SEVEN

Science or Political Science?

An Assessment of the *U.S. National Assessment of the Potential Consequences of Climate Variability and Change*

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What constitutes science, and where is the line that separates a politically inspired document posing as science from a legitimate scientific assessment? When does science become "junk science"?

This nebulous region, where science, politics, and agendas intersect, is exactly the territory occupied by the recent *U.S. National Assessment of the Potential Consequences of Climate Variability and Change* (hereafter the USNA).[1] In this chapter, I examine the USNA, demonstrate that the models that serve as its basis are inconsistent with observations, and conclude that it

1. National Assessment Synthesis Team, *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change* (Washington, D.C.: U.S. Global Change Research Program, 2000).

should be withdrawn from public distribution. Further, the President's Office of Science and Technology Policy, the agency that appointed the committee that produced the USNA, should appoint a new committee and undertake another analysis.

In the famous case *Daubert v. Merrell Dow,* the Supreme Court held that expert testimony relating to scientific studies must be grounded in the methods of science. The basic test for any scientific hypothesis or model is to compare its predictions against observations. Hypothesis and models that make accurate predictions are accepted as useful and "scientific," while those that fail to make adequate predictions are discarded or modified.[2]

Although "junk science" has no rigorous definition, it is characterized by one or both of two properties: (1) data that do not meet the normal criteria for being unbiased and objective, and (2) inappropriate or incomplete representations of tests of the predictive accuracy of of models that create a false impression of reliability.

By analogy to medical practice, the application of junk science in legal proceedings or government decision making is improper practice. Suppose a physician prescribed a medication knowing it would have less of an effect on a disease than a glass of water. Further assume that this doctor had been informed of this through an irrefutable clinical trial supported by an unassailable quantitative analysis. Further, to check on the validity of that analysis, the physician repeated it, confirmed the result, and still continued to prescribe the worthless medication. The self-policing agencies in the medical community would likely judge this physician's actions as inconsistent with medical ethics.

The USNA, published in October 2000, incorporated a flaw analogous to the physician's knowingly prescribing an incorrect

2. K. R. Popper, *Conjectures and Refutations: The Growth of Scientific Knowledge* (London: Routledge & Kegan Paul, 1963).

medication. USNA begat other, related documents that perpetuate and reinforce its flaw. For example, an important chapter on impacts of climate change in the Bush administration document *Climate Action Report* 2002 was, in large part, directly taken from the USNA.[3] Far from being examined on its merits by the politicians and officials who ordered it, and flawed as it is, the USNA also serves as the basis for expensive and intrusive energy legislation currently under consideration by Congress.

House of Representatives Bill HR 4, the standing version of the Senate's 2002 Energy Legislation as of this writing (October 2002), would, if it becomes law, mandate U.S. participation in international negotiations to reduce greenhouse gas emissions and that would require that 10 percent of all U.S. energy be produced from "renewables" (largely solar energy and windmills), which are prohibitively expensive. As the basis for HR 4, Congress "finds" in Section 1001, that, "In October 2000 a U.S. Government Report found that global climate change may harm the United States by altering crop yields, accelerating sea level rise, and increasing the spread of infectious tropical diseases." That document is the USNA. The climate models that serve as its base do not work. Basing energy legislation on this document will enshrine bad science in laws that cost the nation dearly.

History and Composition

The USNA had its inception in a January 1998 letter to the National Science Foundation's Global Change Research Subcommittee chair from John H. Gibbons, assistant to President William Clinton for Science and Technology (the letter is available at www.usgcrp.gov/uscrp/nacc/background/organization/

3. U.S. Department of State, *U.S. Climate Action Report 2002* (Washington, D.C.: U.S. Department of State, 2002).

letter.html). Gibbons was a popular speaker on the university circuit, lecturing on the evils of rapid population growth, resource depletion, environmental degradation, and, of course, global warming. His visual aids included outdated population and resource projections from Paul Ehrlich in which "affluence" was presented as the cause of environmental degradation, a notion that has been discredited for decades; after all, environmental protection and low population growth correlate highly with per capita income. Gibbons's material on climate change was also dated, assuming growth rates for carbon dioxide and other greenhouse gases that were known to many scientists to be gross overestimates at the time the USNA was in production.[4]

In his capacity as the President's science adviser, Gibbons also led the National Science and Technology Council, established by President Clinton in November 1993, which, according to the USNA, "is the principal means for the President to coordinate science, space, and technology policies across the Federal Government." The "Membership consists of the Vice President [Al Gore], the Assistant to the President for Science and Technology [Dr. Gibbons], Cabinet Secretaries and Agency Heads with significant science and technology responsibilities, and other senior White House officials." The Council is clearly a political body. "[C]oordinating . . . policies" is a political task, not a scientific one.

