

## **Comment on “Climate Science: Climate Change and Its Impacts”**

authored by David R. Legates

and published as NCPA (National Center for Policy Analysis) Policy Report No. 285, May 2006

Michael MacCracken, Ph.D.

Climate Institute

Washington DC

May 24, 2006

This report is about as weighty and transparent as a small cube of aerogel, and deserves about as much consideration as does the area of the state of Delaware, where Legates is based, in comparison to the area of the world from which are drawn the views of the international scientific community. The report is filled with personal assertions that reflect a very selective and biased look at the available scientific results, skeptically treating and dismissing scientific results that are broadly accepted while uncritically accepting very weakly supported claims of a natural origin of virtually all variations and changes that have been observed. It is seemingly aimed at refuting “climate alarmists” (who are mainly not identified, but seem to include the media and representatives of environmental groups) and in doing so sets up a lot of strawmen that gives him an excuse to put in a couple of contradictory references. In most cases, however, the claims he shoots at are neither valid nor at all central to the key scientific findings regarding human-induced global warming.

Since 1990, the Intergovernmental Panel on Climate Change (IPCC) has issued three major assessment reports (IPCC 1990, 1995, 2001) that assemble and evaluate international scientific findings in this field after they have gone through a several-stage review process that ensures their views encompass the full range of expert science. Legates does not seem to accept the central findings of the IPCC, namely that human activities are having a significant effect on the global climate. But then, multiple times throughout the report, he selectively cites IPCC as an authority on what is not well-established in order to try to refute the views of those he labels as “climate alarmists.” This is a bit like saying I won’t believe what the American Medical Association recommends as best practice for treating various diseases, but will consider them an authority on what they say is not well-established as effective.

If IPCC is being cited against the “climate alarmists,” then its findings must not represent those that Legates is criticizing and IPCC’s views should be accepted as valid. But no, he both attacks and cites their findings. And this is not an isolated situation. Legates takes the same two-faced approach with the international Arctic Climate Impacts Assessment (with many of the citations to opposing results being to quite dated papers), the US National Assessment (discussed further below), the results of NASA (where he relies on selected results, generally ignoring recent results). He even (on page 11) cites the “scientific consensus” as an authority while throughout most of the rest of the report disagreeing with it. He is basically totally inconsistent on what is authoritative and what is not.

The report is also filled with mistakes and nonsense. Herewith just a sampling:

Legates says in the Introduction (and repeats the point on page 18) that “the Northern Hemisphere ice age ended about 20,000 years ago.” This is patently incorrect. This was the time when it is generally agreed that the glacial extent was at its maximum, and the major ice sheets on North America and Europe were not mostly gone until perhaps 9,000 years ago or more recently.

He asserts (page 5) that “the computer models consistently project a rise in global temperature over the past century that is more than twice as high as the measured increase.” As illustrated in Figure 1 (see below), this is simply not the case. There is actually very good agreement between model simulations and observations.

Legates asserts that all changes occurring before 1940 cannot be attributed to human causes, seemingly forgetting that there were significant human influences on atmospheric composition before that, including of CO<sub>2</sub> (for which the logarithmic relations gives a relatively larger influence of changes when concentrations are low), of methane (CH<sub>4</sub>), and of aerosols, not to mention land cover change.

In his Figure III, it takes sharp eyes to recognize that the rightmost bar indicating hurricane numbers is for only five years, whereas all the other bars are for ten years, so he is not at all making obvious the great increase in the number of hurricanes that has occurred over the past decade.

On page 16 he asserts that “more energy is required to warm an Arctic area than a tropical area of equal size.” This is simply wrong. Not only is the tropical atmosphere deeper than in the Arctic, but it also takes much more energy to raise temperatures in the tropics, due to the exponential increase in the amount of water vapor that must be evaporated for each degree rise in temperature as compared to the situation in the Arctic.

On the same page he indicates that the high reflectivity of snow is one reason for the Arctic warming not being greatest in winter. But the Sun is not up in the Arctic during winter, so the snow albedo is irrelevant (a key reason he fails to mention is the very shallow inversion present in winter, which it takes only a limited amount of heat to change).

On page 18, Legates makes it sound as if an atmospheric gain of “ $9.0 \times 10^{14}$  liters of water” would make a significant dent in the rise of sea level. A simple calculation shows that this amounts to about one-third of a centimeter (about one-eighth of an inch) against IPCC’s central range for the projected sea level increase by 2100 of about 30-50 centimeters (roughly 12-20 inches), and perhaps up to almost a meter (roughly 3 feet); or, under quite special circumstances, as little as 9 cm (about 4 inches).

As an example of what he leaves out, he claims (contrary to the views of most experts) that coral can become adapted to higher temperatures through bleaching, while leaving out the very well-established point that the rising CO<sub>2</sub> concentration alone (so, even with no change in climate) will tend to acidify the ocean and make formation of shells by many organisms and coral quite problematic, a reason many marine biologists justify action to reduce CO<sub>2</sub> emissions, even independent of the impacts of climate change.

Legates' misrepresentation and biased (or uninformed) treatment of the National Assessment is particularly egregious. He claims (page 4) that "[b]oth IPCC and National Assessment projections assume that all atmospheric aerosols have a slight warming effect." This is simply wrong. The model simulations he is talking about include only sulfate aerosols, which have a rather significant cooling effect, and warming aerosols were not even treated in simulations available at that time.

In the box on page 6 he implies that "more than 30 such models" were available to be used for the US National Assessment studies. While the IPCC's 2001 report did in Chapter 8 evaluate the performance of 31 models, only 6 of them by 2001 had run the type of control and perturbation simulations needed for the National Assessment (standard scenario, out to 2100, etc.), and only the two models used in the National Assessment had completed their runs by 1998 when the assessment needed them in order to complete the impact studies that it carried out and that were published in 2000 as input for the IPCC assessment.

