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## Prometheus

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### December 26, 2007

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#### *End-of-2007 Hurricane-Global Warming Update*

Posted to [Author: Pielke Jr., R.](#) | [Climate Change](#) | [Disasters](#)

There are a few new papers out on hurricanes (or more generally, tropical cyclones) and global warming that motivate this update.



Before sharing these new papers, let me provide a bit of background.

Regular readers will know that I began studying hurricanes during my post-doc years at NCAR, and even co-authored a book on them ([PDF](#)) with my father. I've been fortunate to get to know many of the people in the science community who study hurricanes and also to become familiar with the literature on hurricanes and climate change.

Let me also remind readers that I believe that there is little policy

significance in the debate over hurricanes and global warming. Why not? Because no matter who is right, it won't do much to alter the ranking of alternative policies focused on addressing future storm impacts. This is an argument I make in this recent paper, which I'll point to for interested readers:

Pielke, Jr., R. A., 2007. Future Economic Damage from Tropical Cyclones: Sensitivities to Societal and Climate Changes, *Proceedings of the Philosophical Transactions of the Royal Society A*, 365:2717-2729. ([PDF](#))

But from a political perspective, the issue remains of considerable importance, as those advocating action on energy policies based on stemming the impacts from future cyclones place themselves far out on a thin limb. As tempting as it is to invoke the impacts of hurricanes as a justification for action on climate-related energy policies, it really should be a "no go zone."

In 2004, I along with Chris Landsea, Max Mayfield, Jim Laver, and Richard Pasch decided to prepare a short, accessible summary on the state of the debate over hurricanes and climate change, which ultimately was published as a peer-reviewed paper in 2005 in the *Bulletin of the American Meteorological Society* ([PDF](#)). In that paper we concluded that the debate over hurricanes (and their impacts) and climate change would not be resolved anytime soon, and we provided three reasons for this:

First, no connection has been established between greenhouse gas emissions and the observed behavior of hurricanes (Houghton et al. 2001; Walsh 2004). Emanuel (2005) is suggestive of such a connection, but is by no means definitive. In the future, such a connection may be established [e.g., in the case of the observations of Emanuel (2005) or the projections of Knutson and Tuleya (2004)] or made in the context of other metrics of tropical cyclone intensity and duration that remain to be closely examined. Second, the peer-reviewed literature reflects that a scientific consensus exists that any future changes in hurricane intensities will likely be small in the context of observed variability (Knutson and Tuleya 2004; Henderson-Sellers et al. 1998), while the scientific problem of tropical cyclogenesis is so far from being solved that little can be said about possible changes in frequency. And third, under the assumptions of the IPCC, expected future damages to society of its projected changes in the behavior of hurricanes are dwarfed by the influence of its own projections of growing wealth and population (Pielke et al. 2000). While future research or experience may yet overturn these conclusions, the state of the peer-reviewed knowledge today is such that **there**

**are good reasons to expect that any conclusive connection between global warming and hurricanes or their impacts will not be made in the near term.**

If I might pat ourselves on our collective backs for a moment, these conclusions that we reached in 2005 were echoed in 2006 by a much more comprehensive [assessment report prepared by the World Meteorological Organization](#):

A consensus of 125 of the world's leading tropical cyclone researchers and forecasters says that no firm link can yet be drawn between human-induced climate change and variations in the intensity and frequency of tropical cyclones.

And then in 2007 by the [IPCC](#). IPCC lead author Neville Nicholls characterized the report's conclusions on hurricanes and climate change as [follows](#):

We concluded that the question of whether there was a greenhouse-cyclone link was pretty much a toss of a coin at the present state of the science, with just a slight leaning towards the likelihood of such a link.

So our 2005 paper has held up really well. Did we get some recognition from the IPCC for providing an accurate assessment of the state of the scientific debate and its relevance? Well, no. But maybe we at least could point to a citation in the relevant IPCC chapter, which of course summarized all of the peer-reviewed literature? Actually the IPCC ignored our review. It is not that they were unaware of it. The lead author for the relevant chapter (Chapter 3 of WG 1), Kevin Trenberth, [said of our paper at the time it was released](#):

I think the role of the changing climate is greatly underestimated by Roger Pielke Jr. **I think he should withdraw this article. This is a shameful article.**

So, despite providing an accurate assessment of hurricanes and global warming in 2005 which was ultimately backed up by WMO and IPCC, given Kevin Trenberth's obvious bias against our views, we weren't really surprised to see our paper go uncited by the IPCC chapter that Kevin was lead author on. I did notice that Trenberth was somehow able to find room to mention his own work 95 times in that chapter, but I digress.

So our assessment of the state of the hurricane-global warming has held up really well. And in fact, I'd say that our assertion of the lack of a conclusive connection seems even stronger today. Over recent weeks I have become aware of 4 significant new papers on hurricanes and climate change that raise important questions about many aspects of the debate. I highlight

these four papers not because they point toward certainty in the debate, quite the opposite: they indicate that the debate is alive and well, and uncertainty continues to reign on this subject. And unless you are paying attention to the literature, you'll probably never hear of these papers.

The first paper is one I mentioned a few weeks ago by Vecchi/Soden published in [Nature](#). That paper suggested that identifying the signal of global warming in tropical cyclone behavior would be challenging in the context of ongoing climate variability. I [wondered why](#) that paper escaped media attention, despite being published in *Nature* and being a major contribution to the ongoing debate. Here are three other papers that will probably also escape media attention.

