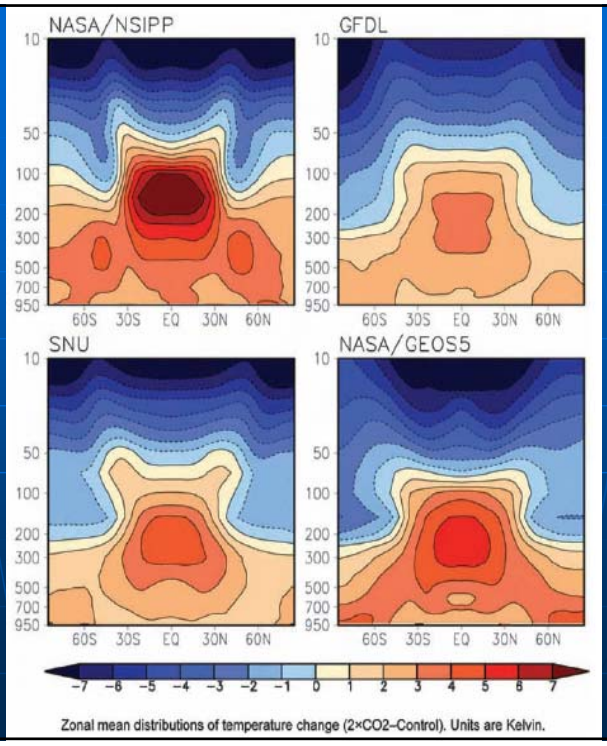
Lindzen: Taking Greenhouse warming seriously



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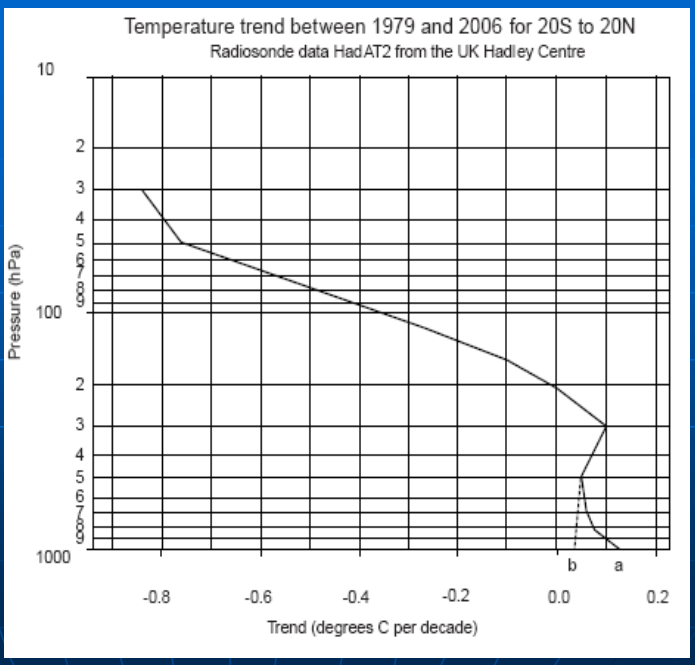

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How then did the recent IPCC Summary for Policymakers reach its conclusion that most of the surface warming over the past 30 years is due to anthropogenic forcing? The answer is that the modelers could not find anything else that could account for recent warming. The specific response of Alan Thorpe, head of NERC, the primary funding agency for climate research in the UK, is revealing:

"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 insuficiently 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."