Two political appointees, D. James Baker, at that time head of the National Oceanic and Atmospheric Administration, and Rosina Bierbaum, second in line at the Office of Science and Technology Policy, were made co-chairs of the Committee on Environment and Natural Resources, one of the many constituent committees of the National Science and Technology Council. Baker, in his role as chair, directed a subcommittee of his com-

4. J. E. Hansen et al., "A Common-Sense Climate Index: Is Climate Changing Noticeably?" *Proc. Natl. Sci.* 95 (1998): 4113–20.

mittee, the Subcommittee on Global Change Research, established by Congress in 1990, "to provide for the development . . . of a comprehensive and integrated United States research program which will assist the Nation and the world to understand, assess, predict and respond to human-induced and natural processes of global change." The subcommittee appointed yet *another* committee, the National Assessment Working Group, which created the "National Assessment Steering Team," which produced the USNA.

This torturous bureaucracy was larded with political appointees at all levels and dictated the conclusions to be incorporated in the USNA. Gibbons's letter didn't have to state the views of Clinton or Gore on global warming; the orders passed through so many political vettings that those who finally went to work on the USNA knew full well what was expected: produce a document that pleased the Council, which was headed by the Vice President. What member of the synthesis team would not chart a course consistent with the views of the higher-ups? If such a document were proffered, what would the professional consequences be for challenging the Vice President and the President's science adviser?

As we shall see, the resultant document so intended to please that it broke the basic ethical rule of science: that hypotheses must be consistent with facts.

The USNA Steering Committee

Formation of committees to summarize the state of global warming is a standard exercise in climate change science. The composition of those committees largely determines the outcome.

Perhaps the most prominent example is the United Nations Intergovernmental Panel on Climate Change (IPCC), whose representatives are chosen by their respective governments to pro-

vide summary documents on climate change. Only about one third of the IPCC's members are climate scientists, outnumbered by far more nonclimatologist political appointees. Not surprisingly, the IPCC reports and recommendations have been predictably controversial, often omitting refereed studies or data arguing that climate change may not be such a serious issue.

A related version of this process occurred with the composition of the National Assessment Synthesis Team, which coordinated the National Assessment. Only two members of the team were credentialed climatologists, and a clear majority was not technically disposed to provide criticism of the climate models that formed the basis of the Assessment. This circumstance created the debacle described in this chapter.

The roster of the synthesis team, shown boxed, indicates backgrounds. The only member with a doctorate in climate studies is Eric Barron. On October 13, 1994, Barron chaired a similar committee, assembled to produce a document summarizing global warming science for Congressman John Dingell (D-Mich.). Barron threatened to adjourn the assessment if the two dissenting scientists present, MIT's Richard Lindzen and I, did not stop objecting to the assessment's material and methods. The senior author of that 1994 document was Robert Corell, who is also on the USNA Synthesis Team.

The Synthesis Team did not even replicate the *faux*-diversity of the Dingell Committee. It contained not one individual who has been skeptical or critical of the importance of climate change as an issue. Some observers might consider such a roster appropriate for a committee looking at potential consequences of climate change rather than examining the evidence for change. It is not. The potential consequences vary with the predictions of climate change, and of the models the team considered, it selected two that produced the most extreme changes. Perhaps if other clima-

The *National Assessment Synthesis Team*

Jerry Melillo (co-chair): Ph.D., Forestry and Environmental Studies, Yale University
Anthony Janetos (co-chair); Ph.D., Biology, Princeton University
Thomas Karl (co-chair): M.S., Meteorology, University of Wisconsin
Eric Barron: Ph.D., Oceanography and Climate, University of Miami
Virginia Burckett; Ph.D., Forestry, Stephen F. Austin State University
Thomas Cecich: No doctorate
Robert Corell: Ph.D., Oceanography, Case Institute of Technology
Katherine Jacobs: No doctorate
Linda Joyce: Ph.D., Range Ecology, Colorado State University
Barbara Miller: Ph.D., Engineering, University of Illinois
M. Granger Morgan: Ph.D., Applied Physics, University of California
Edward Parson: Ph.D., Public Policy, Harvard University
Richard Richels: Ph.D., Applied Sciences, Harvard University
David Schimel: Ph.D., Rangeland Ecosystem Science, Colorado State University

tologists or scientists skeptical or questioning about the importance of change had been included, the team would not have produced a document based upon such extreme models.

Moreover, although estimates of potential consequences are completely dependent on the climate models that are used, except for Eric Barron and Thomas Karl, all the panel members were from fields that use predicted changes from climate models to assess impact on their particular areas of interest, such as grassland or forest ecology. They were not trained to and could not be expected to focus attention on critical analysis of the climate models themselves, and that led to the problems detailed in this chapter.

