

On the meaning of global warming claims

*When Anxious Alarm Accompanies
an Innocent Climate*

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Summary

Despite the claim that global warming is scientifically contentious issue, there really is relatively little disagreement among scientists on many of the basic aspects of the issue. The real problem in public communication is that simple facts about climate are often presented, and/or perceived as having ominous implications -- even when they don't. Although there is certainly room for skepticism, the emphasis on controversy often gets in the way of understanding the meaning of what is agreed on.

Over 40 years ago, C.P. Snow popularized the notion of ‘Two Cultures’ -- essentially science and non-science -- whose ability to communicate with each other was minimal.

RHYMES WITH ORANGE by Hilary Price



Snow, as a scientist, novelist and government advisor, argued the importance of bridging the two cultures. Unfortunately, it has proven easier to exploit the problem than to solve it. Moreover, scientists frequently belong to one culture for their discipline and the other outside their discipline.

I would suggest that the climate change issue has been so used, in order to exploit alarmism, and the obvious benefits that accrue from this.

This talk will attempt to cut through the innuendo in order to see what the claims concerning global warming actually mean.

In our discussion, it will be important to distinguish between change of temperature and the cause of temperature change.

While both may be important to society, only the latter is relevant to the issue of greenhouse gas limitations.

Nevertheless, if one is confused about the latter, one may respond inappropriately to the former.

(Arguments about whether the temperature is increasing or not can be misleading since the listener may infer that if the temperature is indeed increasing then we have a problem. This is by no means the case.)

The political claims are reasonably clear, relevant, and, unfortunately wrong:

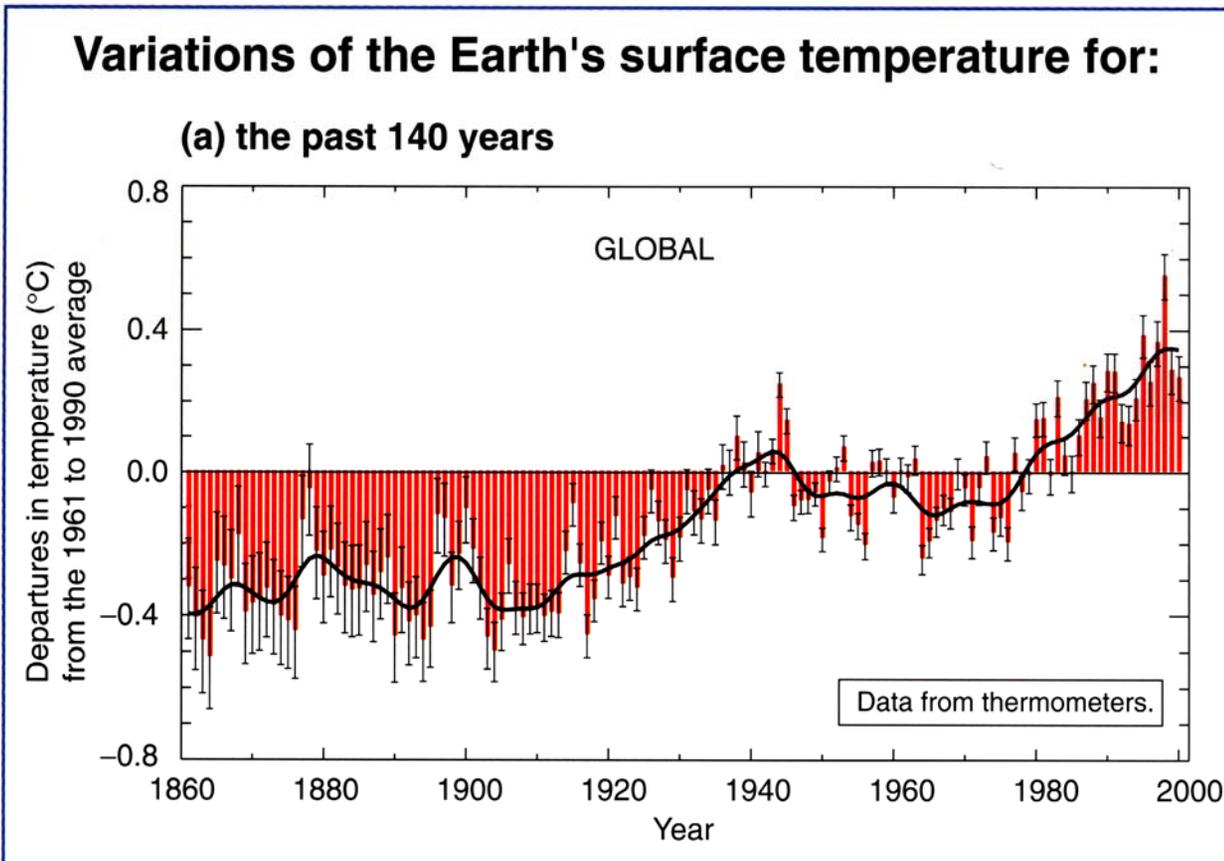
The earth is warming up due to man's activities, and the results will be catastrophic unless we agree to Kyoto. The science on this is settled.

Is this really what scientists agree on?

In contrast to the political claim, above, the statements of the scientific community are often vague, irrelevant, and sometimes even wrong.

To the best of my knowledge, nothing that follows should in any way be controversial among scientists, and all of it can be found in the IPCC Scientific Assessments. Note that statements in red at the top of slides indicate statements concerning which there is, indeed, widespread agreement -- though, of course, they might still be wrong.

The global mean temperature has increased roughly 0.6C over the past century.



Note that there has been no significant trend since the late 1980s.

Claims of warming over the past 30 years refer primarily to the period 76-86.

Nuances:

The temperature of the earth is always changing.

Warming has been concentrated in the periods 1919-1940 and 1976-1986; cooling occurred between these two periods.

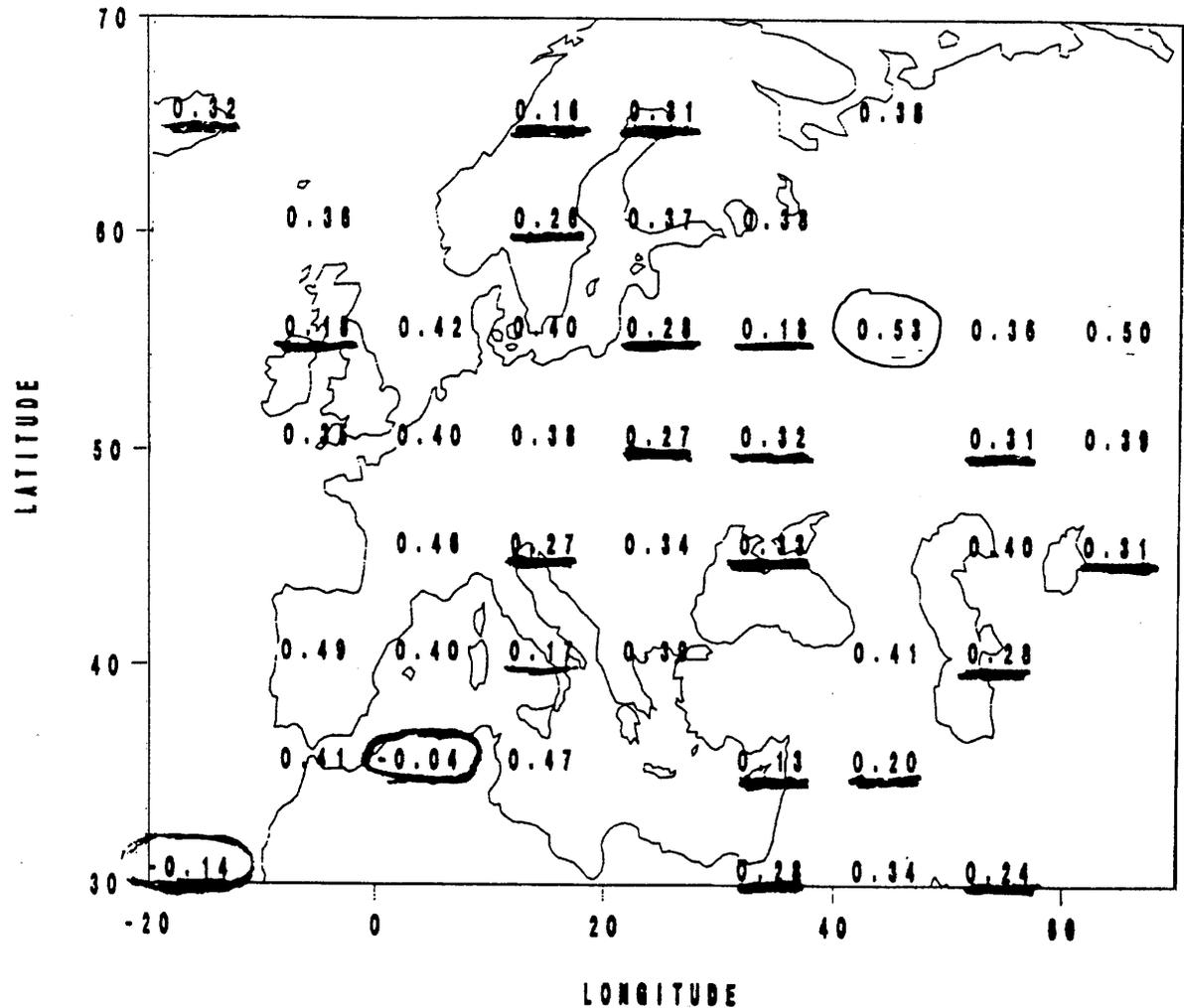
We are now at a period of high temperature and fluctuations about this high will inevitably lead to record breaking years; this says nothing about trends.