Legates also repeats a mistaken claim of Dr. Patrick Michaels that the Canadian model, which was one of the two models used, "predicts more future warming under a doubling of atmospheric CO<sub>2</sub> concentrations than any other model." An examination of Figure 9.3a in IPCC (2001) makes clear that the Canadian model simulation (CGCM1) is very near the mean of the 19 models that completed this special type of CO<sub>2</sub>-only simulation (and is only just above half of the maximum estimate of temperature change). And Figure 9.5a makes clear that, while the Canadian model result is at the maximum of the models that treated the influence of projected changes in both CO<sub>2</sub> and aerosols, the model of NOAA's Geophysical Fluid Dynamics Laboratory was on track, through the end of its simulation in about 2060, to get a similar or even larger response.

With respect to Legate's urging use of the model simulation from NCAR (including its mention in his Figure II), not only was this simulation not available early enough for full use in the US National Assessment, but the simulation it did was for a lower emissions scenario that made its results not comparable to the central emissions case that formed the basis for most of the model simulations that were done. Legates also might want to reconsider his recommendation to use the results of the NCAR modeling group in that more recent versions of that model have led to about a 60% increase in its climate sensitivity (the results of this model are to be included in the Fourth Assessment Report of the IPCC due out in the first half of 2007).

In any case, both the IPCC Third Assessment Report (2001) and the report of the US National Academy of Sciences (2001) commissioned by President Bush reviewed and then endorsed the results of the US National Assessment that Legates, as a rather uninformed individual, is criticizing.

Finally, Legates repeats a number of arguments that were first made by Dr. Patrick Michaels. Interestingly, he does so without attribution, perhaps so as not to seem to be depending on such a controversial source of material. For example, in discussing the trends in polar bears, he cites the results of the analysis done by Michaels, but does not reference its presentation in the *World Climate Report*. In any case, that analysis is also rather dated and fails to tie to changes in ice extent rather than temperature. Another example is Legates' criticism of the Canadian climate

model mentioned earlier, for any independent analysis would not support Dr. Michaels' misreading of the IPCC graphic. Legates also puts forth the typical skeptic claim that a reduced pole-equator temperature gradient will lead to fewer intense storms. While perhaps the case for winter storms, he fails to note that the most severe storms, namely tropical cyclones (hurricanes and typhoons), occur during the summer season when the pole-equator gradient is at a minimum.

This is just a brief overview of the uncritical reiteration of tired and discredited criticisms made by Legates in this report. The special note on page 21 should be taken very seriously; namely "[n]othing written here should be construed as necessarily reflecting the views of the National Center for Policy Analysis..." In fact, NCPA should delete the word "necessarily" in order to protect their fragile reputation and come into line with the prevailing scientific consensus on the coupling of human-induced activities to global warming and its intensifying impacts.

References:

For access to the IPCC reports and publications, go to <http://www.ipcc.ch>.

For access to the Arctic Climate Impacts Assessment, go to <http://amap.no/workdocs/index.cfm?dirsub=%2FACIA%2Foverview>.

For access to the results of the US National Assessment, go to <http://www.usgcrp.gov/usgcrp/nacc/default.htm>.

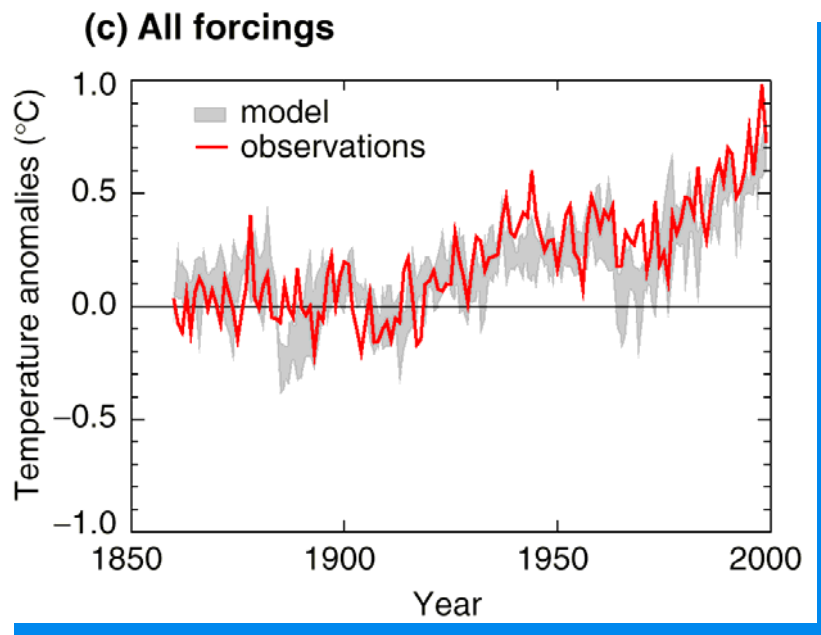


Figure 1, taken from IPCC (2001) Working Group I report, showing that model simulations of the 20<sup>th</sup> century change in global average temperature which account for both natural (i.e., solar and volcanic) and human-induced (i.e., greenhouse gases and aerosols) radiative forcings come very close to matching the observed variations over this period. It should also be noted that a

perfect match should not be expected between the model simulations and observations because year-to-year fluctuations arising from air-sea interactions, which result in such events as El Niño-induced warmings of the eastern tropical Pacific Ocean, are not predictable over decadal and century-long periods. Thus, while each model simulation generates its own time history, this should not be expected to reproduce the single time history of what has actually happened (i.e., weather is chaotic beyond a time scale of about a week). So the question is whether the single time history is plausible given the bounds of a set of model simulations.