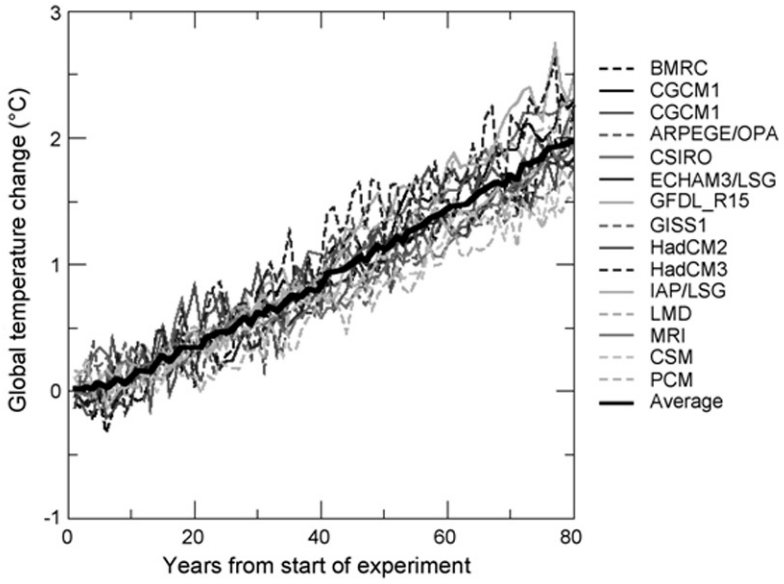

Fig. 1 Temperature changes predicted by a variety of climate models
Note: Various models (acronyms are on the right) when forced with an exponential increase (1% per year) of carbon dioxide. Most models predict a nearly linear temperature rise.
Source: Draft for Scientific Review, Intergovernmental Panel on Climate Change, *Third Assessment Report*.

The Use of Extreme Models

The synthesis team had many models from which to choose; there are literally dozens of GCMs, which are four-dimensional simulations of atmospheric behavior that calculate changes in weather and consequent climate as atmospheric composition changes. The team considered and rejected several "general circulation climate models" (GCMs) for making its predictions of future temperatures and rainfall and chose two models that predicted the most extreme climate changes. As shown on Figure 1, taken from the scientific review draft of the 2001 report of the UN Intergov-

ernmental Panel on Climate Change (IPCC), the predictions of temperature changes from the various models are quite similar.[5]

The consensus of these models is to produce a constant (linearly increasing) rate of warming, despite the assumption of exponentially increasing concentrations of greenhouse gases, such as carbon dioxide, in the atmosphere. That is because the response of temperature to a change in concentration of a given gas is logarithmic—that is, it begins to damp off at increasing concentrations. The combination of a dampening response and an exponentially increasing concentration is a straight-line (constant) temperature increase.

The two models chosen by USNA team are clearly outliers from the family of available models. The Canadian Climate Centre model (acronymed by the USNA as CGCM1) is one of the very few that produces a substantially exponential (rather than linear) change in temperature. The other model used by the team is known as the Hadley Centre Model (acronymed by the USNA as HadCM2), developed at the United Kingdom's Meteorological Office.[6]

The CGCM1 model produces the most extreme temperature changes of *any* model that the USNA considered for inclusion, and the HadCM2 produces the most extreme precipitation changes.

- The temperature rise predicted by CGCM1—4.5°C over the U.S. between now and 2100—is more than twice the rise of 2.0°C predicted by the HadCM2, the model that predicts the second largest increase (Figure 2).

5. See Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change*, ed. J. T. Houghton et al. (Cambridge: Cambridge University Press, 2001).

6. T. C. Johns et al., "The Second Hadley Center Coupled Ocean-Atmosphere GCM: Model Description, Spinup, and Validation," *Climate Dynamics* 13 (1997): 103–34.

