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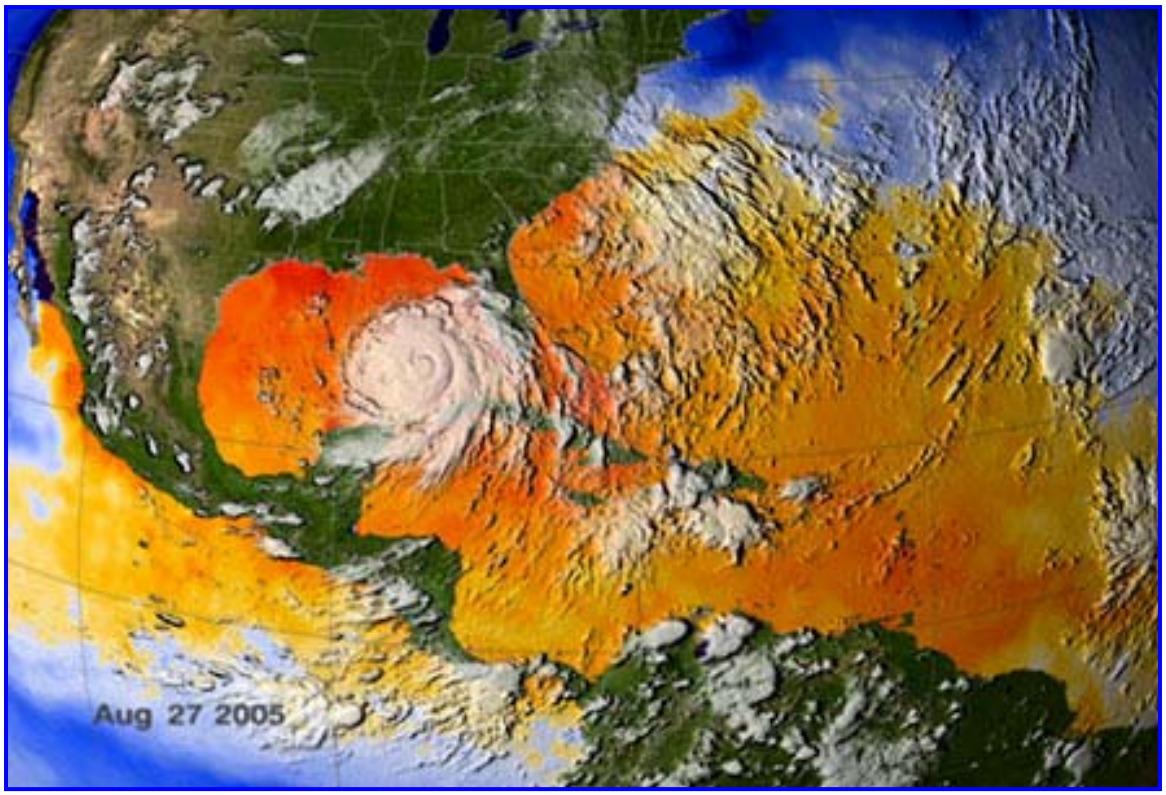
Storm experts feared the worst

Diary of a mad hurricane



NASA/SVS

This image depicts a 3-day average of actual sea surface temperatures (SSTs) for the Caribbean Sea and the Atlantic Ocean, from August 25-27, 2005. Every area in yellow, orange or red represents 82 degrees Fahrenheit or above. A hurricane needs SSTs at 82 degrees or warmer to strengthen.

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By Thomas Hayden

F*or several days as Hurricane Katrina first threatened and pounded the Gulf Coast, then flooded New Orleans, dozens of government agencies and private researchers helped predict, resist, and recover from the storm. In a series of timelines, U.S. News staffers detail the activities of:*

FEMA officials: On paper, feds gave an upbeat analysis;
Climate researchers: Experts feared the worst;
U.S. Army Corps of Engineers: 'It all started crashing pretty fast';
The Army's 82nd Airborne Division: A waiting game;
The Coast Guard: 'Hoisting up every vulnerable-looking thing';

The National Guard: 'We did respond with amazing speed';
State and local emergency officials: Getting through the storm;
and airborne storm chasers: A view from the eye.

Here, the climate researchers' story:

Two Louisiana hurricane experts pieced together their day-by-day recollections of Hurricane Katrina as it unfolded. Here are their accounts:

Barry Keim, the Louisiana state climatologist

Keim is based on the Louisiana State University campus in Baton Rouge, which also houses LSU's Hurricane Center, the Southern Regional Climate Center and the university's geography department. During Katrina, the LSU-based groups worked with state emergency officials, providing regular briefings on the storm's behavior. The scientists got satellite images of the storm, pinpointed flooded areas and even 911 calls on interactive GIS maps, used computer models to predict the storm surge, and analyzed the storm for officials as it developed.

THURSDAY, August 25

"I recall vividly, I was teaching a class, and showing the students the morning weather broadcast. The forecast at that time was for landfall in Apalachicola, Fla., or points east. But the storm had been very slow across Florida, causing a lot more damage than was anticipated, because the steering currents [large-scale wind patterns] were very sluggish. And that makes it very hard to forecast where it's going."

FRIDAY, August 26

"By Friday morning the hurricane shifted track somewhat westward, and as the day went on it started migrating into a more serious threat for us. On Friday afternoon I saw that steering currents were not really there, there was nothing to keep it from running to us. . . . It could have ended up anywhere from Louisiana to Florida."