Statistician William Briggs has two new papers. One is in press with the *Journal of Climate*, and is titled "On the changes in number and intensity of North Atlantic tropical cyclones" ([PDF](#)). That paper concludes:

We find that to conclude that there has been an increase in the number of tropical cyclones in the North Atlantic basin depends on from what date you start looking. Looking from 1900 gives strong evidence that an increase has taken place; however, data early from that period are certainly tainted by inadequate and missing observations, so the confidence we have in this evidence is greatly reduced. Starting from (the years around) 1966 does not give evidence of a linear increase, but starting from (the years around) 1975 does. These potential increases are noted after controlling for the effects of CTI, NAOI, and the AMO. These differences due to start date could be real, perhaps because of some underlying cyclicity in the data that coincidentally bottomed out around 1975 (after controlling for AMO etc.), or it may just be a good lesson that it's possible to pick and choose your starting date to argue either way: yes, there's been an increase, or no, there hasn't been.

Briggs is presenting a second paper at the upcoming AMS meeting in which he applies the same technique to other basins, in a paper titled, "Changes in number and intensity of tropical cyclones" ([PDF](#)). That paper concludes:

We find little evidence that the mean of the distribution of individual storm intensity, measured by storm days, track length, or individual storm PDI, has changed (increased or decreased) since 1975 over all the oceans. Again, there were certain noted increases in the Indian oceans, which may be real or may be due to flaws in the data: this is evidenced by the posteriors from these oceans being very sensitive to the priors used. We did, however, find an unambiguous increase in the variance of the distribution of storm intensity over all oceans.

We also found that two components of intensity, storm days and track length, have likely decreased since 1990 over most oceans. Thus, we conclude that mean intensity has not been increasing, at least since 1975, and certainly not since 1990.

A fourth paper has just been published in the journal [Risk Analysis](#) by Kenneth Bogen, Edwin Jones, and Larry Fischer, titled, "Hurricane Destructive Power Predictions Based on Historical Storm and Sea Surface Temperature Data." That paper concludes:

Results obtained clearly challenge recent hypotheses about the effect of rising SST on future hurricane destructive potential . . . In contrast to a significant post-1970 positive trend in NAO SST and previous claims that this trend is linked to increased hurricane activity (Goldenberg et al., 2001; Emanuel, 2005; Trenberth, 2005; Webster et al., 2005; Hoyos et al., 2006; Santer et al., 2006; Trenberth & Shea, 2006), this study found little evidence of APDI trend or of a substantial APDI correlation with SST.

These papers suggest that the science of hurricane and global warming is healthy and new voices are bringing new ideas and methods to the debate. This is all good news. But it should also be apparent that the issue remains highly uncertain and contested. If anything, uncertainties have *increased* since we published our 2005 paper.

So I am going to stand pat with our conclusions first presented in 2005 in that *shameful* (but accurate) article:

**[T]here are good reasons to expect that any conclusive connection between global warming and hurricanes or their impacts will not be made in the near term.**

That is where things stand on this subject at the close of 2007.

Posted on December 26, 2007 05:22 AM

## Comments

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Roger,

The thing about Emanuel's 2005, and other similar, papers, is that they do some odd things with the hurricane statistics, which are not optimal, and which make it too easy to find trends that do not exist.

For example, Emanuel adds up a function of wind speed over all storms within a year (storm 1 + storm 2 + ...) as a proxy for intensity. He then plots this sum year by year, over-plotting a 5-year running average through the points because he feels the actual data are too noisy.

It is far better to try to model the distribution of storm intensity within a year. You then track this distribution from year to year, using a physically realistic probability model. This is a lot more complicated, and is what I attempted in my papers (I also model intensity as a three-dimensional entity: storm days, track length, and wind speed).

The other common mistake is to run X-year running averages through measures like storm number. This leads to physically unrealistic estimates: for example, it can lead you to say something like, "there were 5.6 storms last year," which is, of course, impossible. You can have 5 storms or 6, but you can never have 5.6: the probability models you choose should reflect this impossibility, which they do not, in many papers.

But the biggest mistake is to fail to provide measures of uncertainty. Even if you feel you can say that "Next year there will be 6.3 storms", this is of little use unless you can also say something like, "And there's a 90% chance that there will be between 1 and 10 storms."

To say there will be exactly "6.3 storms" is to be overconfident to the highest degree. But many predictions, especially in "global warming" scenarios, are unfortunately like this.

Also sorry to hear about Trenberth's unfortunate comment.

Matt Briggs

Posted by: [mattstat](#)  at December 28, 2007 10:50 PM

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Trenberth calling someone else's action "shameful" is ludicrous. This is the same Trenberth, after all, who suddenly became a good soldier (as opposed to a good scientist) when Chris Landsea refused to toe the dogmatic line necessary to link hurricanes to global warming. See also this:

<http://www.ucar.edu/communications/quarterly/summer05/catarina.html>

"Although Catarina was later tagged by some as a possible sign of climate change, the waters over which it formed were actually slightly cooler than average. However, "the air was much colder than normal," says Dias. This produced the same type of intense upward heat flux that fuels hurricanes, normally seen in warmer waters."

Posted by: [Harry Haymuss](#)  at December 29, 2007 06:00 AM

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