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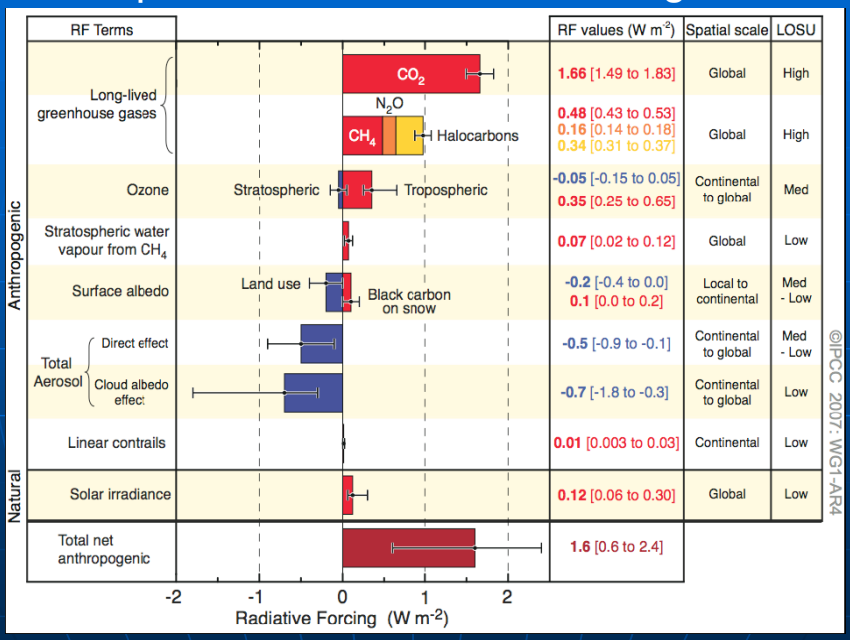
Several features of this response should be noted immediately:

1. Evidence for natural variability is restricted to model outputs.
2. Evidence is said to include the irrelevant claim that only by assuming human causality is policy relevance assured. To be sure, policy relevance is important, but it cannot be a reason for a scientific conclusion.
3. The assertion that there is no reason to suppose that there are factors omitted from the models is likely to be false as we shall discuss shortly. So too is the claim that such factors are currently unknown to science.

Components of Radiative Forcing, 2005



Intergovernmental Panel on Climate Change (IPCC), WGI Fourth Assessment Report *2007: Summary for Policymakers,* Cambridge University Press (in press, 2007). http://www.ipcc.ch

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For reference purposes, the radiative forcing associated with a doubling of CO2 is about 3.5 watts per square meter (as noted in the last 3 IPCC Scientific Assessments).

Adding up current radiative forcing of GHG yields about 3 watts per square meter, which is about 86% of the radiative forcing associated with a doubling of CO2.

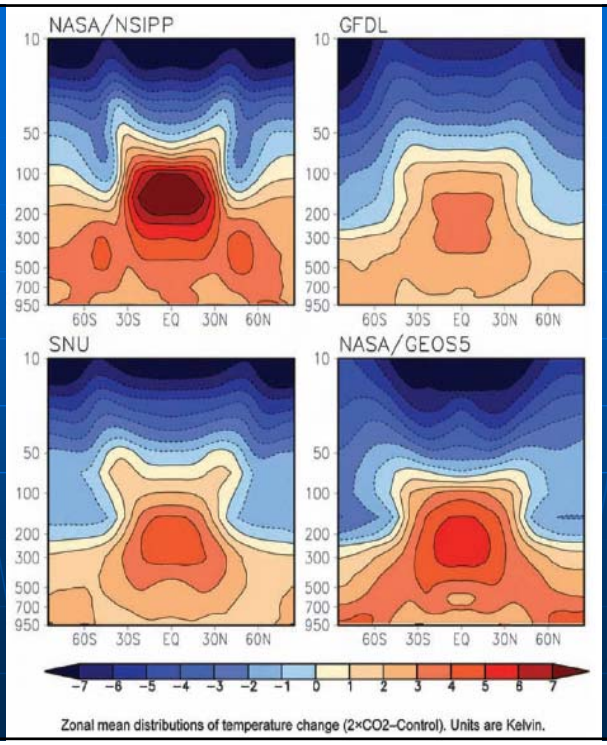
That is to say we are almost at the radiative forcing associated with the benchmark of doubled CO_2.

For these models, we should expect a surface warming of1.5 – 3.5 ºC.

BUT observations are for surface warming of only 0.6 – 0.8 ºC.

Conclusion:

Current models are much more sensitive to anthropogenic GHG than they should be.



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

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How can it be claimed that models are replicating the observed warming?

1. The large error bars in other items – aerosols in particular – are used to "arbitrarily cancel" half the anthropogenic warming.

2. Transient runs rather than equilibrium is used for predications – so the argument is that the ocean has not yet responded to the warming.

"The need to cling to the high sensitivities is readily explained by Thorpe's insistence on policy relevance. Without high sensitivity, this would be greatly diminished. Indeed, to maintain the ominous projections, it is necessary to assume that the aerosol cancellation will soon disappear (Wigley and Raper, 2002)."