Determining long term trends from short records is generally meaningless.

Regional changes tend to be much larger than the *small* global trends and largely uncorrelated with the latter.

Individual Gridpoint Correlations with respect to CRU NH Average

Note the very low (and sometimes even negative) correlations between local temperature changes and global mean changes.

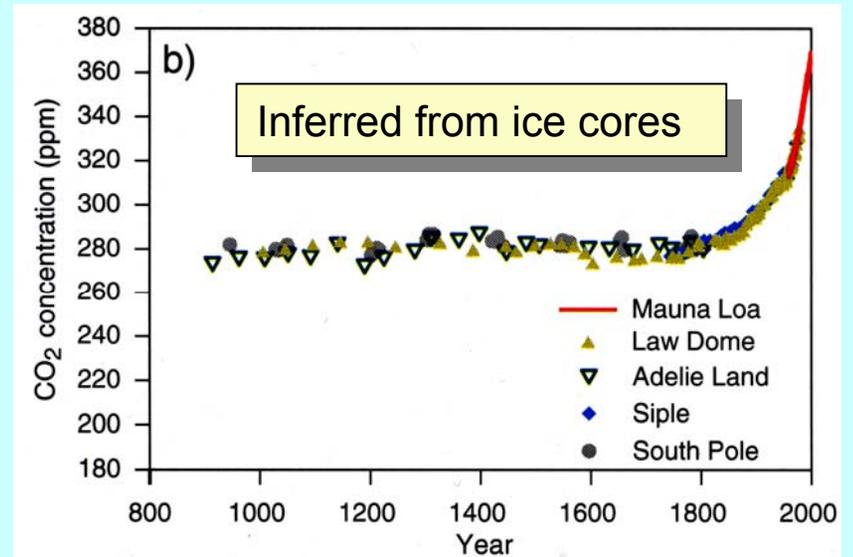
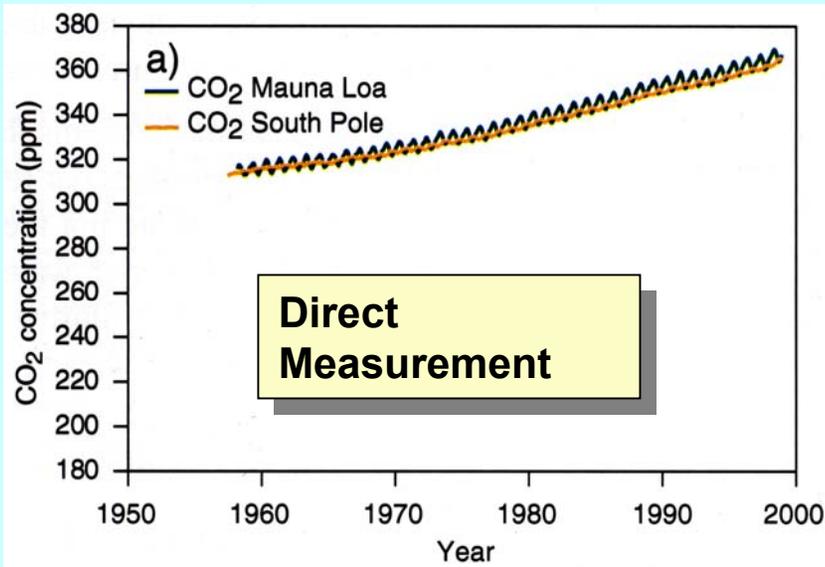


Carbon dioxide in the atmosphere is increasing, and the increase is largely due to mans activities. The same may be said for some other greenhouse gases – in particular for methane and for freons.

For the record, CO₂ has increased from about 280 ppmv around 1800 to about 374 ppmv today.

About half of emitted CO₂ appeared in atmosphere.

Ceasing emissions does not immediately alter CO₂ level, nor does reduction of emissions stop CO₂ from increasing.



Note that changes appear somewhat exaggerated when vertical axis does not start at zero.

Carbon dioxide is a greenhouse gas (which is to say, CO₂ absorbs in the infrared portion of the radiative spectrum).

Nuances:

Anthropogenic greenhouse gases are much less important than natural greenhouse substances like water vapor and clouds.

Note that this has long been understood. It was discussed, for example, in the following volume from 1941. Although this volume may seem obscure, it really is a well known review of the nature of weather and climate.

CLIMATE

YEARBOOK OF

and MAN

AGRICULTURE

1941

UNITED STATES
DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

UNITED STATES GOVERNMENT PRINTING OFFICE



Climatic Change Through the Ages

BY RICHARD JOEL RUSSELL¹

IT WILL be news to many people that man, during his geologically brief existence on earth, has never known a "normal" climate. We are now at the tail end of an ice age and living in a period of crustal and climatic violence as great as any the earth has known. This is why we have to think so much about the weather. Such periods of revolution have occurred briefly several times in the history of the earth. Between them have been the far longer periods of crustal peace and a genial climatic uniformity—the "normal" times of the geologist. Here is the story.

¹ Richard Joel Russell, Professor of Physical Geography, Louisiana State University, is a Collaborator, Soil Conservation Service.

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trasts, cloud layering as a possible conditioning factor.

Much has been written about varying amounts of carbon dioxide in the atmosphere as a possible cause of glacial periods. The theory received a fatal blow when it was realized that carbon dioxide is very selective as to the wave lengths of radiant energy it will absorb, filtering out only such waves as even very minute quantities of water vapor dispose of anyway. No probable increase in atmospheric carbon dioxide could materially affect either the amount of insolation reaching the surface or the amount of terrestrial radiation lost to space.

Large amounts of volcanic dust in the atmosphere have also been considered as

Note that nothing presented so far tells us whether we have an ominous problem or not.

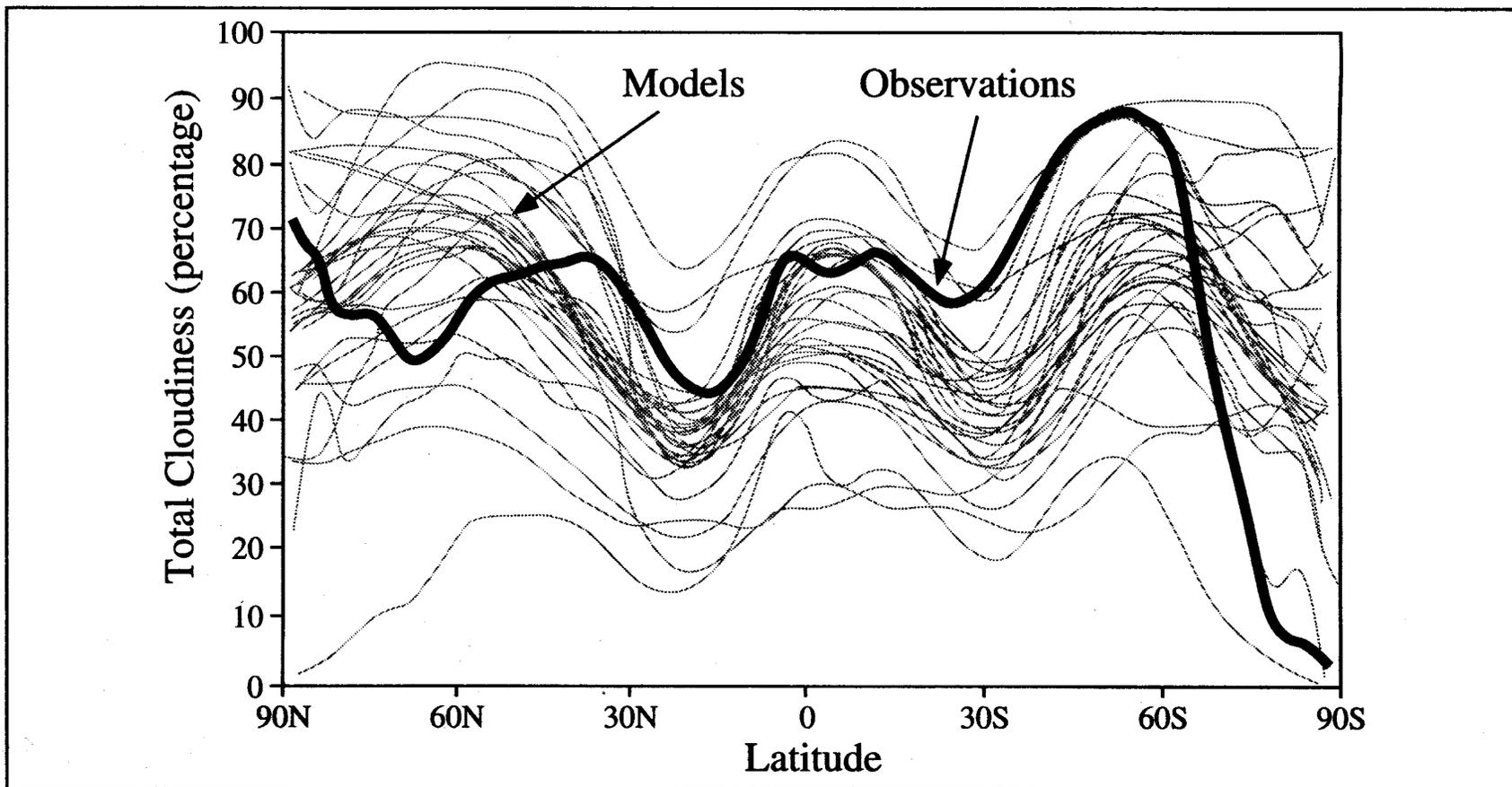
In point of fact, the effect of CO₂ is, indeed finite.