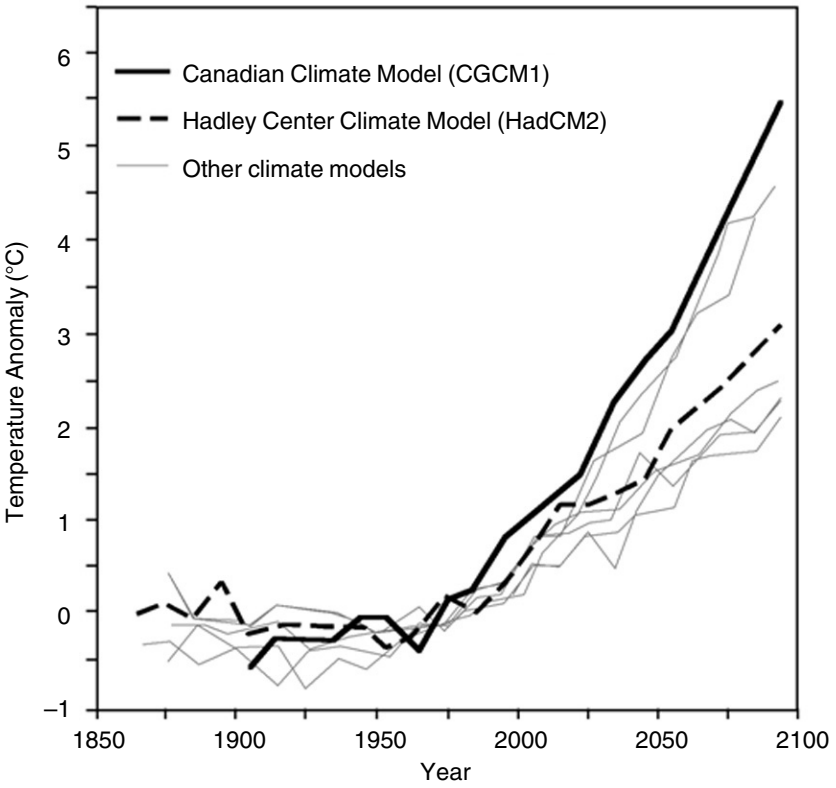

Fig. 2. Temperature increase for the United States as forecast by the climate models considered for inclusion in the United States National Assessment
Note: Notice that the Canadian Climate Model (CGCM1, heavy black line) produces the most extreme temperature rise.
Source: U.S. National Assessment of the Potential Consequences of Climate Variability and Change.

- The HadCM2 predicts more than twice the precipitation change of the next most extreme model, the CGCM1 model. The CGCM1 precipitation changes themselves are twice the average of the remaining, unselected models (Figure 3).

It is therefore clear that the Synthesis Team chose models that were far from representative of the larger population of GCMs.

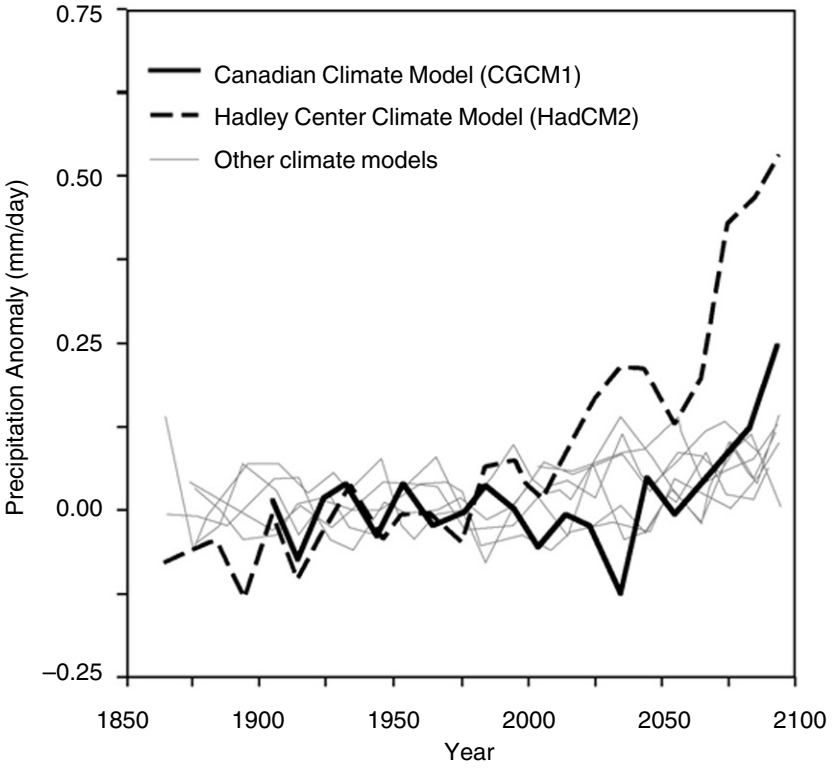

Fig. 3. The precipitation change for the United States as forecast by the climate models considered for inclusion in the United States National Assessment

Note: Notice that the Hadley Centre Climate Model (HadCM2, heavy broken line) produces the most extreme precipitation increase; the Canadian Climate Model (CGCM1, heavy black line) produces the second largest increase.

Source: U.S. National Assessment of the Potential Consequences of Climate Variability and Change.

This is profoundly different from what occurs in most other processes designed to produce scientific "consensus," which usually present the mean position plus some reasonable variation concerning a controversial issue. Moreover, the selection of models that predict the greatest changes appears to have ignored the in-

structions in Dr. Gibbons's request letter and the subsequent charge (www.uscrp.gov/usgcrp/nacc/background/organization/charge-nast.html) that the team was to "take into accord the scenarios of the IPCC." The IPCC has not settled on predictions from particular models, and its scenarios for temperature changes in the next century range from 1.0 to 5.8°C.

