Mixing Politics and Science in Testing the Hypothesis That Greenhouse Warming is Causing a Global Increase in Hurricane Intensity

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Recently, Curry et al. (2006) published an interesting paper on the issue of whether greenhouse warming is causing an increase in hurricane intensity. The authors identified 14 distinct critiques on two recent papers (Emanuel 2005; Webster et al. 2005), and investigated whether any logical fallacies were involved. The use of elementary logic to dissect lines of reasoning and argumentation is a powerful tool, as evidenced by this paper, and the authors should be applauded for using them in such a distinctive manner. This methodology is more popularly known as "critical thinking," and Curry et al. (2006) mention a number of logical fallacies, although many more exist (Caroll 2000; Haskins 2006).

However, it should be noted that the authors have an important logical fallacy themselves. In their dissection of argument 5 (factors other than SST contribute to hurricane intensity), they mention the following:

1) Webster et al. (2005) show that the tropical SST increase is global and occurs consistently in each of the ocean basins. This tropical warming is consistent with a similar increase in global surface temperatures.
2) The twentieth-century temperature variations are understood to be the result of an increase in solar activity (1910s–30s), a slight decrease in surface temperatures resulting from an increase in aerosols (volcanic in the stratosphere and anthropogenic near the surface) for the 1940s through the 1960s, and an increase since the late 1970s resulting from a strong increase in greenhouse gases.
3) Numerical climate model simulations cannot reproduce this behavior unless greenhouse gases are included in such simulations.

The line of reasoning here is that natural factors alone cannot explain the observed twentieth-century temperature variations, while including greenhouse gases does. The logical fallacy is the "fallacy of false dilemma/either–or fallacy," that is, the number of alternatives are (un)intentionally restricted, thereby omitting relevant alternatives from consideration (Haskins 2006).

That global twentieth-century temperature variations can be explained by using a simple model merely points to a certain consistency between this model or climate model simulations and observations. Furthermore, the fact that the late-twentieth-century warming is unexplained by two factors (solar variations and aerosols) and can be explained by including a third factor (greenhouse gases) does not prove that greenhouse gases are the cause; it just points to a missing process in this model. In fact, this whole line of reasoning does not prove the existence of global warming; it is merely consistent with it. As an example, it is still debated whether or not land surface temperature changes during the twentieth century are affected by anthropogenic non–greenhouse gas processes and whether or not these processes affect surface temperatures on a global scale (Christy et al. 2006; Kalnay et al. 2006; de Laat and Maurellis 2006).

There is a risk associated with this line of reasoning in that it suggests that understanding temperature variations of the climate system as a whole is very simple and completely understood, all one has to consider is the amount of incoming and outgoing radiation by changes in atmospheric absorbers and reflectors. Notwithstanding the fact that temperature is not a conserved quantity in any physical system, and thus is not the best metric to study energy within

DOI:10.1175/BAMS-88-2-XXX

the climate system, it also suggests that other processes and nonlinear behavior of the climate system are either nonexistent or do not affect (decadal and global) temperature variations. Presenting climate science this way oversimplifies the complexity of the climate system and possibly overstates our current understanding. Furthermore, this simple model is of limited use to climate scientists other than to very qualitatively explain—not understand—climate variability. By suggesting that climate science is simple and straightforward, the model surely does not help bridge the gap between climate science and the general public.

All in all, the consistency between the model results and observed temperature variations should be treated carefully. As Christy and Spencer (2006) noted in a presentation for the George Marshall Institute,

> Scientists often say "consistent with" rather than "proof of" a hypothesis. The reason is that we never know everything. We cannot say something is really proof of, but rather we use those more mealy-mouthed words, consistent with. Explaining a particular observation in a climate change context requires considerable humility, as one recognizes the overwhelming complexity of the earth system and the limitations of the instruments with which we try to monitor it.

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