Doubling CO₂ will increase radiative forcing by about 2% (ie 3.7 Watts per square meter). 4 Watts per square meter will lead to about 1C warming in the absence of positive feedbacks from water vapor and clouds.

Note, that by positive feedback, I mean that, in the models, the change in temperature caused by increasing CO₂ leads to changes in water vapor and clouds which act to greatly magnify the response to CO₂ alone. **Such feedbacks depend crucially on the ability of models to actually deal with clouds and water vapor.**

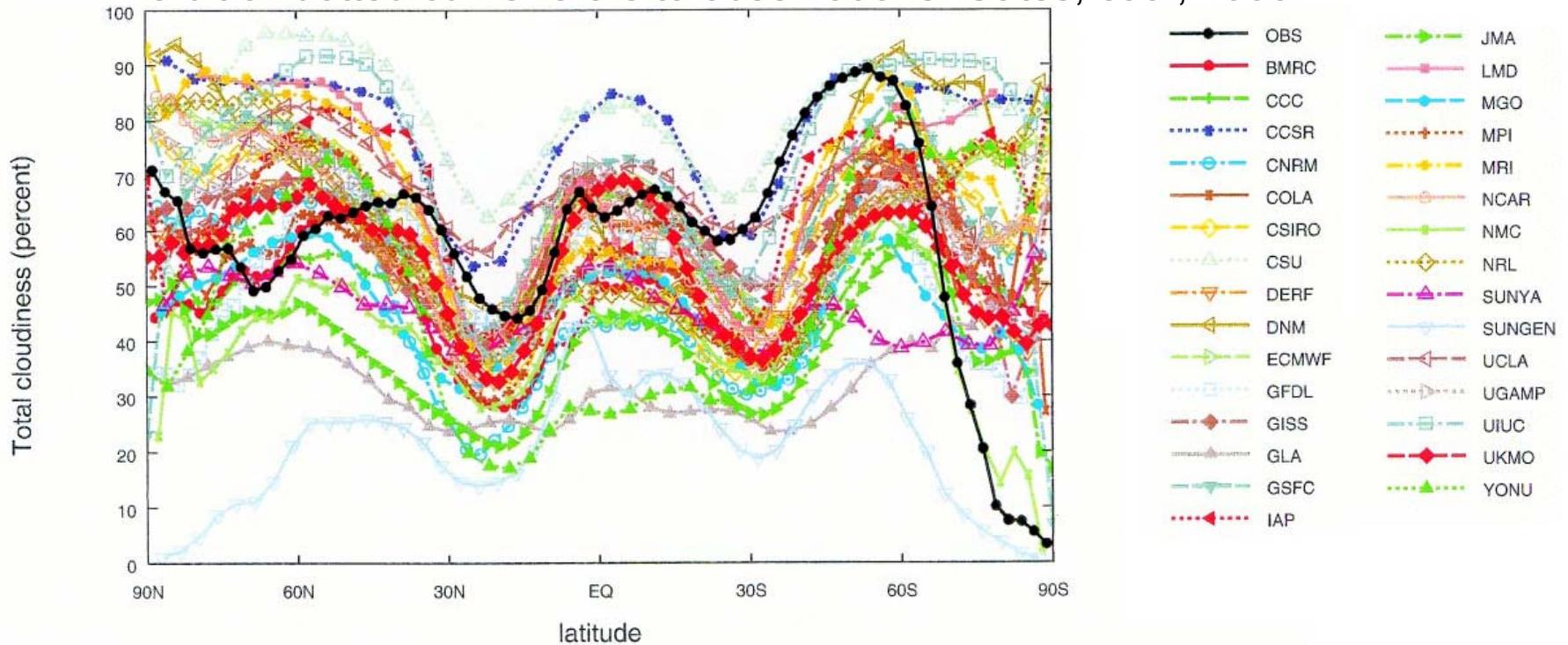
Here we see that treatment of clouds involves errors an order of magnitude greater than the forcing from a doubling of CO₂

Figure 1. Each thin gray line shows an individual model's hindcast of percentage cloud cover averaged by latitude. The black line shows the observed cloud cover.



Here we see that treatment of clouds involves errors an order of magnitude greater than the forcing from a doubling of CO₂

Model hindcasts of percentage cloud cover averaged around latitude circles. The black dotted curve refers to observations. Gates, et al, 1999.



In this connection, the following sentences appeared in an article on model based cloud behavior I reviewed for Climate Dynamics. The authors are young modelers at the Hadley Centre in the UK.

Note that this range itself is very uncertain -- especially at the low end.

In the IPCC Working Group I Third Assessment Report (Cubasch et al, 2001), the range of possible values for the climate sensitivity to an instantaneous doubling of CO₂ remains unchanged from previous reports at 1.5-4.5°C. It is necessary to reduce such uncertainty if policy makers are to make informed social and economic decisions in connection with possible climate change.

Why then do some non-scientists insist that the science demands action now?

The situation gets stranger when one relates temperature changes to forcing.

Current radiative forcing from anthropogenic greenhouse gases is about 2.7 Watts per square meter (almost three quarters of the way to the forcing due to a doubling).

It is important to note that the impact of CO₂ on the radiative heat budget of the earth is nonlinear. The impact of each unit added is less than the impact of the preceding unit. In addition, methane contributes to the present forcing.

If all the observed warming over the past century were due to increased anthropogenic greenhouse gases (which is highly unlikely), then we would be confident that there would be *no pronounced* warming due to these gases because the inferred sensitivity is low.

If most current climate models, which predict about 4C warming for a doubling of CO₂, are correct, then man has accounted for 3-4 times the observed warming over the past century with some unknown processes of unprecedented magnitude canceling the difference. Predictions for the future assume that these unknown processes will disappear.

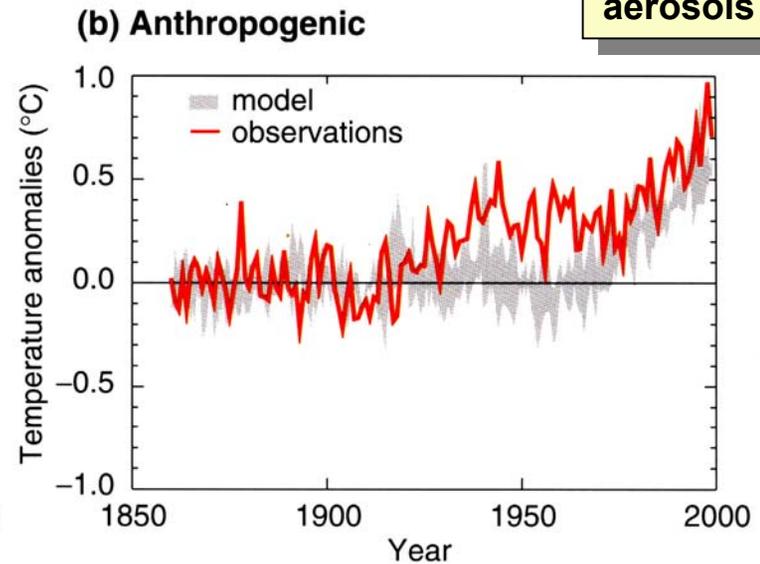
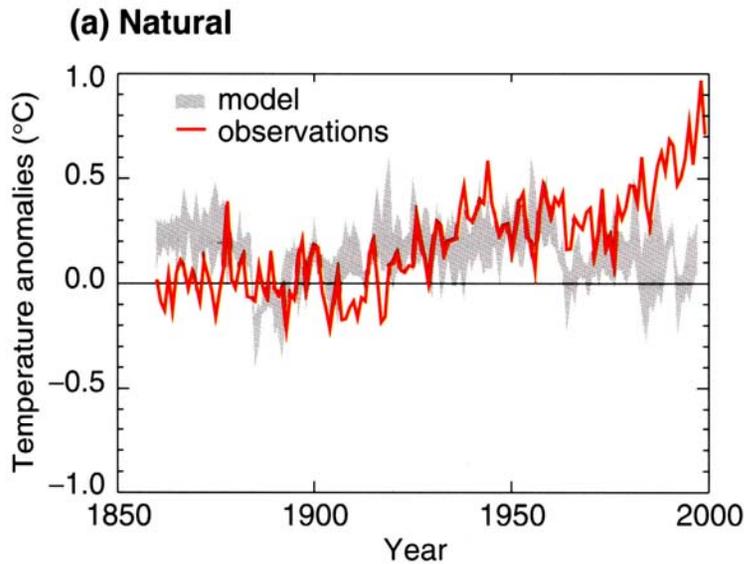
It is, so far, impossible to convincingly relate observed climate change to anthropogenic emissions because we do not fully understand natural variability.