Figure 2 presents predictions of future temperature changes from all the models considered by the Synthesis Team, and the "predictions" from each model for temperature changes over the last century and a half. The CGCM1 "predicts" that the United States should have warmed 1.5°C during the twentieth century, but observed warming, according to the most recent analysis from the National Climatic Data Center (where Thomas Karl is the director) is 0.5°C.[7] Thus CGCM1 is making a 300 percent error over the last 100 years.

Why select such an obviously inappropriate model as the CGCM1? Karl told me that the CGCM1 was chosen because it was one of only two models (along with the HadCM2) that produced separate high and low daily temperatures, and that this level of detail was required for some of the USNA's analyses.

Readers are left to consider the logic: the most extreme temperature prediction model was chosen simply because it produced day and night temperatures. That should have been a red flag. If seasonal or annual temperature predictions from a model are unreliable or extreme, then the smaller-scale values, such as daily or intra-day values, are even more unreliable. The USNA Synthesis Team should have checked predictions from its chosen

7. G. J. Boer et al., "A Transient Climate Change Simulation with Historical and Projected Greenhouse Gas and Aerosol Forcing: Experimental Design and Comparison with the Instrumental Record for the 20th Century," ibid. 16 (2000): 405–25.

models against recorded changes in the past before relying on those models.

Michael MacCracken, head of the National Assessment Coordination Office at the time the report was under review, supplied a different explanation for the use of the CGCM1. He said USNA wanted an example of a "plausible worst-case" scenario for change in U.S. climate. I can find nothing in Dr. Gibbons's letter or the charge to the USNA team that requested a worst-case scenario, but it is possible that the team was told that such a scenario was expected.

Whatever the reason, the Synthesis Team chose the most extreme temperature model when it chose the CGCM1. For balance, then, it could have used an analogously cold model, such as the new version from the U.S. National Center for Atmospheric Research[8] for all applications that didn't require daily data, such as mean seasonal or annual temperature or precipitation changes.

The HadCM2 forecasts of precipitation changes are as extreme as those of the CGCM1 for temperature (Figure 3). The USNA team used no other precipitation change model.

This type of model selection is prima facie evidence of Synthesis Team bias in favor of models that produced very lurid results. That no balancing models were used simply means that no balance was ever intended in the USNA, or, rather, that the USNA reflects the lack of balance evident in the Synthesis Team, itself created by a highly convoluted and clearly political chain of command.

8. B. A. Boville and P. R. Gent, "The NCAR Climate System Model, Version One," *J. Climate* 11 (1998): 1115–30; R. A. Kerr, "Model Gets It Right—Without Fudge Factors," *Science* 276 (1997): 1041.

The Failure of the USNA Models

The basic rule of science is that hypotheses must be verified by testing their predictions against observed data.[9] Hypotheses that cannot be tested can be useful, but they are not science. Hypotheses that are tested and fail must be modified and retested, or simply rejected. Science that relies upon hypotheses that have failed a comparison with reality is "junk science." A computerized climate model, however sophisticated, is indeed nothing more than a hypothesis until it is verified by testing against reality. If it fails that test, and it continues to be used for a "scientific" assessment, that assessment then falls into the "junk science" category.

Both CGCM1 and HadCM2 make predictions of U.S. climate change based upon human alterations of the atmosphere. Those alterations have been going on for well over 100 years. Do the changes those models "predicted" resemble what actually occurred in the last century?

The answer is clearly no. I compared observed U.S. annual temperature departures from the twentieth-century average with those generated by both the CGCM1 and HadCM2 models. In both cases I used ten-year running averages to minimize interannual noise. This is a simple and common test. The modeled U.S. average temperature for 1991–2000 is compared to the observed value. Then the comparison period is backed up one year, to 1990–99, and so on. This smooths out the effect of single years that are unusually warm or cold, such as occurs in a strong El Niño year (such as 1998) or after a large volcanic eruption (1992).

I then examined the differences between the modeled and

9. The Supreme Court holds this is essential in scientific testimony. In *Daubert v. Merrell Dow*, it wrote, "Many conditions will bear on the inquiry, including whether the theory or technique in question can be (and has been) tested."

observed values for both the CGCM and HadCM2, versus the result that would obtain if I simply used the average temperature for the twentieth century to predict the observed values from year to year. In fact, both models did worse than that base case. In other words, both climate models used in the USNA were worse than no model at all.