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This brings us to the last item: namely, is there really no reason to suppose that excluded processes exist?

There are, in fact, numerous phenomena that current models fail to replicate at anywhere near the magnitudes observed.

Intraseasonal oscillations of tropics:

- Madden-Julian oscillation
- QBO
- El Nino

Little Ice Age

Medieval Warm Period

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Arguments suggest that current warming can be explained by oceanic fluctuations such as Pacific Decadel Oscillations and Atlantic Multidecadel oscillations.

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Lindzen's Conclusion

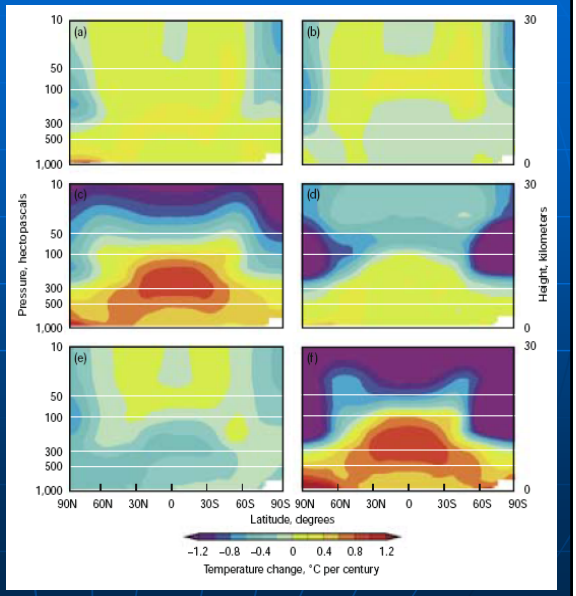
"Using basic theory, modeling results and observations, we can reasonably bound the anthropogenic contributions to surface warming since 1979 to a third of the observed warming, leading to a climate sensitivity too small to offer any significant measure of alarm – assuming current observed surface and tropospheric trends and model depictions of greenhouse warming are correct."

Santer: **Consistency of modelled and observed temperature trends in the tropical troposphere**

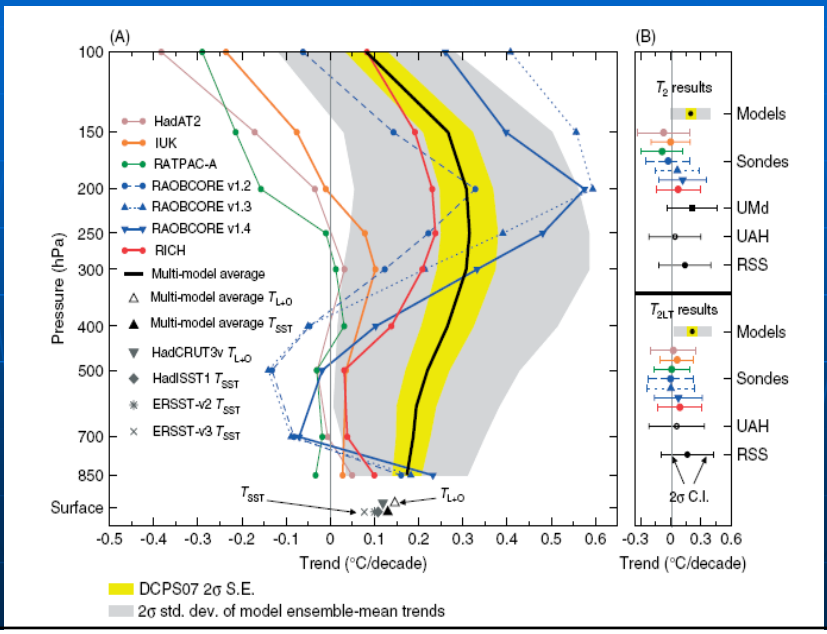
"Several recent comparisons of modelled and observed atmospheric temperature changes have focused on the tropical troposphere (Santer *et al*., 2006; Douglass *et al*., 2007; Thorne *et al*., 2007). Interest in this region was stimulated by an apparent inconsistency between climate model results and observations. Climate models consistently showed tropospheric amplification of surface warming in response to human-caused increases in well mixed GHGs. In contrast, early versions of satellite and radiosonde datasets implied that the surface had warmed by more than the tropical troposphere over the satellite era. This apparent discrepancy has been cited as evidence for the absence of a human effect on climate (e.g. Singer, 2008).