Nuances:

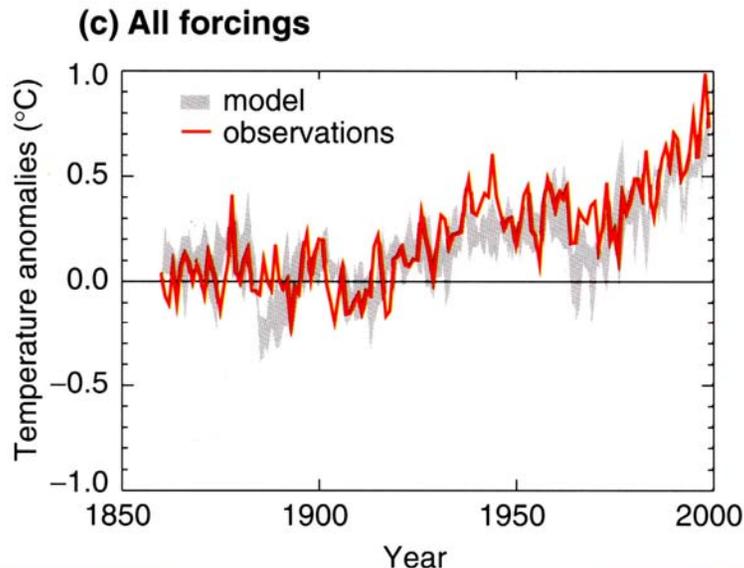
Claims to the contrary are based on crude curve fitting and naive assumptions about success of models in dealing with *internal or natural* variability.

Simulated annual global mean surface temperatures

Note that anthropogenic includes unknown aerosols



The spread in the gray line represents model internal variability. It is much too small, and its variability in time is incomprehensible



Note that 'all' forcings includes Solar Forcing and Volcanoes which we really don't know.

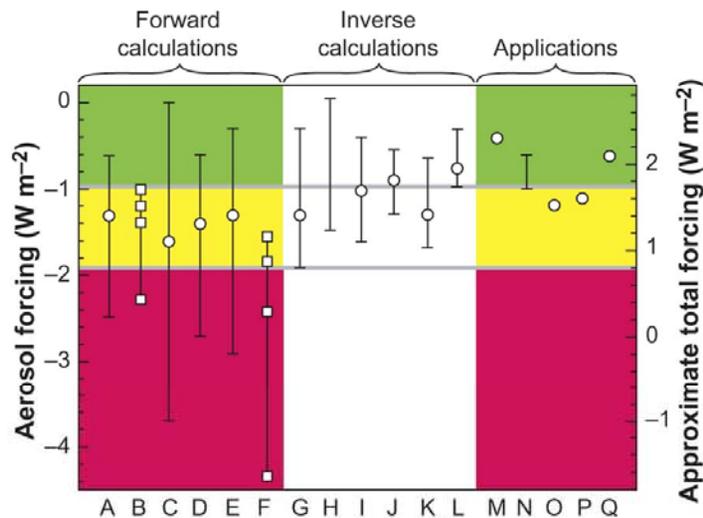
ATMOSPHERIC SCIENCE

Climate Forcing by Aerosols— a Hazy Picture

Theodore L. Anderson, Robert J. Charlson, Stephen E. Schwartz, Reto Knutti,
Olivier Boucher, Henning Rodhe, Jost Heintzenberg

The global average surface temperature has risen by 0.6 K since the late 19th century. Ocean heat content has increased, and other climate indices also point to a warming world. Many studies have attributed this warming largely to top-of-atmosphere radiative forcing—a change in planetary heat balance between incoming solar radiation and outgoing infrared radiation—by anthropogenic greenhouse gases (GHGs) (1, 2).

Such attribution studies compare temperature observations to climate model simulations forced by various industrial-era agents. Among these agents, GHGs have well-constrained positive forcings (creating a warming influence) (3). In contrast, the mostly negative forcings (cooling) as-



Uncertainties in aerosol forcings. Global-mean anthropogenic aerosol forcing over the industrial era (left axis) as estimated by forward (A to F) and inverse (G to L) calculations and as used in applications (M to Q) (20). Circles with error bars are central values and 95% confidence limits. Bare error bars are stated range. Squares represent specific forcing calculations using alternative formulations within the same study. Right axis: Total forcing over the industrial era using the approximation that nonaerosol forcings are 2.7 W m^{-2} (3, 4).

PERSPECTIVES

ing is caused by a positive total forcing over the industrial era (rather than by natural variability and/or unrecognized forcings). They constrain aerosol forcing to around -1 W m^{-2} , with uncertainties that extend no farther than -1 to -1.9 W m^{-2} , depending on the study (see the figure). Aerosol forcing determined by the forward calculations is considerably greater, centered around -1.5 W m^{-2} , with an uncertainty range that extends beyond -3 W m^{-2} . The larger magnitude aerosol forcings from the forward calculations greatly exceed the largest values allowed by the inverse calculations (see colored bands in the figure).

The substantial region of inconsistency shown in the figure (the red and, depending on the study, yellow bands) implies either that the large-magnitude aerosol forcings from the forward calculations are erroneously high or, alternatively, that the limits on aerosol-forcing magnitude inferred from the inverse calculations are erroneously low. We caution against simply assuming the former. The forward calculations are based on a substantial body of aerosol and cloud measurements, observation-based parameterizations of aerosol-cloud interactions, and well-understood physics of radiative transfer.

The inverse calculations are also based on sound physical principles. However, to the extent that climate models rely on the results of inverse calculations, the possibility of circular reasoning arises (5)—that is

The inverse calculations are also based on sound physical principles. However, to the extent that climate models rely on the results of inverse calculations, the possibility of circular reasoning arises (5)—that is, using the temperature record to derive a key input to climate models that are then tested against the temperature record. Rather than rely exclusively on one approach or the other, it is prudent to acknowledge the current inconsistency and seek to understand and resolve it.

Unfortunately, virtually all climate model studies that have included anthropogenic aerosol forcing as a driver of climate change (diagnosis, attribution, and projection studies; denoted “applications” in the figure) have used only aerosol forcing values that are consistent with the inverse approach. If such studies were conducted with the larger range of aerosol forcings determined from the forward calculations, the results would differ greatly.

In brief, we start by assuming the model is correct and replicates observed internal variability.

We then attribute differences between the model behavior in the absence of external forcing, and observed changes in ‘global mean temperature’ to external forcing.

Next we introduce ‘anthropogenic’ forcing and try to obtain a ‘best fit’ to observations.

If, finally, we are able to remove remaining discrepancies by introducing ‘natural’ forcing, we assert that the attribution of part of the observed change to ‘anthropogenic’ forcing must be correct.

We also assume that the response to the greenhouse component of anthropogenic forcing must also be correct.

