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Brief biosketch

I am John Christy, Ph.D., Professor of Atmospheric Science and Director of the Earth System Science Center at the University of Alabama in Huntsville. I have served as Lead Author of both the IPCC and CCSP reports, have published widely on climate science, have served on NRC and NAS panels, have testified several times before congressional hearings and have received a number of awards including NASA's Medal for Exceptional Scientific Achievement. I also appeared as an expert witness, unpaid, in Federal Court to testify as to the impact of California AB 1493 (auto emission standards) on the climate system. Both sides and the Judge accepted my conclusions.

Introduction

There are many aspects about the proposed rules that should be challenged, but I will focus only on the part about which I have considerable experience and a considerable publication record. In general, I am deeply troubled that the EPA has accepted an alarmist set of assumptions as "facts" when the truth is that our ignorance about the climate system is still enormous. I will demonstrate that assertions held by the EPA are highly questionable because they are based on "consensus reports", poor data and poor model projections. I concentrate on three major EPA assertions (the third has two parts) each of which will be introduced by a condensed statement of the assertion, then the alternate conclusion I supply ("Bottom Line"), followed by a rather detailed explanation.

Part III.A.3 The Administrator's Proposed Endangerment Finding (18896)

Condensed EPA Assertion 1: "… most of the observed global and continental warming can be attributed to this anthropogenic rise in greenhouse gases. The information presented here builds on these facts …"

Bottom Line 1: Attribution of climate variations is a function of faith in climate model projections and not in direct observations (i.e. "facts").

Explanation 1:

"Facts" about the climate system are only "assertions" until proven beyond doubt to be real (with error bars) by testing. The EPA has relied almost exclusively on consensus documents (e.g. IPCC and CCSP) as the origin of their "facts". I have served as a Lead Author of both the IPCC and CCSP reports and will demonstrate with published data that these reports are not always "factual" but written (a) to give the impression of certainty where large uncertainty is the reality or (b) to actually suppress results which run counter to the more alarming conclusions. And, more importantly, the "consensus" exercise is a false scientific process because the authors tend to write about their own publications and are given the final review-authority of the products (i.e. this is not a peer-reviewed process in the sense that the product could have a relatively high probability of being rejected by independent reviewers. The selected authors KNOW their words will be published since they have the "last word".)

Indeed, the great majority of the IPCC authors were, on the one hand, not climate scientists and were, on the other hand, pre-approved by their governments in a political process (this is a pattern followed by the CCSP reports as well.) This should lead to considerable caution when interpreting their statements – the reports had as their final editors those who were appointed by the political process. Thus, scientific results deemed inconsistent with personal views of the authors were far less likely to be considered in the reports.

A fundamental notion contained in the IPCC and CCSP reports, and stated in the EPA quote above, is that climate models are capable of producing "facts" when in fact they cannot. They are models – which means they are the sum of the assumptions and prejudices of the organizations building the models (and do rather poorly when measured against the real world as shown later.) Here is a simple fact:

> There is no instrument that can measure Earth's temperature change which can unambiguously determine what part of the temperature change might be due to humans and what part might be due to nature.

[It should be noted that the IPCC AR4 stated there was a 90% probability that most of the surface warming in the past 50 years was human-induced. Thus to characterize human-induced warming as "fact" (see quote from EPA under assertion 1) is to say an idea that is only 90% confident (from the IPCC itself) is a fact. I do not know of any context in which a 10% probability of being incorrect would be considered a "fact".]

Claims as to how much of the change is due to humans are found only in model assumptions and simulations … not in direct observation. Therefore, it is faith in model simulations (and their assumptions) that drives the notion that major variations in the climate are due to greenhouse gases. I will demonstrate below that the "facts" relied on by the EPA endangerment finding are not "facts" but assertions for which there is considerable contradictory information.

Part III.C. The Administrator's Proposed Finding That the Air Pollution Endangers Public Health and Welfare

Part 1. Evidence of currently observed climatic and related effects (18898)

Condensed EPA Assertion 2: Popular surface datasets, which show warming, represent the effect on the climate caused by greenhouse gas increases.

Bottom Line 2: Popular surface datasets have poor station selection and are contaminated by warming of nighttime temperatures caused by surface development, not greenhouse warming.

