head shall be brass, and the earth that is under thee shall be iron. The Lord will make the rain of thy land powder and dust; from heaven shall it come down upon thee, until thou be destroyed.”

And, finally, herd instincts have always trumped science, logic and fact. The following is from about 150 years ago.

There is no opinion, however absurd, which men will not readily embrace as soon as they can be brought to the conviction that it is generally adopted.

(Schopenhauer, *Die Kunst Recht zu Behalten*)

Einstein (1954) went further:

“Few people are capable of expressing with equanimity opinions that differ from the prejudices of their social environment. Most people are even incapable of forming such opinions.”

Despite Schopenhauer's and Einstein's grim observations, I deeply believe that the public will eventually awaken to the fact that it is being manipulated toward a bad end; it will be interesting to see the consequences of this awakening.

Further reading:

http://scienceandpublicpolicy.org/images/stories/papers/monckton/23_trenberth_errors.pdf

http://scienceandpublicpolicy.org/images/stories/papers/monckton/monckton-gores_10_errors_old_and_new.pdf

Lindzen_Rahmstorf-Exchange.pdf (available from rlindzen@mit.edu)