On August 11, 2000, I sent this result as a formal review comment to the USNA Synthesis Team. Specifically, I wrote:

> The essential problem with the USNA is that it is based largely on two climate models, neither one of which, when compared with the 10-year smoothed behavior of the lower 48 states (a very lenient comparison) reduces the residual variance below the raw variance of the data [this means that they did not perform better than a model that simply assumed a constant temperature]. The one that generates the most lurid warming scenarios—the Canadian Climate Centre [CGCM] Model—also has a clear warm bias. Variance reduction is a simple test of whether or not a model is valid . . . and both of these models fail. All implied effects, including the large temperature rise, are therefore based upon a multiple scientific failure. The USNA's continued use of those models and that approach is a willful choice to disregard the most fundamental of scientific rules. (And that they did not find and eliminate such an egregious error is astounding.) For that reason alone, the USNA should be withdrawn from the public sphere until it becomes scientifically based.

The USNA team is required to respond to such criticism, but it chose to ignore the core argument, responding: "When the observations of the full 20th century in the U.S. are compared to the Hadley and Canadian model projections, comparable statistically significant warming is seen in all three."

This is not true. As shown earlier, the CGCM model predicts a rise of 1.5°C in U.S. temperature in the twentieth century, three times what was observed. Further, the USNA completely ignored

the fact that the models were producing worse forecasts of temperature than would result from random numbers applied to the mean.

Independent Replication of the Failure

Was this the end? Was the Synthesis Team satisfied to reject my argument? No. In fact, it commissioned a special study to determine if indeed I was correct.

A member of the synthesis team was kind enough to supply the results. He or she wrote to me:

> "One has to look at the time averages. In the assessment we were most interested in, decadal to century scale trends, not annual averages [Note: As mentioned above, I used decadal (10-year) moving averages!], so [we] would not be inclined to perform the test you did. . . . Nevertheless we ran the test you did, but changed the averaging period."

Figures 4 and 5 illustrate the results from comparing variations in predicted temperature from the two GCMs with the measured variations over different time periods in the last century. The leftmost set of bars represent predicted and measured variations in temperatures over one-year periods; the other sets of bars represent variations over 5, 10, 20, and 25-year moving averages. The shaded bars (in the foreground of each figure) represent the scatter of the observed temperatures around their twentieth-century average. The lighter bars are the differences between the model-predicted and observed temperatures, or the model error. For both GCMs, at all time scales, the model errors are greater than observed temperature variations in the twentieth century. These results, generated by the Synthesis Team itself, confirmed my finding that both these models were worse than no model at all.

At all time scales averaged over the United States, both the

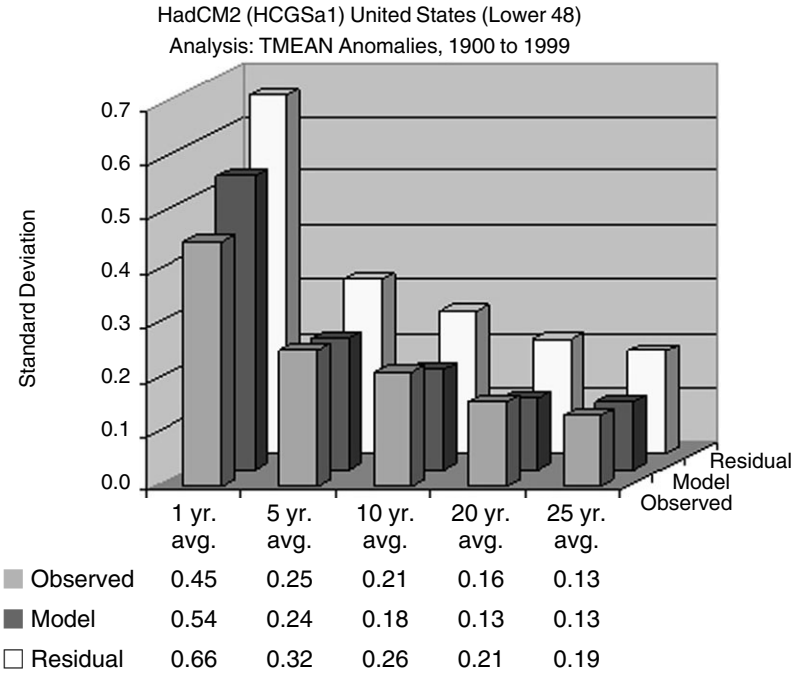

Fig. 4. A test of predictions from the Hadley Centre Climate Model against actual temperature variations recorded over in the United States over the twentieth century

Note: The darker bars for each time period represent the scatter of observed temperatures from the twentieth-century average. The lighter bars represent the scatter of the difference between the model-predicted temperatures and the observed temperatures. As is evident, at all time scales, the scatter of the model predictions is greater than the scatter of the observation, indicating that the model fails to account for measured temperature variations over the last century.