Explanation 2:

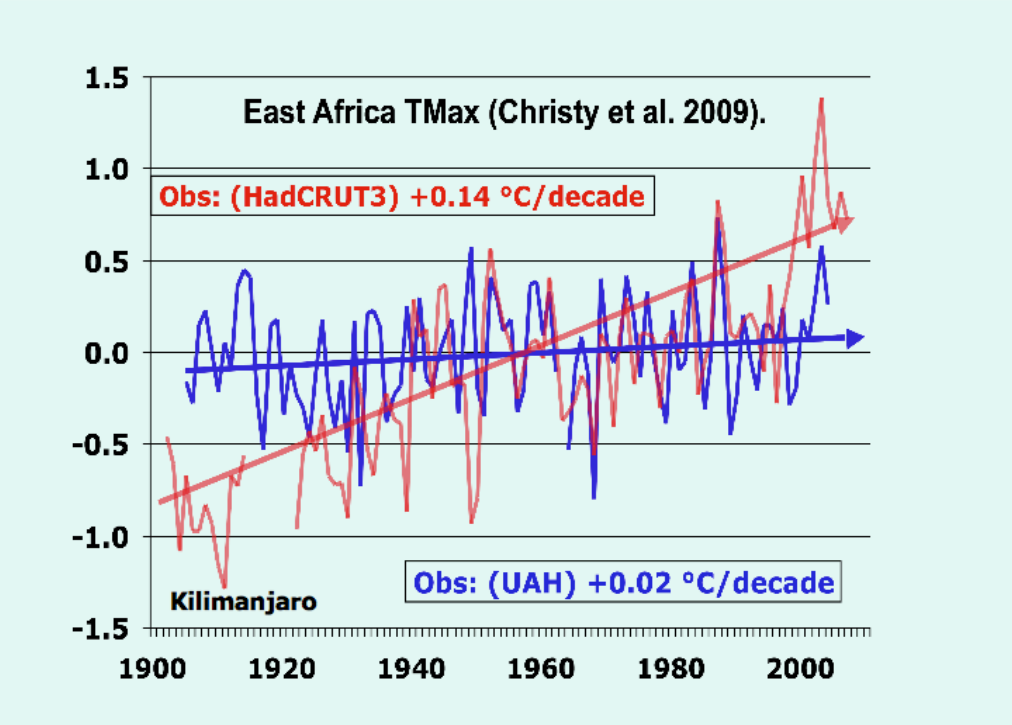
The major "fact" used by the EPA (derived from the IPCC) is that the popular surface temperature datasets (HadCRUT3v, GISS, NOAA/NCDC) are accurate representations of the part of the climate system which is affected almost exclusively by rising greenhouse gases. Thus, the reasoning goes, as the surface temperature rises, this becomes an indicator primarily of greenhouse effects with all other effects being fairly minor, including natural variability. This is an assertion which is highly questionable and likely false.

As a culmination of several papers and years of work, Christy et al. 2009 demonstrates that popular surface datasets overstate the warming that is assumed to be greenhouse related for two reasons. First, these datasets use only stations that are electronically (i.e. easily) available, which means the unused, vast majority of stations (usually more rural and more representative of actual trends but harder to find) are not included. Secondly, these popular datasets use the *daily mean* surface temperature (TMean) which is the average of the daytime high (TMax) and nighttime low (TMin). In this study (and its predecessors, Christy 2002, Christy et al. 2006, Pielke Sr. et al. 2008, Walters et al. 2007 and others) we show that TMin is seriously impacted by surface development, and thus its rise is not an indicator of greenhouse gas forcing. Some have called this the Urban Heat Island effect, but, as described in Christy et al. 2009, it is much more than this and encompasses any development of the surface (e.g. irrigated agriculture). For scientists reading this response, I would encourage you to read Christy et al. 2009 for a discussion of how the delicate nocturnal boundary layer formation process is disrupted by surface development, leading to an increase in TMin which is unrelated to greenhouse gas forcing. The evidenced supplied in this paper is supported by several other studies from the observational, theoretical and boundary-layer modeling arenas.

(In some of the examples below, we will look at trends from 1979 forward since this is the period of surface warming in the popular datasets blamed on greenhouse forcing. Since there was no warming from 1950-1979, the IPCC 2007 assertion that "most" of the warming since 1950 is due to greenhouse gases relies only on the post-1978 period).

Below is an example for East Africa (grid square bounded by 5°S – Eq, 35°E – 40°E). Here we see the two flaws in the popular datasets (HadCRUT3v and GISS NASA). First, the reliance on a very few stations leads to large errors (popular trends > +0.3 °C/decade vs. +0.1 when all stations are used with rigorous techniques) and secondly, the use of TMean which incorporates the warming effects of surface development in TMin which are mistakenly assumed to be driven by greenhouse gases (Christy et al. 2009).