SATURDAY, August 27

"By Saturday morning, [the national hurricane center was] locked onto southern Louisiana. It was a pretty darned good two-day forecast, and nobody trusts four- to-five-day forecasts anyway, whether it's a hurricane or not." Keim gives the first of his many weather briefings to state homeland security and Office of Emergency Preparedness officials late that morning. He was officially "activated" to duty at the Emergency Operations Center in Baton Rouge at 2 p.m. In the briefings, a duty that Keim shares with LSU scientist Kevin Robbins and others, "we take the forecast and localize it with local information, like wave buoy data, local wind speeds, and so on, and tell the elected and appointed officials so they can make decisions." In this first briefing, "the forecast was

calling for a Category 4 hurricane, and that's enough to get anyone's attention. Nobody dreamed at that time that it would be as bad as it was, but they were very concerned."

Mark Levitan, director, Louisiana State University Hurricane Center

Levitan, who is also based at the LSU campus in Baton Rouge, is a civil and environmental engineer and expert on wind damage, wind and flood protective shelters, and evacuation planning.

"It wasn't planned for us to have a big operational role," Levitan says, pointing out that he and his colleagues are researchers, not emergency professionals. But they always go to the state Emergency Operations Center to help get information and give briefings. "But because of the communications situation, we ended up being the only ones who could map for GIS. We ended up running the mapping at the EOC, including getting the remote sensing [satellite images] and converting 911 calls to [global positioning system] coordinates, right through the event. This was the first time our operational window extended beyond the first few days.

"This is our backyard, and we've had 20 faculty studying the New Orleans scenario for several years," Levitan says of the LSU Hurricane Center. "New Orleans is our case study. We had the high-resolution images; we had grad students volunteering through the night. We aren't funded for any of this, but we are citizens, and to see all these people working so hard, it was wonderful."

FRDIAY, August 26

Levitan is alerted by the state emergency management agency that he might be activated.

SATURDAY, August 27

Levitan is put on duty early in the morning. The LSU Hurricane Center and other units on campus begin doing computer modeling to predict storm surges and wind damage, and providing meteorological analysis—"detailed local data, information, and technical consulting about what the storm is doing and what impact it's going to have." (The LSU Hurricane Center was one of 40 agencies providing information to decision makers in the state EOC "overwatch room.")

The LSU EarthScan Lab has its own satellite tracking station, so scientists are pulling in images to track the storm path. Hassan Mashriqui and other LSU researchers had cranked up their storm surge computer model, known as ADCIRC, on LSU's supercomputer, one of the fastest university computers in the country. Their goal: to analyze the National Hurricane Center's advisories for the potential impact of storm surges throughout the region. ADCIRC is a detailed computer simulation not just of physics, climate, meteorology, and oceanography, but also of the shapes and forms of the seafloor, land, and the built environment of New Orleans.The first "model run" took about nine hours to

complete because all of the pre-existing conditions of the sea, air, and land, as well as the history of the storm system, had to be calculated.

Storm surge modeling begins with National Hurricane Center Advisory No. 16, which was issued at 4 a.m. CDT. About 1:30 p.m., Levitan gives the state EOC its first storm surge briefing. The computer spits out a colorful map of coastal Lousisiana, with different colors corresponding to expected surge heights. And already at the first briefing, emergency planners should have gotten the troubling message: 11- to-12-foot surges expected in Lake Pontchartrain. The map comes appended with these words in red: "Special Note: Levee overtopping predicted for west New Orleans (Kenner) but may also occur in New Orleans East and St. Bernard Parish where waves will cause runup." (Runup refers to wave height increasing as water depth decreases—it's what turns ocean waves into surf at the shore.)

"The model is a research tool; it's not optimized for operational use," Levitan cautions. The main problem is that it relies on only a single "run"—that is, it has to assume that the NHC prediction is dead-on and can't calculate the probabilities of different scenarios—so its results aren't used for making evacuation decisions. A National Oceanic and Atmospheric Administration surge model that runs 20 scenarios at a time, but is much less detailed, is weighted more heavily for evacuation decisions. Also, the LSU system doesn't yet include waves in the modeling and must assume that the levees will hold, so it gives an "at the least" underestimate of potential impacts. For all that, Levitan says, ADCIRC "was developed for the Navy and tested by the [Army] Corps [of Engineers], and it has been well validated."

From the first ADCIRC model run, Levitan says, "We showed and we briefed that there was a risk of overtopping, and some leaking near the airport, which is pretty much what happened." Levitan was at the EOC "pretty nonstop" until the next day.

MONDAY, August 29

Levitan gives briefings every several hours as new model runs are completed.

"By advisory 25," says Levitan, referring to the advisory issued at 10 p.m. CDT Sunday, August 28, "we pretty much knew what would happen." Even earlier on, Levitan recalls, "On Saturday we were fearing the worst but hoping for a turn. By early Sunday morning, it was clear that even if it turns, we're going to be stuck. We're getting hammered and it's extremely bad, and that was the briefing we were giving."

Levitan hands off duties at the EOC on Monday afternoon, to get the LSU center's research effort into Katrina's aftermath going.

"Very fortunately, the wind damage was not as intense as predicted," says Levitan. "And it has been a minor blessing that we haven't really had rain for two weeks. That could have caused even more damage and flooding."