Source: USNA Synthesis Team member, personal communication.

HadCM2 and CGCM models fail. They failed an independent test designed to verify whether my original criticism—that the models were no better than "noise," or random numbers—was correct. So, in summary, the USNA was sufficiently concerned about my criticism that, in spite of its public brush-off, it specifically tested my hypothesis and independently verified the finding that the

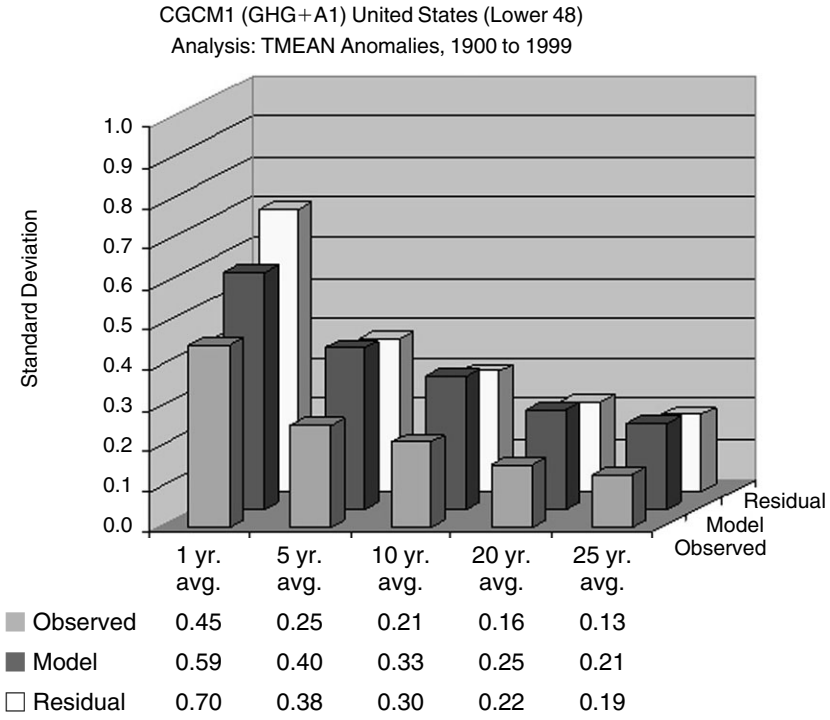

Fig. 5. A test of predictions from the Canadian Climate Model against actual temperature variations recorded over in the United States over the twentieth century
Source: USNA Synthesis Team member, personal communication.

models were worse than trying to predict U.S. temperatures from a table of random numbers.

Nonetheless, the Synthesis Team went through with publication of its report even after being told (and then independently verifying) that the models it relied upon could not simulate U.S. temperature on any time scale during the last 100 years. That leads to the obvious conclusion that the USNA is a politically driven polemic that merely looks scientific. It is decidedly not science by the norms of the scientific community. And it is un-

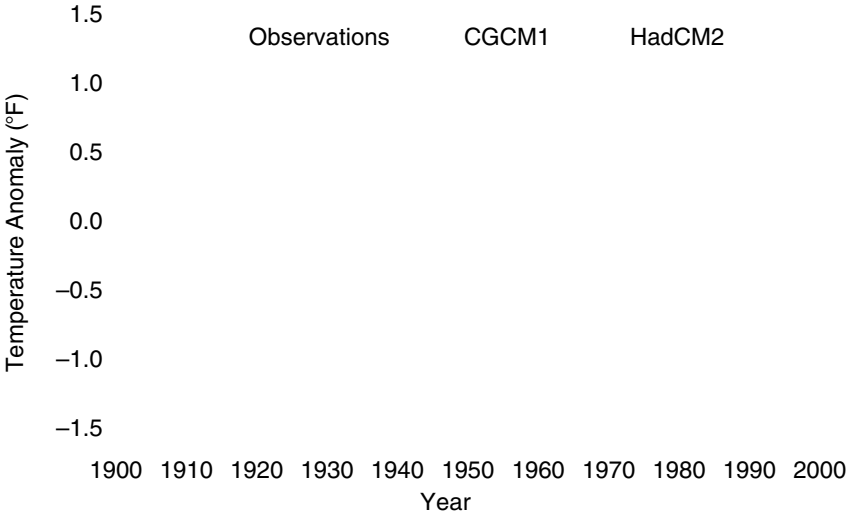

Fig. 6. The ten-year smoothed observed and predicted annual average temperature for the United States during the twentieth century by the two models used in the USNA
Source: U.S. National Assessment of the Potential Consequences of Climate Variability and Change.

likely that testimony built on it would be admissible in a court case under the standards set by the Supreme Court in *Daubert v. Merrell Dow.*

The real reason for the models' failure can be found in a simple visual comparison between U.S. annual temperature departures from the long-term mean and modeled temperatures (Figure 6). The discrepancies come about because:

1. U.S. temperatures rose rapidly—approximately 0.7°C—from about 1910 to 1930. The GCMs, which base their predictions largely on changes in atmospheric carbon dioxide, miss this warming, as the greatest changes in carbon dioxide occur after this warming.
2. U.S. temperature fell—about 0.6°C—from 1930 to 1975. That

is the period in which the climate models begin to ramp up their warming.