East Africa 1979-2004	Trends °C/decade			
Dataset	TMean	TMin	TMax	No. Stations
HadCRUT3v	+0.31	-	-	2
GISS NASA	+0.35	-	-	4
Christy et al.	+0.11	+0.16	+0.05	45

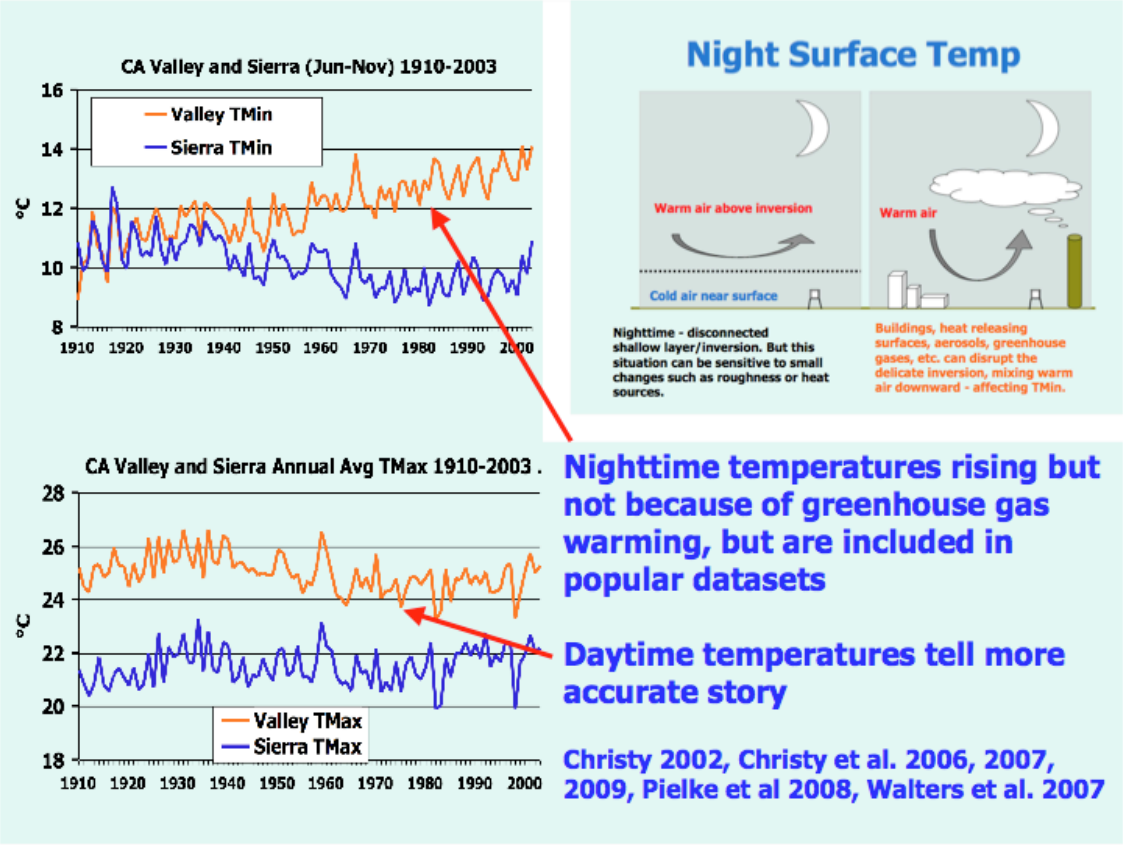


The figure above shows the difference between the results of HadCRUT3v (surface TMean) and our published study for the 100 year period 1905-2004 (surface TMax, the earlier Table looked at 1979-2004 only). It is clear that the popular dataset (HadCRUT3v) overstates the physical warming of the surface (and atmosphere.)

A second example below is given for Central California as reported in Christy et al. 2006. Here we have a different experiment in which we built two datasets, one of the San Joaquin Valley which has experienced extensive surface development (urbanization, irrigated farming, orchards replacing desert, etc.), and one of the adjacent Sierra Nevada mountains, where little development has occurred.

California	Trends C/decade			
1910-2003	TMean	TMax	TMin	Stations
Valley	+0.07	-0.10	**+0.25**	18
Sierra	-0.02	+0.05	-0.08	21

The figure below is a summary of the results for California, demonstrating the misrepresentation of incorporating TMin in popular datasets.



Here, we see that the only significant temperature trend is for TMin in the developed Valley. The "control experiment" (TMin in Sierras) shows no warming, thus greenhouse gases could not be the cause of the Valley warming because greenhouse gas warming, according to models, would warm the entire area, and in fact warm the Sierra more than the Valley. A second "control" experiment, TMax, is not warming in either region, further indicating TMax is the preferred metric for detecting larger-scale phenomenon like the enhanced greenhouse effect (which apparently is having no impact.) The paper also reports that the popular datasets show higher TMean warming rates than even shown here due to their small selection of stations used (+0.10 °C/decade warmer, Christy et al. 2006, pg 562). An objection was raised about a single one of the sixteen time series created in our paper by Bonfils et al. 2007, but Christy et al. 2007 demonstrated the objection was incorrect.

The basic result of all of these studies is that the few stations selected for calculations in the popular datasets are spuriously warm over the land and that they include TMin, which is warming more than TMax, but not because of greenhouse gas forcing. The best surface metric for detecting atmospheric warming is TMax (daytime high) as it generally occurs with the deeper mixing of the atmosphere and is not nearly as impacted by boundary-layer disruptions (see studies cited above and upper right hand figure above.) An even better metric is tropospheric temperature change (satellite data.) The recent paper by

Voss et al (2005) which appeared to show that more recently TMin was warming at a rate not quite as slowly as TMax did not have the opportunity to include most of the developing world (as we have shown for East Africa, for example), and thus has generally missed the part of the world where such effects would be observed.

