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A Conversation with Kerry Emanuel

## With Findings on Storms, Centrist Recasts Warming Debate

By CLAUDIA DREIFUS

For decades, Kerry Emanuel, the meteorologist and hurricane specialist from the Massachusetts Institute of Technology, was known as a cautious centrist on questions of global warming and hurricane ferocity.

Professor Emanuel asserted often that no firm link had been established between warming and the intensity and frequency of hurricanes.

But in August, two weeks before Hurricane Katrina struck the Gulf Coast, Professor Emanuel wrote in the journal *Nature* that he had discovered statistical evidence that hurricanes were indeed affected by global warming. He linked the increased intensity of storms to the heating of the oceans.

"His paper has had a fantastic impact on the policy debate," said Stephen Schneider, a climatologist at Stanford. "Emanuel's this conservative, apolitical guy, and he's saying, 'Global warming is real.' "

On a recent visit to New York, Professor Emanuel, who is 50, said, "It's been quite a ride since the *Nature* article." He added, "But it's a really bad thing for a scientist to have an immovable, intractable position."

**Q.** Let's go back to late August. What were your feelings as you watched television and saw Hurricane Katrina heading toward New Orleans?

**A.** I'll go back to a few days before that. As Katrina was making up off the coast of Florida, it was already an interesting storm. Though she was weak, the prediction was she was going to hit Florida.

But when Katrina came off the west coast of Florida, there were new predictions taking it into the central gulf and then up toward New Orleans, and I became concerned.

Many people in my profession had been worried about New Orleans for a very long time. And we had always envisioned these worst-case scenarios, and this was beginning to look like one of those. And so I plotted out the position of the "loop current," which is this warm current of water in the Gulf of Mexico, and the forecast had the hurricane going right up the axis of this loop current.

I remember looking at that, and alarms went off. I had this terrible feeling of dread, which deepened when the hurricane was elevated to a Category 5. We all knew that the pumps that kept New Orleans dry wouldn't be able to handle more than about a Category 3.

My mother has an elderly friend in New Orleans, and I did something I never do. I sent her a message: "You ought to get out, now!" In retrospect, I will say that had Katrina been 30 miles further west, the death toll could have been much worse. New Orleans would have flooded more rapidly and to deeper levels.

**Q.** Because last year's hurricane season was so intense, many people declared: "Ah, ha! Global warming!" Were they right?

**A.** My answer is, Not so fast. That may have been a contributor. But the fact we had such a bad season was mostly a matter of chance. On the other hand, though the number of storms globally remained nearly constant, the frequency of Atlantic storms has been rising in concert with tropical ocean temperature, probably because of global warming.

There is no doubt that in the last 20 years, the earth has been warming up. And it's warming up much too fast to ascribe to any natural process we know about.

We still don't have a good grasp of how clouds and water vapor, the two big feedbacks in the climate system, will respond to global warming. What we are seeing is a modest increase in the intensity of hurricanes.

I predicted years ago that if you warmed the tropical oceans by a degree Centigrade, you should see something on the order of a 5 percent increase in the wind speed during hurricanes. We've seen a larger increase, more like 10 percent, for an ocean temperature increase of only one-half degree Centigrade.

**Q.** So what are the implications of increased ocean temperatures?

**A.** Not much for storms at the time of landfall. But if you look at the whole life of storms in large ocean basins, we are seeing changes. And even if that doesn't have an immediate effect, people ought to be concerned about this because it is a large change in a natural phenomenon.

**Q.** There are scientists who say of fossil fuel consumption and global warming, We may not have all the evidence yet, but we ought to be acting as if the worst could happen. Do you agree?

**A.** It's always struck me as odd that this country hasn't put far more resources into research on alternative energy. Europeans are. France has managed to go 85 percent nuclear in its electrical generation. And the Europeans have gotten together to fund a major nuclear fusion project. It almost offends my pride as a U.S. scientist that we've fallen down so badly in this competition.

**Q.** How did hurricanes become your specialty?

**A.** When I was a child, we lived in Florida for three years, and I went through of a couple of hurricanes and was very impressed by them. Later, at M.I.T., I was asked to teach a course in tropical meteorology, which included hurricanes.

As I started preparing, I realized I didn't understand what I'd been taught on the subject. As with many things, you think you understand something until you try to teach it. After some reading, I realized that the reigning theory had to be wrong.

This theory held that the main thing that drives a hurricane is just ingestion of enormous quantities of water vapor from the atmospheric environment. It made predictions that weren't true. So it became a very big intellectual challenge to me. The more I got into it, the more interesting it became.

**Q.** Given what you know about hurricanes, should we be building beachfront housing on the Atlantic and Gulf Coasts?

**A.** Disaster specialists will tell you that part of the increasing lethality of land-falling hurricanes isn't related to nature. A lot of it has to do with human activity. We're moving to the coasts in droves, like lemmings.

We're building waterfront structures there that aren't necessarily strong. We're taxing the infrastructure and paying a big price for doing that.

**Q.** Would you ever buy a house on the beach?

**A.** I'd love to! But if I could do that, I'd insist on paying for my risk. And I'd do what is now being called "the Fire Island option," which involves putting up flimsy houses that you don't mind losing to a storm. You don't insure them.

**Q.** Almost concurrent to Hurricane Katrina, you published a beautifully packaged book, "Divine Wind: The History and Science of Hurricanes." How did you feel about the timing of its publication?

**A.** Not terribly good. If one is just interested in sales, I suppose it was fortuitous. But I was trying to convey a sense of hurricanes as not just things of scientific interest, but as beautiful. A leopard is a very beautiful animal. But if you took it out of its cage, it would go for your jugular. Anyone can understand that neither a leopard nor a hurricane is a willful killer.