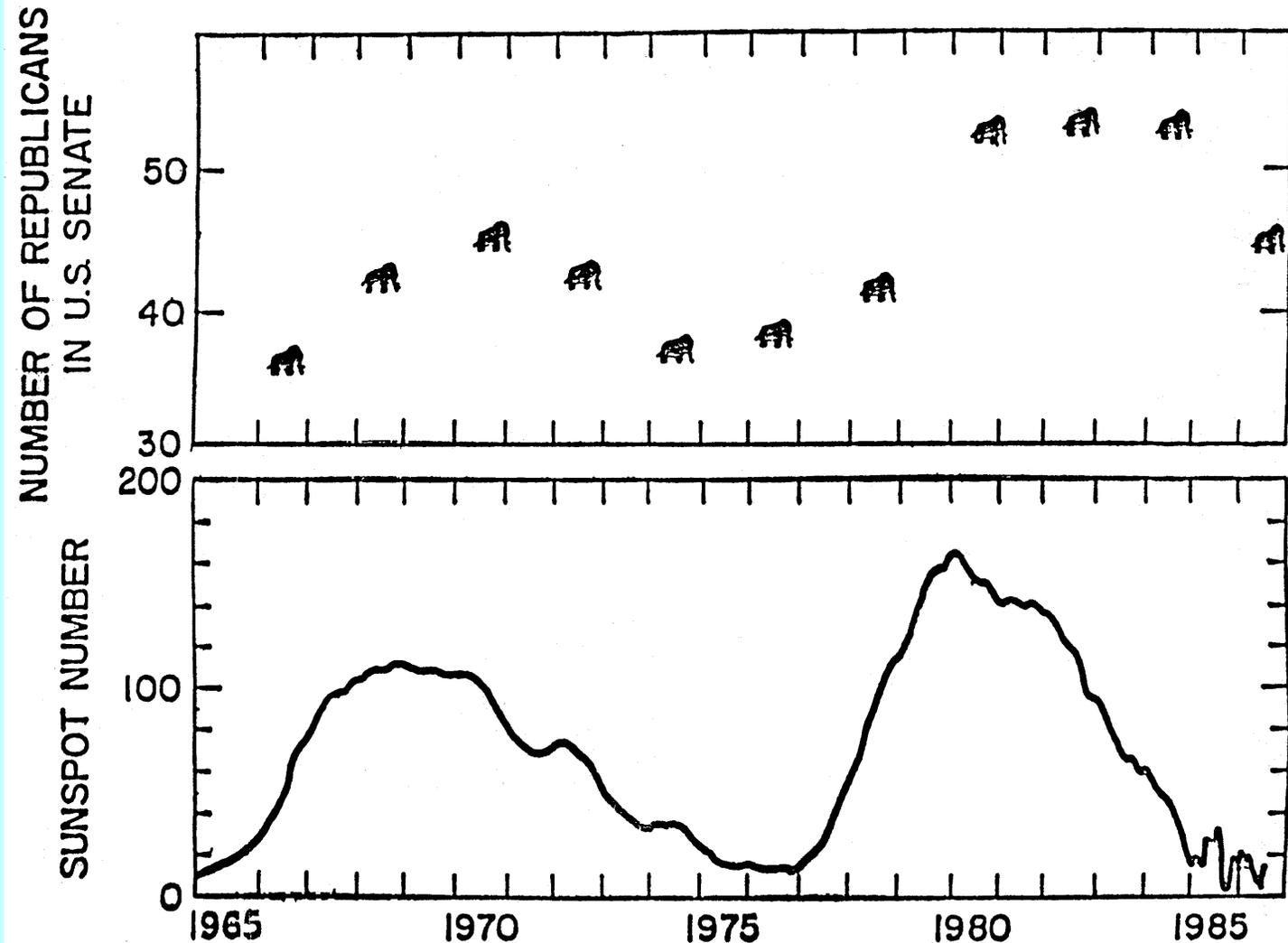
Of course, model internal variability is not correct, and ‘anthropogenic’ forcing includes not only CO₂ but also aerosols, and the latter are unknown to a factor of 10-20 (and perhaps even sign).

Finally, we have little quantitative knowledge of ‘natural’ forcing so this too is adjustable.

Perhaps, worst of all, the Hadley Center had to use a relatively insensitive model (2.5C for a doubling of CO₂) in order for their procedure to work. Nevertheless, their “success” is used to justify fears of a much more sensitive climate.

Such an analysis would have been an embarrassment to the Ptolemaic epicyclists. Nonetheless exactly this sort of analysis has recently been repeated by the National Center for Atmospheric Research in Boulder, CO.

The preceding analysis depended on the presence of many adjustable parameters. It is hardly better than the following attempt to relate Republican in the Senate to sunspots.



Yet, the ‘argument’ I have just presented is the basis for all popular claims that scientists now ‘believe’ that man is responsible for much of the observed warming!

It would appear that the current role of the scientist in the global warming issue is simply to defend the ‘possibility’ of ominous predictions so as to justify his ‘belief.’

There is, of course, a germ of truth to some such claims:

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

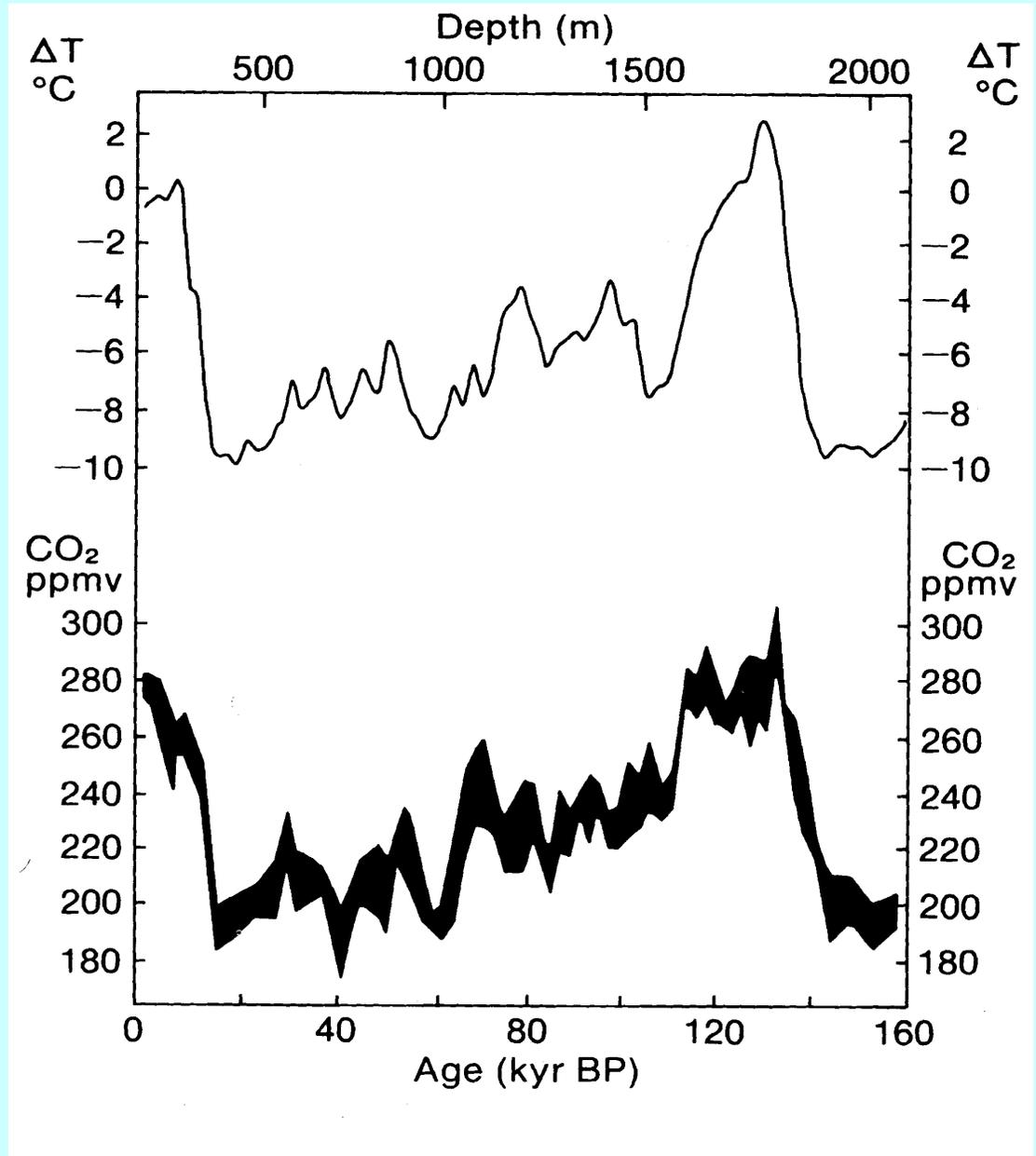
Only the claim of ‘discernible’ is dubious. However, as we already have noted, even if greenhouse gas increase caused all of the observed change, it would not imply a problem.

Nonetheless, the above statement constituted the ‘smoking gun’ for Kyoto. There is probably no better example of how a statement can mean different things to scientists and to the public.

In point of fact, although there is no doubt that increasing CO₂ ought to cause *some* change, there is no serious observational evidence of this.

Temperature leads
CO₂ by hundreds of
years.

Note also that
observed percentage
change in CO₂ would
not produce
significant
change in climate
according to either
models or experience
of past century.



CLIMATE CHANGE
SCIENCE
AN ANALYSIS OF SOME KEY QUESTIONS
NRC 2001

Greenhouse gases are accumulating in Earth's atmosphere as a result of human activities, causing surface air temperatures and subsurface ocean temperatures to rise. Temperatures are, in fact, rising.

The changes observed over the last several decades are likely mostly due to human activities, but we cannot rule out that some significant part of these changes is also a reflection of natural variability.