One criticism of our work might be that we have examined only a few locations around the earth. This is a legitimate point. However, these studies are excruciatingly detailed and time-consuming (thus we have only completed these). We have selected three very different surface temperature climates and found the same result in all – the popular surface datasets overstate the warming in these areas as compared with our carefully-constructed *and published* results. However we can point to global results too. When comparing the global land trends of the satellite (i.e. atmospheric) and surface datasets, the trend differences are physically explainable only if the land surface measurements are contaminated by local development activities. Thus we have demonstrated in three locations what is consistent with the global-land temperature trend differences between the surface and the atmosphere.

Warning: The EPA will be tempted to rely on scientists/appointees who are well-entrenched into a particular view of the issue of global warming to review documents such as this, and who will (a) develop clever-sounding rebuttals, and (b) are afforded the luxury of the "last word" to protect the current EPA consensus. Basic scientific inquiry should encourage EPA to listen to those of us who actually build these datasets (from scratch) as our message has equal if not greater credibility.

Part III.C. The Administrator's Proposed Finding That the Air Pollution Endangers Public Health and Welfare

Part 1. Evidence of currently observed climatic and related effects (18898)

Condensed EPA Assertion 3: Climate models have enough precision to allow EPA to make the assertions stated in this section, i.e. "… most of the observed global and continental warming can be attributed to this anthropogenic rise in greenhouse gases." And "… changes are occurring now that can be attributed to the anthropogenic rise in atmospheric greenhouse gases …"

Bottom Line 3.1: Climate model output has failed to reproduce current tropical changes, a key greenhouse detection region, significantly overstating the very modest warming. The information in CCSP 1.1 (Karl et al. 2006) is biased, but more importantly, out of date.

Explanation 3.1:

That climate models have serious shortcomings is not a new scientific finding. However, it is well known that the clearest signal of model-projected greenhouse warming is found in a rapidly warming tropical troposphere. This issue has been examined by both the IPCC and CCSP (SAP 1.1, Karl et al. 2006) with disappointing analysis. I want the EPA to know that those who write these consensus reports are people who often serve as gatekeepers of these issues. I have served on these panels and have witnessed the heavy-handed tactics of the authors. The majority of these authors are selected by their governments for their specific view on climate change, not because of their scientific productivity on the issue at hand. I struggled with the other CCSP lead authors, as detailed in my House Testimony of 2006 (Christy 2006), for a more accurate rendering of the summary statements, but was unsuccessful. Thus "consensus" is less than what it appears to be.

With that as a background, the fundamental issue here is that climate model simulations produce temperature changes in the tropics that show the upper air warms more than the surface as a very distinct signature of the enhanced greenhouse effect. At certain altitudes, the warming is twice (or more) that of the surface in the models. So, a simple hypothesis test can be performed which compares the upper air temperature trends to the surface using observations and models. Models show that the upper air layer-average

trend is 1.3 times that of the surface. The factor of 1.3 is often called an amplification factor or amplification ratio.

Let me say here that one point of confusion occurs immediately. One can say that the surface and tropospheric trends are consistent (i.e. not statistically different) in the sense that their magnitudes are similar (i.e. an amplification ratio of 1.0). However, the real scientific discussion deals with the fact that in the tropics climate models indicate that tropospheric trend should be about 1.3 times greater than the surface if models have greenhouse theory correctly simulated. Thus when someone says the discrepancy between the surface and tropospheric trends has been resolved with no difference between them, this becomes a misleading statement because it also implies that the troposphere is warming no more than the surface, which is therefore *inconsistent* with model greenhouse theory on which the current EPA relies.

We have continued to look at this issue beyond CCSP (and the IPCC which simply followed the CCSP findings) and now have even further evidence to demonstrate that this well-known discrepancy is indeed real and that the models have erred significantly. In Christy et al. 2007, the most detailed analysis to date was performed on all balloon stations in the tropics (20°S - 20°N) in comparison with all datasets available at the time and concluded the observed upper air tropical trend was not 1.3 times that of the surface (it was less).

While much was in the paper, one interesting result was that a satellite dataset produced by Remote Sensing Systems (RSS, which indicated a warmer temperature trend than the other datasets) contained a discontinuity in 1992 that was especially strong in the tropics. This feature was confirmed in three other studies which used different tests to demonstrate also that the trend of RSS was spuriously too positive (Christy et al. 2006, Randall and Herman 2008 and Christy and Norris 2009.) In this last paper (Christy and Norris 2009) we also demonstrated that the new NOAA-produced satellite dataset (STAR) has serious problems due to errors in correcting diurnal problems and intersatellite biases. These results were not included by the CCSP or IPCC panels to influence the "consensus" (the publications were after CCSP and thus IPCC had closed), but their results remain unchallenged and should be accepted by the EPA as peer-reviewed, published findings. [Note: A different paper, Douglass et al. 2007, which demonstrated the model failures, was challenged as will be discussed below.]