3. Temperatures rose again—making up for the 0.6°C lost between 1940 and 1975—from 1975 to 2000.

The summation is that much of the warming in the U.S. record took place before most of the greenhouse gas increases, and in fact, nearly half of the so-called "greenhouse era" (the twentieth century) was accompanied by falling temperatures over the U.S. It's no wonder that no model that is fed a diet of only greenhouse gases can get this right!

The bottom line is simple: Unless a climate model can explain the rapid run-up in U.S. temperatures in the early twentieth century, and the subsequent temperature fall to 1975, it is not an accurate guide to the future, because the most recent temperature rise in U.S. temperature is not greater than the one that ended more than seventy years ago.

The failure of the models is not surprising. Even though it, too, suffers from considerable political overhead, the United Nations Intergovernmental Panel on Climate Change (IPCC) has repeatedly remarked that estimation of temperature changes over regions, such as the continental United States, is at best problematical. In the IPCC's 2001 *Third Assessment Report* (TAR), it summarized the findings of its *Second Assessment Report* (SAR) issued five years earlier:

Overall the SAR placed low confidence in the simulation of regional climate change produced by available modeling tools because of three factors:

- *Errors in the reproduction of present-day regional climate characteristics* (emphasis added)
- *Wide range in the simulated regional climatic changes by different models* (emphasis added)

- The need to more comprehensively use regionalization techniques to compare the predictions made with global models to those from models that focus on smaller areas.[10]

The 2001 TAR devoted an entire chapter to regional climate projections. It says: "This chapter . . . stems from the increasing need to better understand the processes that determine regional climate. . . . To date, a relatively high level of uncertainty has characterized regional climate information." Later, in the same chapter: "Despite recent improvements and developments . . . a coherent picture of regional climate change via available regionalization techniques cannot yet be drawn. More co-ordinated efforts are thus necessary to improve the integrated hierarchy of models . . . and apply these methods to climate change research in a comprehensive strategy."

Clearly, the USNA is premised on an impossibility that is recognized by a larger community of scientists, even one as clearly politicized as the IPCC. It should therefore be no surprise that climate models fail when applied to an area as small as the lower forty-eight states. What is incomprehensible is why, then, they were used at all.

Is it scientifically proper to use models that are demonstrable failures? The answer is no. Using a model that is no better than random numbers is no better than a physician prescribing a medication that does not work.

Conclusion

It is clear that the USNA Synthesis Team crossed a clear line when it employed indefensible scientific models to generate a supposedly scientific assessment of prospective climate change in the

10. This means that current smaller-scale climate models are often not consistent with larger-scale ones.

United States. I believe this occurred because the Synthesis Team was unbalanced, containing only two climate scientists, and none who had expressed considerable skepticism about the ability of climate models to perform adequately at the level of the United States, even though the larger scientific community has expressed considerable skepticism about this ability.[11]

The result is that we now have a landmark document, the USNA, being cited as the reason for expensive and intrusive energy legislation, such as HR 4, currently before the U.S. Congress. This is a situation that needs remediation.

The nation needs a new, more scientifically based assessment of the nature and possible effects of climate change on the United States. If it is scientifically impossible to predict with any confidence, the assessment should say that. This will only occur with a more broadly based synthesis team. As it stands, the current document is clearly not science and, as a result, it falls much more in the category of a politically based polemic. The National Assessment Synthesis Team should make a very public show of withdrawing the existing Assessment and starting over.

Starting over means generating a new assessment with a team that has the diversity to withstand the political pressure—from either the left or the right—and is more consistent with normative scientific behavior. The current *U.S. National Assessment of the Potential Consequences of Climate Variability and Change* is not consistent with these norms.

11. See P. J. Michaels, P. C. Knappenberger, and R. E. Davis, "Integrated Projections of Future Warming Based Upon Observed Climate During the Attenuating Greenhouse Enhancement," *Proceedings of the 1st International Conference on Global Warming and the Next Ice Age*, American Meteorological Society (2001): 162–67; T. R. Karl et al., "Indices of Climate Change for the United States," *Bull. Am. Meteorological Soc.* 77 (1995): 279–92.