On the basis of these lines, the report was depicted in the press as an implicit endorsement of the Kyoto Protocol. CNN's Michelle Mitchell was typical of the coverage when she declared that the report represented "a unanimous decision that global warming is real, is getting worse, and is due to man. There is no wiggle room."

This apparently remains the interpretation of Senators McCain and Lieberman.

Nevertheless, these lines, in fact, contained no support for alarm!

We now come to some items where the basic scientific consensus is actually opposite to what is presented to the public.

Global warming will likely be associated with reduced storminess in the extratropics and diminished extremes.

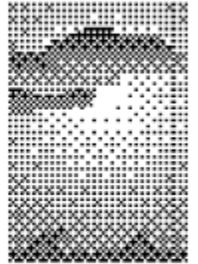
Nuance:

The primary source of extratropical storms is the pole to equator temperature difference which is anticipated to decrease in a warmer world.

It has been claimed that increased storminess might result from enhanced evaporation. This is unlikely even in the tropics. **There is, in fact, no reason to suppose that global warming will increase tropical storminess either.**

Bulletin of the American Meteorological Society, **79**, 1998:

Tropical Cyclones and Global Climate Change: A Post-IPCC Assessment



**Leading figures
in hurricane
studies.**

A. Henderson-Sellers,^{*} H. Zhang,⁺ G. Berz,[#] K. Emanuel,[@] W. Gray,[§] C. Landsea,^{**}
G. Holland,⁺ J. Lighthill,⁺⁺ S-L. Shieh,^{##} P. Webster,^{@@} and K. McGuffie⁺

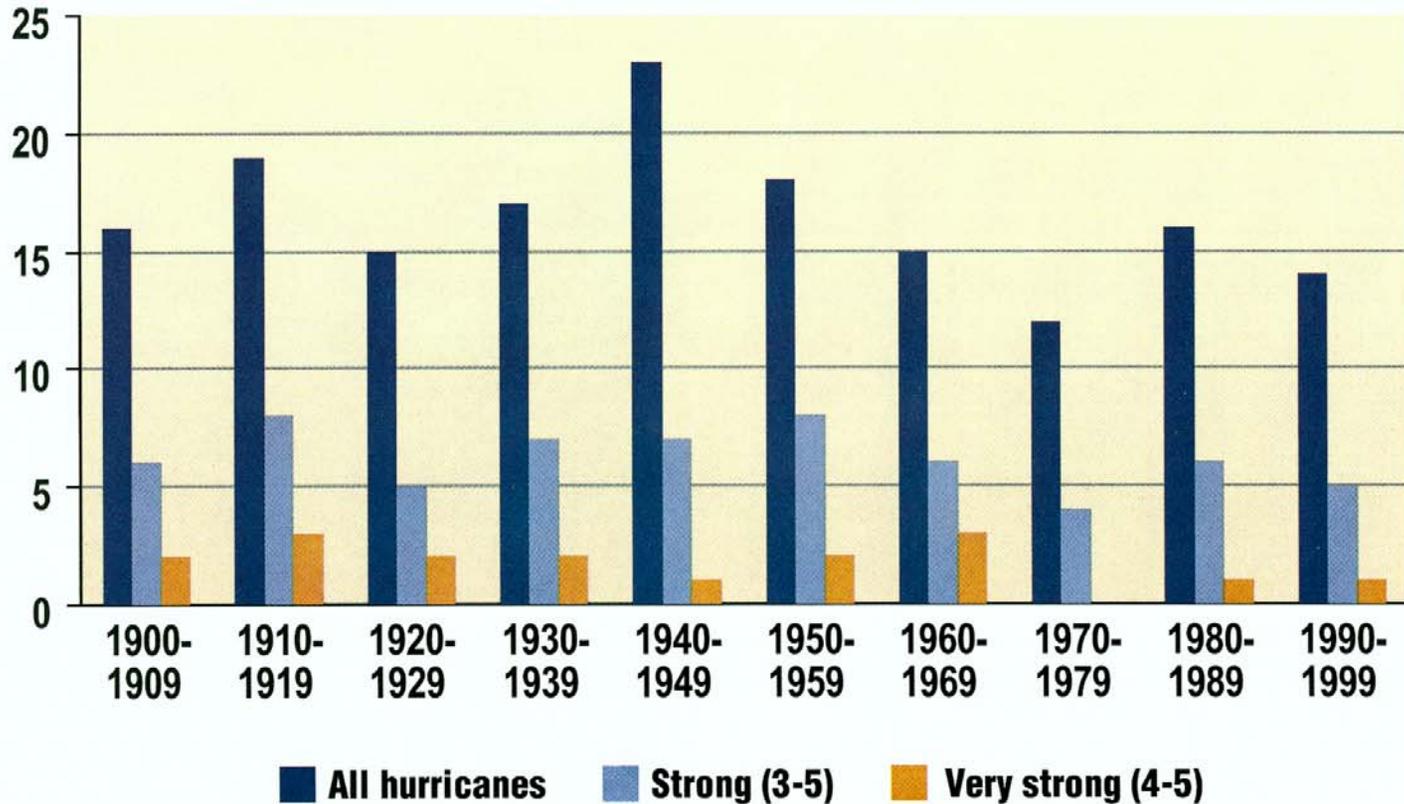
“Recent studies indicate the MPI (maximum predicted intensity) of cyclones will remain the same or undergo a modest increase of up to 10%–20%. These predicted changes are small compared with the observed natural variations and fall within the uncertainty range in current studies. Furthermore, the known omissions (ocean spray, momentum restriction, and possibly also surface to 300-hPa lapse rate changes) could all operate to mitigate the predicted intensification.”

More recently there has appeared a study involving the world's best resolved climate model:

Sugi, M., Noda, A. and Sato, N. 2002. Influence of the global warming on tropical cyclone climatology: an experiment with the JMA global model. *Journal of the Meteorological Society of Japan* **80**: 249-272.

In the words of the authors, "the results of experiments indicate that the number of tropical cyclones may significantly be reduced due to the global warming." As for the maximum intensity of tropical cyclones, they find that "no significant change has been noted."

U.S. Hurricane Strikes by Decade, 1900-1999



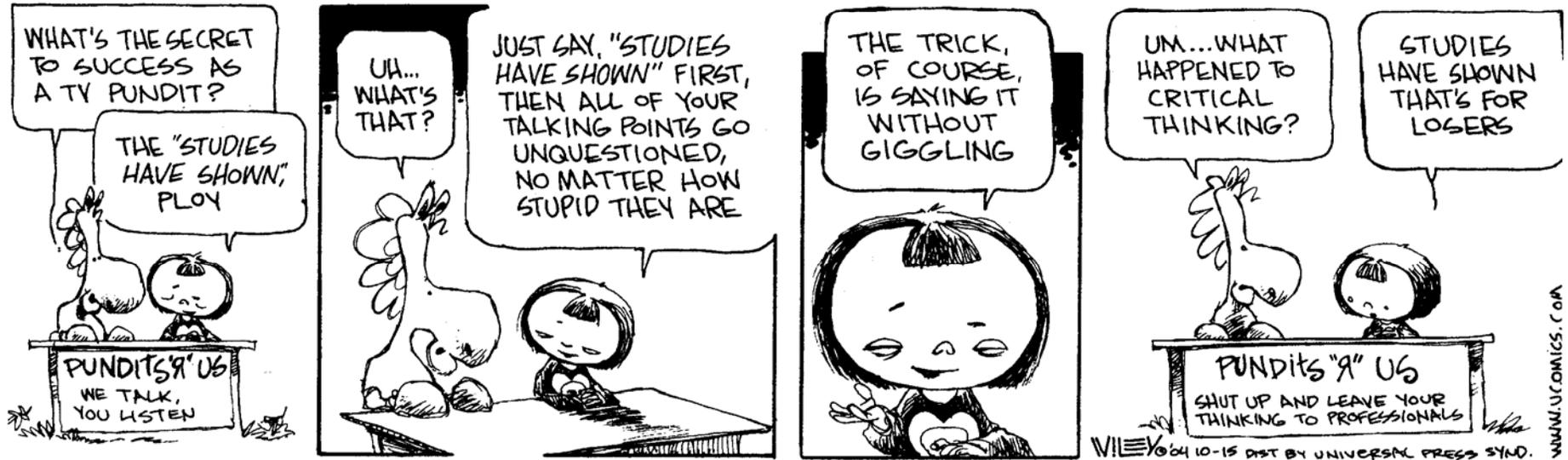
Data provided by the National Hurricane Center shows hurricane strikes (landfalls) by decade in the U.S. since 1900. Clearly, the 1940s were the busiest, the 1970s were the quietest and the 1990s were very close to the long-term average. A simple linear fit suggests a decrease over time.

Paradox of consensus:

When scientists emphasize consensus on basic (and generally trivial) issues, and the topic at issue becomes politicized, advocates will claim scientific consensus for whatever they wish to claim.