A simple way to look at this basic issue is that models show an amplification of temperature trends through the troposphere caused by greenhouse gases, so that whatever the trend is at the surface, the upper air trends warm by up to a factor of 2 (and more) by 12 km altitude. The average factor for the layer (which satellites measure) is 1.3, i.e. the layer measured by satellites should warm by a factor of 1.3 faster than the surface according to the greenhouse theory in models. The results of Christy et al. 2007 indicate the factor is not 1.3, but 0.7 to 1.0 (when RSS is discounted) – i.e. no amplification and thus models over-warm the atmosphere. Douglass et al. 2007 (I was a co-author) followed up with a detailed comparison of observations and models to demonstrate a significant difference between the two using both satellites and balloons, or that the

model hypothesis of an amplification factor was falsified – important because that is the key signature of greenhouse gases in the models.

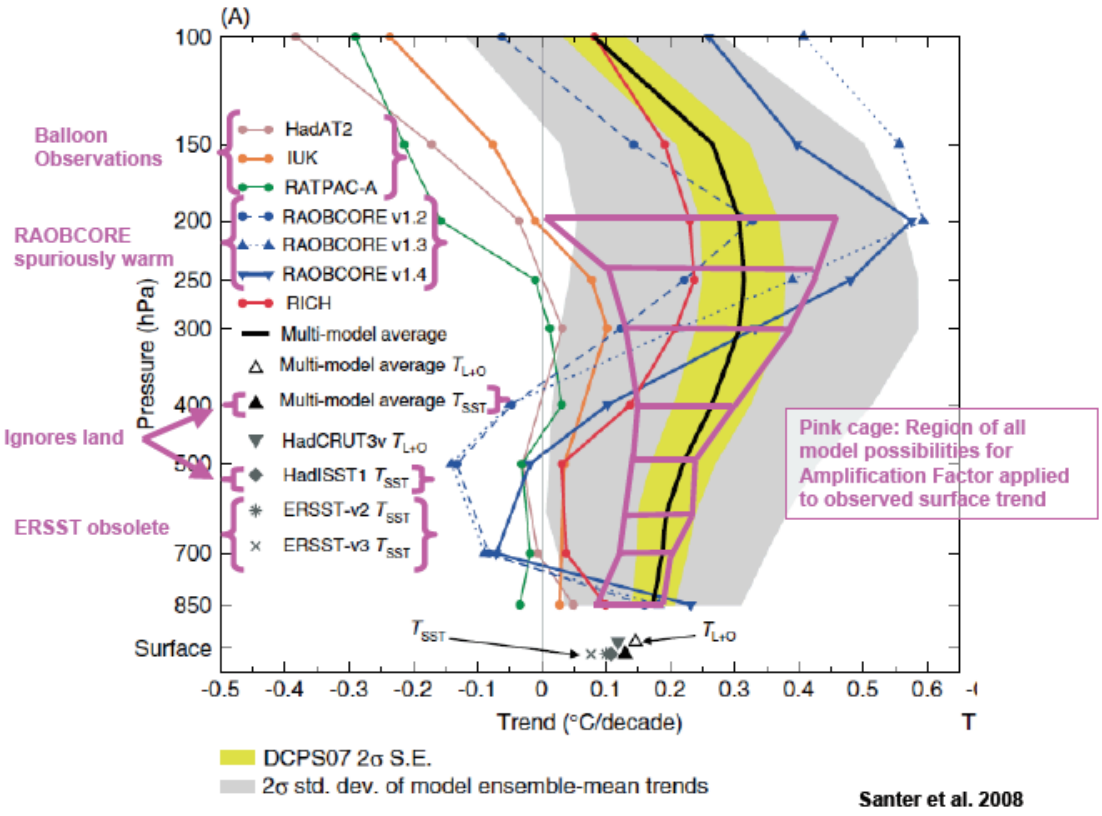
It didn't take long for the "consensus" side, which earlier dominated CCSP 1.1 (Karl et al. 2006), to respond. Santer et al. 2008 reconfirmed the numerical results of the question addressed by Douglass et al. 2007. Our question was simply, "When the models and the observations have the same surface temperature trend, do the models and observations agree in the troposphere?" The answer was no. In other words, Santer et al. reproduced the results of Douglass et al. 2007.

However, Santer et al. then asked a different question, which might have interest to some, but was not our question as stated above. They asked something like this, "When individual model trends of the surface are allowed to be examined, whether they agree with the observations or not, do upper air trends between models and observations agree?" Not surprisingly, because some individual model trends are quite bizarre, they could answer in the affirmative, but only for models whose surface temperature did *not* match the observed surface trend. In other words we compared apples to apples and Santer et al. compared apples to oranges. When going back to the fundamental issue of whether models overstate the atmospheric amplification factor, the answer is clearly yes from the observations and models we have. (And in an ironic result, had Santer et al. used UAH satellite data through the most recent year, the models would have failed their test in any case.)

