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Cold Front

Hurricane Debate Shatters Civility Of Weather Science

**Worsened by Global Warming?
Spats Are So Tempestuous,
Sides Are Barely Talking**

Charge of 'Brain Fossilization'

By VALERIE BAUERLEIN
Staff Reporter of THE WALL STREET JOURNAL
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The 2,000-plus scientists at this week's annual meeting of the American Meteorological Society had plenty to talk about, from last year's droughts to flash floods and wildfires. But the biggest question at the meeting in Atlanta -- why last hurricane season was the worst since recordkeeping began 151 years ago -- was almost too hot to handle.



William Gray

William Gray, America's most prominent hurricane scientist and an ardent foe of the belief that global warming has worsened hurricanes, was supposed to join a panel discussing the storms. So was Greg Holland of the National Center on Atmospheric Research -- who disagrees with Dr. Gray. But the organizers withdrew the invitations after deciding the dispute had grown so nasty it was too risky to put the two in the same room.

"It was looking like it would totally dominate everything else," says Joe Schaefer, a planner and the director of the National Weather Service's Storm Prediction Center.

"To hell with it, I'm not going" to Atlanta, said Dr. Gray, a Colorado State University professor of atmospheric science, after learning of the cancellation before the conference. He didn't attend.

His adversary Dr. Holland is among a group of prominent scientists who argue that the recent burst of powerful storms isn't part of a normal pattern. In a recent article, he and co-authors said that global warming caused by human activity, while not affecting the number of hurricanes, appears to be causing more of them to be very intense. Dr. Holland went to the meeting despite the cancellation of his joint appearance with Dr. Gray and presented his paper's conclusions during a session on a wide variety of weather issues.



Greg Holland

What is going on with hurricanes like Katrina and the subsequent Wilma, which was the strongest ever recorded in the Atlantic, matters urgently to millions of people wondering whether coastal areas are safe. Insurers and other companies are trying to calculate future risks of operating in the vulnerable regions. And policy makers are wrestling with whether to rebuild some shattered communities.

Dr. Gray, who is 76 years old, has been studying storms for nearly a half-century. He is the author of seminal early models for predicting the atmospheric conditions that lead to storms and was a mentor to 70 doctoral and master's students -- including Dr. Holland.

Dr. Gray hasn't been shy about firing back at his critics. After Judith Curry, a climatologist at Georgia Institute of Technology in Atlanta, co-wrote a paper linking global warming and hurricane intensity, he said: "Judy Curry just doesn't know what she's talking about."

Dr. Curry, in an interview at her Georgia Tech office, said Dr. Gray has "brain fossilization." She added: "Nobody except a few groupies wants to hear what he has to say."

Dr. Gray has said on his Web site and has testified to Congress that recent storms' intensity wasn't fueled by human-induced global warming. Natural factors, he says, such as the presence of upper-air currents that can bat storms from side to side, helped steer them ashore and thus made them more destructive. Dr. Gray believes the current era of high activity will eventually end as a result of changes in salinity and currents in the Atlantic. Sometime in the next decade or two, he predicts, the earth will enter a cooling period, as it did in the 1950s.

In October 2004, Dr. Gray's views faced a head-on challenge from Kevin Trenberth, head of climate analysis at the National Center for Atmospheric Research, a prominent institute in Boulder, Colo., where Dr. Holland also works. At a news conference convened by Harvard Medical School's Center for Health and the Global Environment, Dr. Trenberth outlined his position that the spate of hurricanes that slammed the U.S. in 2004 might be linked to global warming caused by humans. He said rising temperatures weren't necessarily triggering more hurricanes but might be causing stronger ones, because as oceans warm they create more water vapor, the fuel for hurricanes.

That news conference roiled the world of weather scientists, several of whom thought Dr. Trenberth hadn't done sufficient research to back up the provocative claims. Some started new studies aimed at testing his claims.

In the July 31, 2005, online edition of the scientific journal *Nature*, Kerry Emanuel, a tropical meteorologist at Massachusetts Institute of Technology, published results of a complicated re-examination of historic data on wind speed and duration for North Atlantic and Western North Pacific storms. Hurricane damage increases exponentially as wind speeds rise, meaning that a hurricane with winds of 148 miles per hour may produce as much as 250 times the damage of a hurricane with 74 mph winds, according to the National Oceanic and Atmospheric Administration.

To calculate the total power generated over a storm's lifetime, Dr. Emanuel multiplied each hurricane's maximum sustained wind speed by itself and then multiplied that result by the wind speed again, a calculation known as cubing. Then he factored in how many hours the storm lasted.

Dr. Emanuel says he used scientifically accepted formulas to adjust for years when wind-speed data are most likely to contain errors, particularly in Atlantic storms from 1949 to 1969, when it is thought speed was overestimated. The calculation showed that the intensity of storms had essentially doubled in the past 30 years. He attributed growing hurricane intensity and destructive power to rising water temperatures that he said were "at least partially" the result of human activity.

At the same time, Dr. Curry and Peter Webster, who is also at Georgia Tech, set out specifically to investigate Dr. Trenberth's assertions. Dr. Webster had co-written a paper in 1998 with Dr. Gray and nine other scientists in which they didn't find the connections Dr. Trenberth claimed.