Of course, this is not really consensus, but it is an attitude conditioned by the reliance on consensus.

NON SEQUITUR by Wiley



While most scientists readily acknowledge that consensus is no substitute for normative scientific methodology, the dangers of the consensus approach clearly transcend matters of methodology.

“CONSENSUS is the process of abandoning all beliefs, principles, values and policies in search of something in which no one believes , but to which no one objects; the process of avoiding the very issues that have to be solved. merely because you cannot get agreement on the way ahead.”

Margaret Thatcher *The Downing Street Years*, page 167

Why the global deep freeze?

WHY IS IT SO FRIGID when the As an Arctic frost chills two-th and kills hundreds in Bangladesh may come from changes in the Ar

First, if you had any doubts, w ally deep cold spell, with snow an across the South. Driving conditi (and sometimes tragic) as pedestr homeless face bitter winds and icy "orthopedic weather." Ice dams are blocking Latvian ports, winds and storms are battering Europe, Portugal is freezing, Vietnam has lost one-third its rice crop, and the cold has caused close to 2,000 deaths in usually temperate South Asia.

As several scientists have warned, global warming will be full of surprises. Warming over the past half-century has already brought more erratic and extreme weather. Some climatologists are increasingly concerned about the stability of the climate system itself and the potential for abrupt shifts — to warmer or even much colder states. Can we make sense of the present cold snap?

Part of the explanation comes from changes to our north. Warming causes ice to melt, forming cold fresh water. And increased input of cold fresh water to the ocean can affect weather patterns as well as global ocean circulation.

Recent warming in the Northern Hemisphere has melted a lot of North Polar ice. Since the 1970s the floating North Polar ice cap has thinned by almost half.

A second source of cold fresh water comes from Greenland, where continental ice is now melting at higher elevations each year. Some melt water is trickling down through crevasses; lubricating the base, accelerating ice "rivers," and increasing the potential for sudden slippage.

A third source of cold fresh water is rain at high latitudes. Overall ocean warming speeds up the water cycle, increasing evaporation. The warmed atmosphere can also hold and transport more water vapor from low to high latitudes. Water falling over land is enhancing discharge from five major Siberian rivers into the Arctic, and water falling directly over the ocean adds even more fresh water to the surface.

The cold, freshened waters of the North Atlantic accelerate transatlantic winds, and this may be one factor driving frigid fronts down the eastern US seaboard and across to Europe and Asia.

It is too early to know how long the current cold spell will last, and time and hindsight will be needed to reveal all the factors contributing to the present chill. But the ice itself and pollen and marine fossils reveal that cold reversals have interrupted warming trends in the past.

Explicitly denied by the IPCC

Global warming brings some erratic and surprising weather

across to France. The North — for the next 1,000 years — jumped again in just several world to its present state.

In the past few years the has freshened, and since the flow between Iceland and S 20 percent.

Since cold reversals occur ask whether humans can in well.

Natural var fluctuations together changes in the tions (of orbita our hospitable likely to end d time soon. But fossil fuels, an bon dioxide ar any time in the last half million years. The recent buildup of heat-trapping greenhouse gases is forcing the climate

Epstein is an MD and McCarthy is a biologist. Neither could give a correct explanation of the greenhouse effect if their lives depended on it.

first slow down. And slowi much less coal, oil, and gas trees.

Significant incentives w neously solve the problems ment, and the economy. Bu through renewable energ of growth for this 21st cent insurance for a hea er-m cure future.

Dr. Paul R. Epstein is asso Center for Health and the G Harvard Medical School. Je professor of oceanography c and was co-chair of the IPC Working Group II.

As several scientists have warned, global warming will be full of surprises. Warming over the past half-century has already brought more erratic and extreme weather. Some climatologists are increasingly concerned about the stability of the climate system itself and the potential for abrupt shifts — to warmer or even much colder states. Can we make sense of the present cold snap?

Have we never seen a cold snap before?

Dr. Paul R. Epstein is associate director of the Center for Health and the Global Environment at Harvard Medical School. James J. McCarthy is professor of oceanography at Harvard University and was co-chair of the IPCC 2001 Assessment, Working Group II.

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1-03



PAUL R. EPSTEIN AND JAMES J. MCCARTHY

Why the global deep freeze?

WHY IS IT SO FRIGID when the globe is warming?
As an Arctic frost chills two-thirds the nation

The North Atlantic Ocean can freshen to a point
where the North Atlantic deep water pump — driv-

Even the editors of the *Boston Globe* realized how silly the Epstein-McCarthy Op-Ed was. Note the cartoon they attached to the piece.

Note that we have so far concentrated on those aspects of the science where there is very substantial agreement.

However, there is considerable recent work which strongly suggests that nature is dominated by negative rather than positive feedbacks, and that climate sensitivity to increasing anthropogenic greenhouse gases is small.

R.S. Lindzen, M.-D. Chou, and A.Y. Hou (2001) Does the Earth have an adaptive infrared iris? *Bull. Amer. Met. Soc.* **82**, 417-432

Lindzen, R.S. and C. Giannitsis (2001) Reconciling observations of global temperature change. *Geophys. Res. Ltrs.*, **29**, (26 June) 24-1-24-3.

Govindan, R.B., Vyushin, D., Bunde, A., et al, 2002: Global climate models violate scaling of the observed atmospheric variability. *Phys. Rev. Ltrs.*, **89**, 028501-1-4.

O. Kärner, 2002: On nonstationarity and antipersistency in global temperature series. *J. Geophys. Res.*, **107**(0), XXXX, doi:10.1029/2001JD002024.

Eugenia Kalnay and Ming Cai, 2003: Impact of urbanization and land-use change on climate. *Nature*, **423**, 528-531.

Chen, J., B.E. Carlson, and A.D. Del Genio, 2002: Evidence for strengthening of the tropical general circulation in the 1990s. *Science*, **295**, 838-841.

Wielicki, B.A., T. Wong,, 2002: Evidence for large decadal variability in the tropical mean radiative energy budget. *Science*, **295**, 841-844.

It is worth noting that the last two papers, while finding that the radiative budget behaves essentially as predicted by the iris effect, deny that the iris effect is responsible. The denial is based on an obvious misconception which is easily demonstrated.

One could go on at some length, but here is one point of scientific agreement that demands special attention:

Complete adherence to Kyoto will have no significant impact on climate, regardless of what one believes about climate sensitivity.

(Environmentalists sometimes point out that Kyoto is only the first step in a process that will necessitate many Kyotos. The cost will then also be many times that of Kyoto.)



Advanced Technology Paths to Global Climate Stability: Energy for a Greenhouse Planet

Martin I. Hoffert,^{1*} Ken Caldeira,³ Gregory Benford,⁴ David R. Criswell,⁵ Christopher Green,⁶ Howard Herzog,⁷ Atul K. Jain,⁸ Haroon S. Kheshgi,⁹ Klaus S. Lackner,¹⁰ John S. Lewis,¹² H. Douglas Lightfoot,¹³ Wallace Manheimer,¹⁴ John C. Mankins,¹⁵ Michael E. Mauel,¹¹ L. John Perkins,³ Michael E. Schlesinger,⁸ Tyler Volk,² Tom M. L. Wigley¹⁶

www.sciencemag.org SCIENCE VOL 298 1 NOVEMBER 2002

This paper points out that the UNFCCC and Kyoto approach of cutting CO₂ emissions isn't going to work and is therefore a huge waste of resources. The only solution to the potential problem of global warming, should such a problem exist, is long-term technological transformation. However, contrary to the IPCC's Working Group 3, the technological means to deal with the problem do not yet exist. After reviewing the possibilities from fusion to renewables to sequestration to bio-engineering, they conclude that there must be major breakthroughs in one or more of these areas. Thus, the solution to the potential problem is a long term one that will depend on human ingenuity over the next 30 to 100 years.

Political Take on Issue:

Tony Blair: In his speech to the party conference the British Prime Minister Mr. Blair informed those attending that implementing Kyoto will 'solve' Global warming.

Evening Standard : Robin Cook reports that Blair convinced Bush that the price of EU help on terrorism is that Bush starts acting like a responsible global citizen on Kyoto.

Dutch Minister of the Environment (Pronk): 'The science is settled.'

(To be sure, these remarks were made well before the preceding article on Kyoto, but the inappropriateness of Kyoto had been noted far earlier and remarks like the above continue to be made.)

The political remarks continue unabated. The claims of David King (Science Adviser to Tony Blair) and Hans Blix concerning Global Warming as a Weapon of Mass Destruction are too hysterical for serious comment.

A recent article in *The Observer* (Antony Barnett, Sunday April 4, 2004) continues a libelous and scientifically misleading approach:

“The memo's main source for the denial of global warming is Richard Lindzen, a climate-sceptic scientist who has consistently taken money from the fossil fuel industry. His opinion differs substantially from most climate scientists, who say that climate change is happening.”

Note the conflation of ‘climate change,’ which is always occurring, with the alleged problem of fossil fuels.