In the analysis, Santer et al. used some "old" , "modified" (i.e. SSTs only) and "new" datasets that (a) revealed less surface warming or (b) more upper tropospheric warming. By using these datasets, the apparent discrepancy could be reduced (i.e. cooling the surface or warming up the troposphere in the observations). Then, one unorthodox trick was added - the use of Sea Surface Temperatures (SSTs) only and ignoring the warming of the land temperatures as if they did not matter (which is incredulous since the upper air resides over land too.) Regarding the SST datasets, they used a "new" one –ERSST - which indicated less warming at the surface so when multiplied by the model-calculated factor of 1.3, implies less warming in the upper air – which then was closer to our upper air observations. However, the version of ERSST used in the paper is now obsolete (obsolete trend was +0.076, new trend is now +0.126 °C/decade – 65% warmer!), so the consistency arguments of Santer et al. based on the old ERSST are obsolete as well.

The figure below, from Santer et al. 2008 but supplemented with pink comments, is quite complicated, but contains much of the information described herein. This is a diagram of the vertical atmosphere and superimposed are trends for 1979-1999 from various balloon observations and IPCC AR4 model results. The key point here is that the pink cage represents the entire range of model trends under the assumption they produced the observed surface trend (i.e. this gives an apples to apples comparison between models and observations). As can be seen, the observations (brown, red, green, orange lines) lie to the left (cooler) than the coolest of the model trends for the bulk of the lower atmosphere (700 – 400 hPa). Only part of the RICH (red) trends penetrate the cage, though, RICH is influenced by the ERA-40 model forecast scheme which has a clearly

demonstrated spurious warming due to improper assimilation of HIRS channel 11 (which renders RAOBCORE v1.2-1.4 obsolete, see below.) The other balloon datasets are not affected by that problem.



In another curious avoidance, Santer et al. did not include surface datasets generated by NOAA/NCDC and NASA/GISS to confuse the overall picture again. When these datasets are used (with their higher surface trends pointing to higher upper air trends when multiplied by 1.3), they indeed more closely support the results of Christy et al. 2007 and Douglass et al. 2007 that upper air trends of models and observations are significantly different.

Regarding the upper air trend datasets, Santer et al. included RAOBCORE v1.2, v1.3 and v.1.4, which appeared to show a fairly rapidly warming in the upper tropical troposphere (see Fig.) However, the RAOBCORE datasets, which rely on the ERA-40 forecast cycle, have been shown to be spuriously warm in the upper air due to an error in the assimilation of HIRS channel 11 in 1991-2 (noted in earlier papers, but specifically identified in Sakamoto and Christy, 2009). Rather, Christy et al. 2007 and Douglass et al. 2007 used the latest version from the RAOBCORE group - RICH, which was also affected by the spurious warmth in 1991-2 but not as much, and yet found the inconsistency with models was indeed upheld for the layer-average.

Again, relying on the various datasets, *which have been tested for accuracy*, we find no evidence to contradict the results of Christy et al. 2007 and Douglass et al. 2007. (Note the caveat, "which have been tested for accuracy" – papers such as Santer et al. 2008 do no testing, but simply assume that all datasets are equal, such as "new" ERSST or "old" RAOBCORE v1.2, v1.3 and v1.4, and thus ignore the publications which have provided the evidence which document significant errors in the ones they prefer.)

There is much, much more available on this topic, but I will leave it here. Please contact me for more information/clarification if needed.

[Repeated] Warning: The EPA will be tempted to rely on scientists/appointees who are well-entrenched into a particular view of the issue of global warming to review documents such as this, and who will (a) develop clever-sounding rebuttals, and (b) are afforded the luxury of the "last word" to protect the current EPA consensus. Basic scientific inquiry should encourage EPA to listen to those of us who actually build these datasets (from scratch) as our message has equal if not greater credibility.

> **[Repeated] Condensed EPA Assertion 3:** Climate models have enough precision to allow EPA to make the assertions stated in this section, i.e. "… most of the observed global and continental warming can be attributed to this anthropogenic rise in greenhouse gases." And "… changes are occurring now that can be attributed to the anthropogenic rise in atmospheric greenhouse gases …"
>
> **Bottom line 3.2**: Climate models overstate the global surface warming over the past 30 years, the period when temperatures were predicted to start warming more rapidly.

