

Global Warming = More Hurricanes?

By Norman Rogers

Hurricanes are scary. Global warming advocates claim that global warming will cause their to be more and stronger hurricanes. In his book, **An Inconvenient Truth**, Al Gore actually has more pictures of hurricanes and hurricane damages than he has pictures of himself¹. The evidence for this is weak and even the IPCC can't make up its mind about how to link hurricanes to global warming.

The advocates say that global warming will increase the sea surface temperature and that will result in stronger and perhaps more frequent hurricanes. There is little doubt that a linkage exists between sea surface temperature and hurricanes. For example, it is an empirical fact that hurricanes can't get started unless the sea surface temperature is at least 26.5 C (80 F).

When a hurricane passes over the ocean it leaves a trail of cooled water behind. Part of the cooling is due to evaporation that transfers energy from the water to the hurricane. Most of the cooling is probably due to mixing upward cooler deep water.

A hurricane is a circulation where inward rushing wind is warmed and humidified by contact with the ocean. The moist air rises, rains out the moisture and then must exit the area at the top of the hurricane far above the earth's surface. Some of this warm, dried out air may cool by radiation and sink back between the rain bands of the hurricane, but much of it must spread out over a wide area, larger than the hurricane. This outward rushing air above the hurricane forms a counter cyclone, spiraling in the opposite direction from the air spiraling toward the hurricane center near the surface. The coriolis force² makes the air spiral in opposite directions depending on whether it rushes inward or outward. Because the coriolis force is an essential element in hurricanes, there are no hurricanes within about 10 degrees of the equator due to the weak coriolis force near the equator. A hurricane can be considered a heat engine that takes heat from a hot reservoir, the warm ocean, and exhausts air that has cooled by rising into the cold upper atmosphere. The power generated is potentially increased if the ocean is hotter or the upper atmosphere is cooler. It is the temperature difference that measures the possible power of the hurricane.

Hurricanes are poorly understood. Even though it is possible to make measurements of hurricanes from aircraft and by other means and even though one would think that a good computer simulation could be devised based on fundamental physics, no one has a good handle on hurricanes. This should give pause to scientists who make extravagant claims for general circulation models of the earth's climate, a far more difficult scientific problem.

¹ There are 25 pictures of Al Gore in **An Inconvenient Truth**

² A dynamical effect due to the earth's rotation that makes it seem that objects moving north or south experience an east or west force. It causes air moving toward a low pressure area or away from a high pressure area to move in a spiral.

Attempts to draw conclusions from the historical record are frustrated by poor statistics. Some scientists think that the warming of the 20th century has not changed hurricane frequency, other's think that it has. Before satellites there were ghost hurricanes that spent their lives in remote and lightly traveled oceans. In the pre-satellite era, even if hurricanes were reported by ships and made landfall the measurements of hurricane strength were often poor. It is difficult to discern a long term trend since ghost hurricanes and poor measurements create uncertainty. It does seem that there are natural weather cycles that change hurricane frequency over a period of decades. For example the El Nino phenomena in the Pacific is known to reduce hurricanes in the Atlantic³.

The frequency of hurricanes depends on a variety of factors. It seems clear that getting a hurricane started requires a confluence of events, such as a group of thunderstorms and a lack of wind shear. Wind shear is a difference in wind speed or direction at different altitudes. Wind shear tears hurricane structures apart. The number of hurricanes in any season can vary radically for reasons that are not easy to predict.

The bottom line is that we don't know if global warming will increase frequency and/or intensity of hurricanes. And, of course, we don't know if we will continue to have global warming.

The IPCC (2007 AR4 report Chapter 9) agrees with my assessment:

Thus, detection and attribution of observed changes in hurricane intensity or frequency due to external influences remains difficult because of deficiencies in theoretical understanding of tropical cyclones, their modeling and their long-term monitoring...

In the introductory Summary For Policy Makers the IPCC says:

Based on a range of models, it is *likely* that future tropical cyclones (typhoons and hurricanes) will become more intense, with larger peak wind speeds and more heavy precipitation associated with ongoing increases of tropical sea surface temperatures. There is less confidence in projections of a global decrease in numbers of tropical cyclones. The apparent increase in the proportion of very intense storms since 1970 in some regions is much larger than simulated by current models for that period. {9.5, 10.3, 3.8}

Here the IPCC is reporting the results of model studies. The model studies apparently predicted that hurricanes will become more intense but that the number of hurricanes will decrease. Their expert opinion is that the studies are correct with respect to the hurricanes becoming stronger, but wrong with respect to the hurricanes becoming less common, because the results of the model studies don't agree well with late 20th century hurricane experience.

In Chapter 9 of the IPCC 2007 report they say something a little different:

These deficiencies preclude a stronger conclusion than an assessment that anthropogenic factors more likely than not have contributed to an increase in tropical cyclone intensity.