Santer: Tropopause Height/Climate Fingerprint

Results from the Parallel Climate Model show fingerprints of the estimated temperature change from 1890 to 1999 for five natural and anthropogenic forcings, given as a function of latitude and altitude: (a) solar irradiance, (b) volcanoes, (c) well-mixed greenhouse gases, (d) ozone depletion, (e) sulfate aerosols, and (f) all five individual forcings varied in concert.



Santer: **Consistency of modelled and observed temperature trends in the tropical troposphere**



Santer: **Consistency of modelled and observed temperature trends in the tropical troposphere**

In summary, considerable scientific progress has been made since the first report of the U.S. Climate Change Science Program (Karl *et al*., 2006). There is no longer a serious and fundamental discrepancy between modelled and observed trends in tropical lapse rates, despite DCPS07's incorrect claim to the contrary. Progress has been achieved by the development of new datasets, better quantification of structural uncertainties in satellite- and radiosonde-based estimates of tropospheric temperature change, and the application of rigorous statistical comparisons of modelled and observed changes.

We may never completely reconcile the divergent observational estimates of temperature changes in the tropical troposphere. We lack the unimpeachable observational records necessary for this task. The large structural uncertainties in observations hamper our ability to determine how well models simulate the tropospheric temperature changes that actually occurred over the satellite era. A truly definitive answer to this question may be difficult to obtain. Nevertheless, if structural uncertainties in observations and models are fully accounted for, a partial resolution of the long-standing 'differential warming' problem has now been achieved. The lessons learned from studying this problem can and should be applied towards the improvement of existing climate monitoring systems, so that future model evaluation studies are less sensitive to observational ambiguity.

Lomborg: **Global warming – are we doing the right thing?**

"Moreover, global warming will not decrease food production, it will probably not increase storminess or the frequency of hurricanes, ["there is no general agreement yet among models concerning future changes in midlatitude storms (intensity and frequency) and variability," and "there is some evidence that shows only small changes in the frequency of tropical cyclones."] it will not increase the impact of malaria or indeed cause more deaths [Mathematical models, merely mapping out suitable temperature zones for mosquitoes show that global warming in the 2080s could increase the number of people *potentially* exposed to malaria by 2-4 percent (260-320 million people of 8 billion at risk.) Yet, the IPCC points out that most of the additionally exposed would come from middle or high income countries, where a well functioning health sector and developed infrastructure makes actual malaria unlikely."

Lomborg: **Global warming – are we doing the right thing?**

"The consequences of global warming will hit hardest on the developing countries, whereas the industrialized countries may actually benefit from a warming lower than 2-3°C.12 The developing countries are harder hit primarily because they are poor – giving them less adaptive capacity.

Despite our intuition that we naturally need to do something drastic about such a costly global warming, we should not implement a cure that is actually more costly than the original affliction. Here, economic analyses clearly show that it will be far more expensive to cut CO2 emissions radically, than to pay the costs of adaptation to the increased temperatures."

Lomborg: **Global warming – are we doing the right thing?**

"The cost of such a Kyoto pact if implemented, just for the US, will be higher than the cost of solving the single most pressing problem for the world – providing the entire world with clean drinking water and sanitation.

It is estimated that the latter would avoid 2 million deaths every year and prevent half a billion people becoming seriously ill each year. If no trading mechanism is implemented for Kyoto, the costs could approach $1 trillion, or almost five times the cost of world-wide water and sanitation coverage. For comparison, the total global aid today is about $50 billion annually."

Lomborg: **Global warming – are we doing the right thing?**

"Essentially, what the IPCC suggests – and openly admit – is that we need to change the individual lifestyles, and move away from consumption. We must focus on sharing resources (e.g. through coownership), choosing free time instead of wealth, quality instead of quantity, and "increase freedom while containing consumption." Because of climate change we have to remodel our world, and find more "appropriate lifestyles."

Lomborg: **Global warming – are we doing the right thing?**

"But of course, while using global warming as a springboard for other wider policy goals is entirely legitimate, such goals should in all honesty be made explicit. Moreover, it is problematic to have an organization which often quite successfully gathers the most relevant scientific information about global warming, also so clearly promoting a political agenda, which seldom reaches the news headlines."