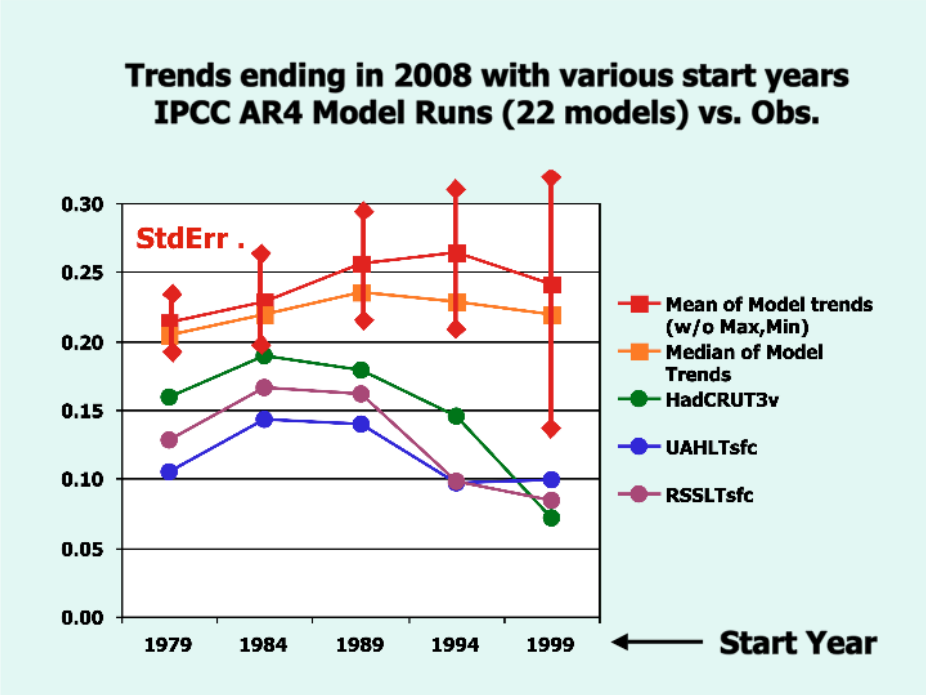
Explanation 3.2:

The reason that the past 20-30 years are important is due to the IPCC assertion that most of the surface global warming since 1950 is caused by enhanced greenhouse gases. However, there was no rise in temperature from 1950-1979 so the assertion depends on the temperature rise of the last 30 years only.

I have tested all of the IPCC AR4 models against observations in two ways to demonstrate that the models overstate the warming that has occurred. The clear implication of this result is that the models have an assumed sensitivity to CO2 that the real world does not. This is really the crux of the modeling problem and the whole of the predictive value of models depends on the magnitude of this "sensitivity" (i.e. temperature response to GHG forcing.)

In the figure below, I have calculated the mean and standard error of the global surface temperature trends of all of the IPCC AR4 models (A1B scenario) for periods beginning

in the year shown and ending in 2008. From the left, 1979 indicates the trend from 1979-2008 in the models is the red square (+0.22 °C/decade) with a standard error of the mean of ±0.03 °C. In other words, there was little spread in the model results for 30-year periods. As the time period becomes shorter, the standard error increases until the last period shown, 10-year or 1999-2008, becomes +0.24 ± 0.11 °C/decade. Ten-year periods can have quite a bit of variation in their trends.



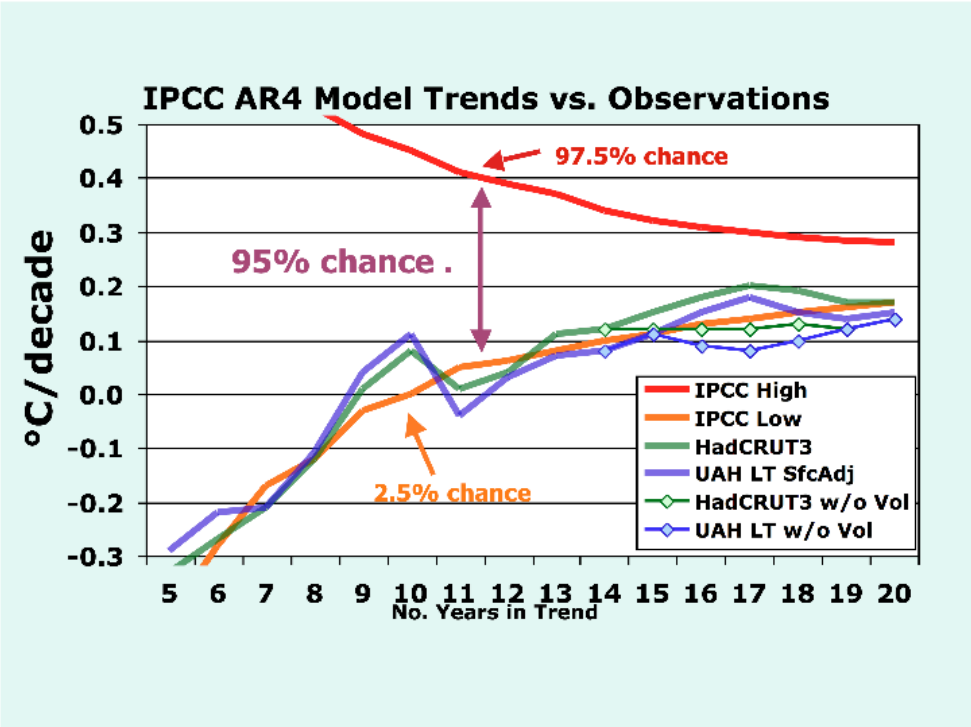
Included with these model results on the chart are the same global trends for three observational datasets. HadCRUT3v (green), UAH (blue) and RSS (purple). UAH and RSS are satellite datasets, but have global coverage. Their variations have been adjusted by the global amplification factor of 1.2 to mimic the surface variation, so that an apples to apples comparison can be made (recall the tropical amplification factor was 1.3). Note two points previously made: (1) for most of the trends, HadCRUT3v is warmer than the two satellite datasets due to excessive land-surface warming as we have demonstrated above, and (2) RSS shows warmer trends than UAH for the longer periods due to the documented spurious shift described earlier. However, even with these highly likely spurious warming effects in HadCRUT3v and RSS, the mean model trends are still significantly warmer than the observations at all time scales examined here. Thus, the model mean sensitivity, a quantity utilized by the IPCC as about 2.6 °C per doubled CO2, is essentially contradicted in these comparisons. The basic meaning here is that the models are too sensitive to CO2 forcing and thus overstate the warming response.