Much of past research on hurricanes had been limited to storms in the Atlantic, which spawns those that hit the U.S. The Georgia Tech researchers, along with Dr. Holland, broadened their scrutiny to all hurricanes -- known as tropical cyclones and typhoons in the Pacific and Indian oceans -- anywhere in the world since 1970.



Judith A. Curry

"It's not rocket science," says Dr. Curry, 52, who says the researchers counted the number of Category 4 or 5 storms, or those with sustained wind speeds of at least 131 mph. They found that the total number of storms world-wide stayed fairly constant, but the number of intense ones had doubled since 1970. About two weeks after Katrina barreled into the Gulf Coast as a Category 3 storm, an article by Drs. Curry, Webster and Holland laid out their conclusion in the journal *Science*. They say the rise in ocean temperatures isn't related to natural causes and appears to be associated with global warming, most likely related to a rise in greenhouse gases.

Dr. Gray's views on the natural cycle of storms in the Atlantic are strongly supported by the weather establishment. The National Oceanic and Atmospheric Administration, which runs the National Hurricane Center, took the unusual step in November of saying it is the consensus view among NOAA scientists that global warming related to human activity isn't causing either more storms or greater storm intensity. "Increases in hurricane activity are primarily the result of natural fluctuations in the tropical climate system," the statement said.

Most serious weather and climate researchers, including Dr. Gray, agree the planet has gradually warmed in recent decades. Last year was the warmest year since 1880, climatologists at National Aeronautics and Space

Administration's Goddard Institute for Space Studies said recently. All sides also agree 2004 and 2005 were unusually active years for big storms.

The sides disagree about how much global warming is attributable to natural cycles and how much to human activity such as the release of greenhouse gases from burning fossil fuels. Among meteorologists who say humans are behind global warming, many contend there isn't enough evidence to link it to increased hurricane intensity.

Further complicating things: Climate change can be studied based on tree-ring and ice-core samples dating back thousands of years, but specific data on hurricanes has been gathered for only about 150 years. Even that is primarily in the Atlantic. Modern hurricane science began about 60 years ago, when daredevil pilots first flew into the storms. Until then, hurricanes' strength had to be extrapolated from damage and from data collected by ships and on land. Some storms in remote places may not have been recorded at all. Satellites improved the quality of information starting in the 1960s, and meteorologists wrote and rewrote formulas for calculating wind speed in an effort to smooth out the historical record.

Dr. Gray responded sharply to the new research tying hurricane intensity to human-caused climate change, and the once-intimate circle of hurricane researchers erupted in turmoil. In Senate testimony in late September and in papers on his Web site, Dr. Gray said the new conclusions were irreparably flawed by the inferior data of earlier years. He says he had seen weather information being gathered haphazardly when he visited remote Pacific outposts in the 1970s. "The satellites were down or the people weren't trained," he says.

Dr. Gray attacked the Science article on his Web site, agreeing that ocean temperatures were climbing but maintaining that the rise was largely attributable to long-term heating and cooling trends. The rise in water temperature has negligible connection to the hurricanes, he argued. He complained that "the near universal reference to this paper over the last few weeks by most major media outlets is helping to establish a false belief among the general public...that global warming may be a contributing factor" to devastation such as that from Katrina.

Worse, he said in a separate paper on his Web site, flaws in wind-speed calculation are magnified when the numbers are cubed, as in Dr. Emanuel's study. In an email widely circulated among climate researchers in November, Dr. Gray wrote: "How were Emanuel and Webster et al. able to see trends in the global data that the rest of us long-time (tropical-cyclone) researchers presently working on these same data sets do not find?"

Dr. Curry says her study used only data collected since 1970, after satellites were in global use, minimizing the possibility of errors. She says Dr. Gray's prominence in the field has overshadowed critical new research. Meteorologists trained by him had looked at the data for so long and in such a prescribed manner, she argues, that they missed red flags about increasing intensity.

Dr. Holland, the scientist who was supposed to appear with Dr. Gray Tuesday night, once was a student under Dr. Gray. At the Atlanta meteorological conference, he said seasonal forecasts, especially Dr. Gray's, are rarely correct. An ally of Dr. Gray, Chris Landsea, of the National Hurricane Center, presented a critique of the global-warming hurricane theories, but the two scientists weren't in a forum that allowed debate.

Dr. Gray says his forecasts are accurate and improving each year. As for his resistance to the new challenges, it is based on experience and solid science, not his age, he said. "I don't feel I'm fossilized. If half my ex-Ph.

D. students say I'm senile, then I'll quit. They have not."

Scientists on both sides say they expect follow-up studies proving they are right to be published before the next hurricane season starts in June. Drs. Trenberth and Emanuel are submitting separate studies to major journals arguing that the influence of natural cycles has been greatly overestimated, a mutinous theory in established hurricane science. Dr. Landsea says he has submitted his own analysis to a major journal confirming the natural ebb and flow of storms argued by Dr. Gray. Both sides are waiting to see which papers will be accepted.

Meanwhile, a new panel discussion featuring the highest-profile hurricane scientists is being planned for an April conference in Monterey, Calif. Drs. Emanuel and Webster already have said they won't participate if Dr. Gray is there.

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