What are we to make of the difference in perception between scientists and the non-scientific public?

Is it purely the fault of politicians and environmental advocates?

Unfortunately, the answer may, alas, be **no** at least to the extent that scientists have not strongly objected to the misrepresentation of their position. The situation has been complicated by the fact that alarmism has become an important factor in both scientific funding and recognition.

The Barnett quote indirectly points to an issue I have avoided so far. Namely, there are individuals for whom global warming has assumed the character of a religion or dogma, and, in the ever expanding world of climate ‘stake holders,’ these individuals often act with authority.

An example of such an individual is Madeleine Jacobs, the former editor of *Chemistry and Engineering News*. In response to a simple and temperate letter from S. Fred Singer, trying to point out some obvious problems in a published paper on global warming, here is Ms. Jacobs reply. Perhaps, you are unaware that such passion, ignorance and venom on this issue has come to be associated with a major science based profession .

N.B. Remarks in red are demonstrably wrong or profoundly misleading.

Dear Dr. Singer

Your letter seems to fall into the category of "Don't confuse ME with the facts." Or to state it differently, if someone repeats something over and over again, eventually some people will believe it, even if it isn't true. Only in this case, it is not C&EN that is guilty of misstating the facts.

*Point by point on your letter. **The two Canadian scientists who have published the so-called detailed audit of temperature records have been discredited for the most part, as have the claims of Lindzen.***

*Your second claim is absolutely false. **The surface temperatures are what is important for life on land and the ocean. The satellite temperatures, now corrected for errors in the original observations, follow almost exactly what would be expected from a combination of warming on earth and cooling in the stratosphere (caused by warming at the surface and ozone depletion).***

Many, many other lines of evidence, such as earlier snow melt and melting of mountains glaciers, point to the fact that most of the earth has warmed.

There is about a 1% chance that the observed global warming is a natural variation. But nearly all scientists who study this issue, believe that much of it is human induced. Almost every prominent scientist who dissents from this view is funded by the coal industry, either directly or indirectly.

Your third claim is also false. The most recent models do not use adjustable parameters.

So, in summary, I won't be publishing your letter.

Sincerely,

Madeleine Jacobs

Editor-in-Chief

Chemical & Engineering News

What is to be done?

At the **policy level**,

Avoid bitter international argument over the implementation of an irrelevant solution to an unlikely problem.

If our concern is with our grandchildren, I think we can leave them a better legacy than Kyoto.

If our concern is with the poor and helpless, there are clearly better things we can do with our resources.

If our concern is over the stability of oil and gas supplies, we can consider that issue on its own merits.

In brief, we should disentangle policy preferences in such matters from the science of climate change.

As concerns **the science**, we certainly can do better, but there is the ominous (and I would suggest likely) possibility that we will find that anthropogenic climate change is not a serious threat. Then, many thousands of people will have to find something else to do than attend innumerable meetings on climate change.

On a more serious note, we really ought to make sure to preserve the integrity of science as a tool for effective assessment and understanding of nature. It is a tool that has served the world well for the most part.

Here are a few suggestions for getting the science to better focus on the problem at hand:

Don't replace understanding (theory) with modeling.

Don't use inappropriate data simply because it is available. Design observational systems to answer meaningful questions.

Don't wallow in ambiguity. Obtain answers that are as definite as consistent with normative scientific standards.

Don't simply compare models; test them as well.

Absolutely crucial to the improvement of the science is the creation of a suitable research environment.

Policymakers should devote their ingenuity to designing a system of support for science that encourages problem resolution and does not encourage alarmism.

I suspect that such a system will only emphasize interdisciplinary interactions to the extent that they are essential to resolving scientific questions. Relatedly, the enthusiasm for integrated assessment should be approached with caution. Involving social scientists often creates a constituency whose only concern with climate depends on alarmism.

Remember that claims of climate catastrophe distort legitimate prioritization in favor of an emphasis on climate (in both science and policy). The inappropriateness of such an emphasis is evident in the IPCC claim that the primary victims of warming will be the poor in the developing south. This has been used to justify Kyoto. Yet, a mere 10% of the annual cost of Kyoto will provide these poor with clean drinking water, while Kyoto won't even significantly impact climate regardless of what one believes about climate.

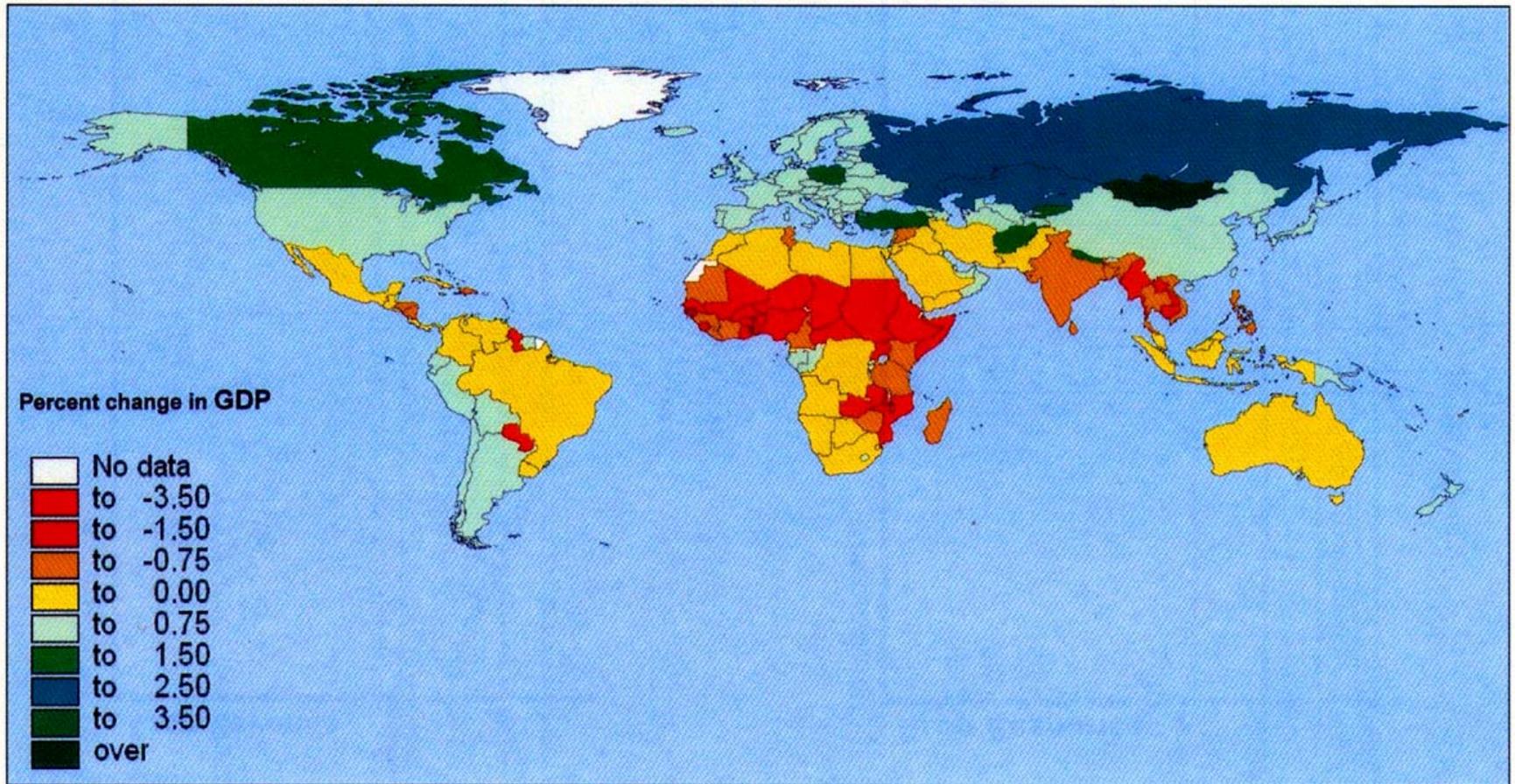
In summary,

We see that there is some possibility of danger to the earth from greenhouse emissions; note that the danger depends not on warming *per se*, but on the amount of warming.

However, the larger problem may be that the public has been misled as to the meaning of the science that exists thus far. This is not a matter of *skeptics v. believers* though there is plenty to be skeptical about. Relatedly, despite large expenditures, the struggle of climate and weather science to become hard sciences has suffered from the profound politicization of field.

That said, climate change has been the norm in the history of the earth regardless of man's activities, and not all climate change is for the worse.

GLOBAL ECONOMIC IMPACTS USING GISS



From *The Greening of Global Warming* (1999) by Robert Mendelsohn of Yale.

At present the situation for developing in the public a rational perspective on the highly politicized climate issue seems poor.

Nevertheless, one can hope that responsible citizens (especially those with a background in physics) will eventually be willing to spend a little time to find out what the graphs and claims we are shown actually mean. Alarm is hardly a substitute for this.