[Note: I will mention here but will rely on submissions from others to identify the key model weakness – clouds. All models cause "reflecting" or "cooling" cloud-cover to

shrink as GHGs rise, allowing the sun to heat the Earth (positive feedback). Thus, it is the reduction of cloudiness that causes the main warming in models, not the direct action of GHGs. In the real world, my colleague Roy Spencer and others, have found that cooling-clouds actually *expand* when the Earth warms, thus creating a thermostatic cooling affect (negative feedback). Hence, the temperature impact of rising GHGs is much less due to this apparent significant negative feedback – and this fits very well with the relatively slow current rate of atmospheric temperature increases.]

A second way to look at the overstated model warming is below. Here, a colleague, Dr. P. Michaels, has calculated the 95% confidence interval for trends from all of the AR4 models over the current 20-year period 2001-2020 (in the models, obviously). The 97.5% high boundary of the range is red and the 2.5% low is orange. As noted above, trends over 5-year periods will have large variations, while longer term trends will not. I have added to this chart the trends of the observations over the last 5 to 20 years (again, UAH has been adjusted to mimic the magnitude of surface variations.)

At first glace, the observations are shown to appear right at the lowest edge of the model range, meaning they are borderline significantly different (solid lines) from the models. However, the observations experienced a major volcano in 1991 (Mt. Pinatubo) while the model simulations did not. Thus, removing the effects of the volcano on the observations (diamonds), we see that for the longest periods (16 to 20 year trends) the observations are indeed significantly different from the model range (orange line).



A recent paper by Easterling and Wehner (2009) looked only at 10-year periods for IPCC AR4 models (though it was not clear which models were used.) In the analysis above, we have calculated all of the possible trend realizations from all 22 of the models for the current time period – a much more robust and direct test of the models. In our results above, we have demonstrated what the probability truly is for these various trend periods, performing the calculations for up to 30 years (not 10) in the two figures, again making the results more robust and significant. Our results also focus on the current decades when GHGs are thought to have their largest impact on the global temperature.

Therefore, what has been shown with fairly simple statistical analysis is (1) that the mean of the IPCC AR4 model runs, often described as the "best estimate" and which represents the best estimate of climate sensitivity, significantly overstates the current global temperature change and (2) that the observations fall outside of the 95% range of the IPCC AR4 model trends and are thus significantly different from the full spectrum of model outcomes. The main point here is that the model projections should not be utilized as confident indications of the true trajectory of the climate system because the evidence shown strongly suggests that climate models are much too sensitive to GHGs.

Summary

The EPA has relied on "consensus" documents which reflect the views of selected authors who (a) have review-authority (i.e. gatekeeper status and luxury of the "last word") and (b) often do not consider the broad range of scientific inquiry into this subject.

The popular surface datasets cited by the EPA as indicators of greenhouse impact are poor representatives of the part of the climate system that is indeed affected by greenhouse gases. Rather they largely represent the impact of surface development over land which, then, is misinterpreted as greenhouse warming.

Atmospheric datasets which monitor regions where the GHG impacts should be easily detectable, indicate significantly less warming than models portray, implying that models in general are more sensitive to greenhouse gases than is the real world.

Thus, the foundation of the notion that humanity is threatened or endangered by the climate-consequences of additional CO2 in the atmosphere (which by itself has considerable benefits for the biosphere) is based on (a) inadequate surface datasets and (b) model projections that fail hypothesis testing as they overstate the warming that is occurring.

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