³ **Effect of El Niño on U.S. Landfalling Hurricanes, Revisited** By Mark C. Bove et. Al. Bulletin of the American Meteorological Society, Vol.79, No.11 (1998)

Here they say that it is *more likely than not* that hurricanes will increase in intensity. In the previous statement they said *likely*. *Likely* and *more likely than not* are not casual statements. These descriptions have been assigned specific meanings by the IPCC. *Likely* means a probability between 66% and 90% while *more likely than not* means a probability between 50% and 66%. Their first statement, that hurricanes will increase in intensity but become less frequent, is based on model studies while the second statement, where they say hurricanes will become stronger, is based on overall expert judgement. So, perhaps they are not contradicting themselves.

Either of these probabilities, *more likely than not* (50% to 66%) and *likely* (66% to 90%) are *not* acceptable confidence levels for drawing conclusions from scientific experiments or observations. Generally it is accepted that a 95% confidence level is required to have much confidence in a conclusion. Although 95% confidence level would seem to indicate 20-1 odds, in reality this is barely acceptable because experience shows that these probability calculations are not that reliable and are influenced by wishful thinking. Scientists want to see 95% confidence levels before they take a result seriously because experience has shown that anything less is too often not credible. The IPCC calls 95% *extremely likely*. Further, the IPCC methods of computing probabilities from model studies not based on solid theory and often uses expert judgment, otherwise known as guesses by scientists.

A very public argument may have influenced the IPCC's cautious view on the future of hurricanes. Chris Landsea, one of the most prominent scientists studying hurricanes, resigned from the IPCC in a very public manner. Landsea's dispute with the IPCC is important because it is a demonstration of the political nature of the IPCC. The details of hurricane history and theory are a minor issue in comparison. An edited version of his dear colleagues letter is below.



Chris Landsea At January 2009 American Meteorological Society Meeting

Dear colleagues,

After some prolonged deliberation, I have decided to withdraw from participating in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). I am withdrawing because I have come to view the part of the IPCC to which my expertise is relevant as having become politicized. In addition, when I have raised my concerns to the IPCC leadership, their response was simply to dismiss my concerns.

... Shortly after Dr. Trenberth requested that I draft the Atlantic hurricane section for the AR4's Observations chapter, Dr. Trenberth participated in a press conference organized by scientists at Harvard on the topic "Experts to warn global warming likely to continue spurring more outbreaks of intense hurricane activity" along with other media interviews on the topic.

... All previous and current research in the area of hurricane variability has shown no reliable, long-term trend up in the frequency or intensity of tropical cyclones, either in the Atlantic or any other basin. ... Moreover, the evidence is quite strong and supported by the most recent credible studies that any impact in the future from global warming upon hurricanes will likely be quite small. The latest results from the Geophysical Fluid Dynamics Laboratory (Knutson and Tuleya, Journal of Climate, 2004) suggest that by around 2080, hurricanes may have winds and rainfall about 5% more intense than today. It has been proposed that even this tiny change may be an exaggeration as to what may happen by the end of the 21st Century (Michaels, Knappenberger, and Landsea, Journal of Climate, 2005, submitted).

It is beyond me why my colleagues would utilize the media to push an unsupported agenda that recent hurricane activity has been due to global warming. ...

... I personally cannot in good faith continue to contribute to a process that I view as both being motivated by pre-conceived agendas and being scientifically unsound. As the IPCC leadership has seen no wrong in Dr. Trenberth's actions and have retained him as a Lead Author for the AR4, I have decided to no longer participate in the IPCC AR4.

Sincerely, Chris Landsea

Hurricanes are a manageable threat. Only 73 strong hurricanes have landed in the U.S. in the last 100 years (wind speed greater than 111 MPH). Only 2 of the 73 were very dangerous category 5 storms with winds over 156 MPH. There is evidence that strong hurricanes were much more frequent between 1000 and 3500 years ago⁴. The radius of intense winds in hurricanes is limited and hurricanes quickly collapse when moving on to land. Generally serious hurricanes strike at a particular place only infrequently, on the order of every 100 years depending on how serious is serious. Damages can be limited by better building standards and damage can be compensated by insurance. In Florida, probably the state most at risk for hurricanes about \$10 billion⁵ was paid in 2007 for hurricane insurance premiums. During the same year the gross domestic product of the state was \$734 billion. This is 1.36% of gross state product, expensive, but manageable.

⁴ <http://www.sciencenews.org/pages/pdfs/data/2000/157-21/15721-16.pdf> - Science News 2000 May 20, 2000.

Paleotempestology analyzes layers of sand washed into marshes by strong hurricanes. Dating is possible by carbon 14 dating of intervening organic layers of sediment.

⁵ Crane Group Insuring Hurricane Risk in Florida April 22, 2008

<http://www.floridareinsurance.com/resources/Insuring+Hurricane+Risk+in+Florida.pdf>

Residents pay far more in state and local taxes. The cost of insurance may be reduced in the future by better building codes.

Certainly there is plenty to worry about with hurricanes but the alleged global warming connection is far down the list.