Major Windstorms of 2008

The 2008 Atlantic hurricane season produced a record number of consecutive storms to strike the United States. A total of 16 named storms formed this season, five of which were major hurricanes at Category 3 or higher. This hurricane season is the third most costly on record, behind only the 2004 and 2005 seasons, with $13.3 billion in insured damage (2008 USD) according to ISO's Property Claim Services. It was the fourth busiest year for named storms since 1944, with six consecutive landfalls on the United States mainland, and is the tenth season to continue the pattern of above-normal activity out of the last 14 years.

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FIGURE 1. September 2, 2008: Gustav (over Texas), Hanna (in the Bahamas), Ike and Josephine (both over open water). Credit: NASA/NOAA GOES Project

2008 North Atlantic Tropical Storms and Hurricanes

Tropical Storm Arthur
Hurricane Bertha
Tropical Storm Cristobal
Hurricane Dolly
Tropical Storm Edouard
Tropical Storm Fay
Hurricane Gustav
Hurricane Hanna
Hurricane Ike
Tropical Storm Josephine
Hurricane Kyle
Tropical Storm Laura
Tropical Storm Marco
Tropical Storm Nana
Hurricane Omar
Tropical Depression Sixteen
Hurricane Paloma

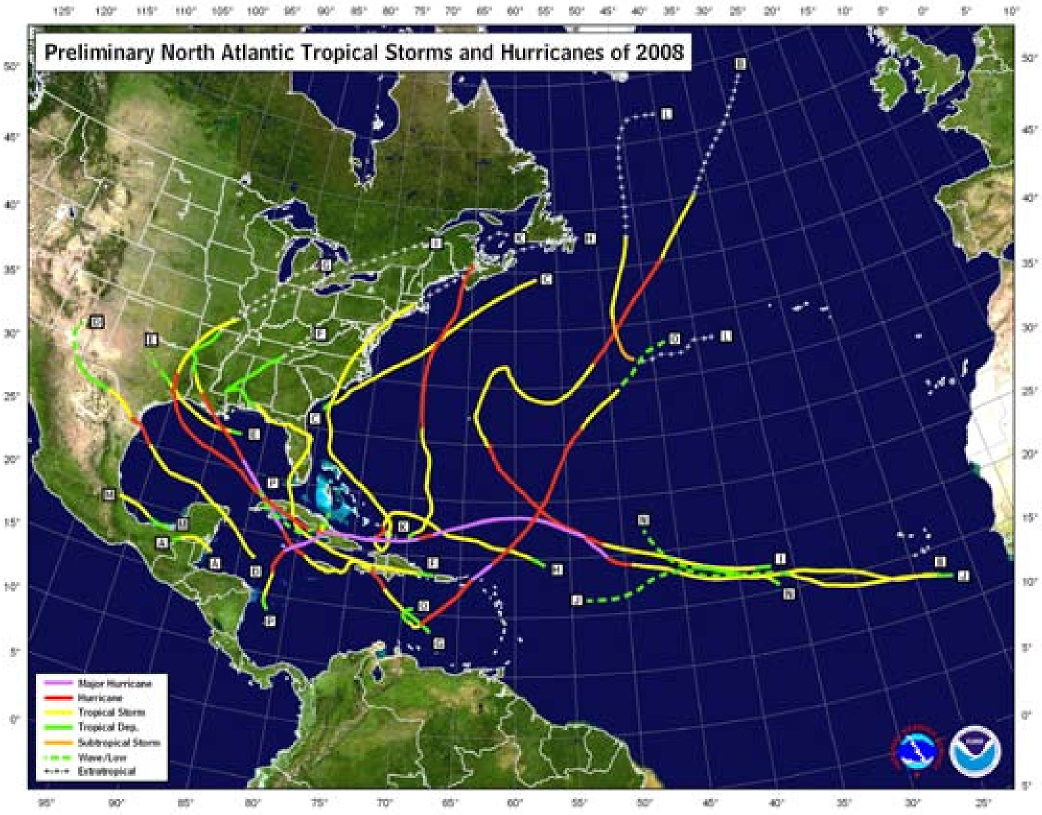


FIGURE 2. There were eight named hurricanes in 2008 but only Dolly, Gustav, and Ike made landfall in the U.S. at hurricane-strength, each resulting in major damage and disruption. Although "only" a tropical storm, Fay caused over $245 million in damage. Credit: National Weather Service/NOAA

Hurricane Dolly

Landfall Brownsville, Texas

$525 million in insured property damage

Hurricane Dolly was a tropical cyclone that intensified to a Category 2 storm before it made landfall in southern Texas near the border with Mexico in July 2008. Dolly was the fourth tropical cyclone and second hurricane to form during the 2008 Atlantic hurricane season. Dolly developed on July 20 from an area of disturbed weather in the Caribbean Sea.

Hurricane Dolly caused $525 million in insured property losses according to ISO. Dolly's heavy rain and wind also destroyed most of the cotton fields in the Rio Grande Valley, usually the first region in the United States to start the annual cotton harvest. Cotton and sorghum crops in the area were deemed a near-total loss.

Hurricane Dolly was the third most powerful hurricane to hit the U.S. in the month of July in recorded history, behind a storm in 1916 and Hurricane Dennis in 2005. (Dennis was a Category 3 hurricane when it made landfall in Florida.) It marked the fastest start of a hurricane season since 2005. Dolly's estimated total damage in Texas of $1.05 billion made it the fourth most destructive Texas hurricane on record, in terms of total cost, behind Hurricane Alicia, Hurricane Rita, and Hurricane Ike.

FIGURE 3. Hurricane Dolly made landfall 30 miles northeast of Brownsville, TX, after first brushing across the Yucatan peninsula as a tropical storm. Strengthening rapidly as it neared land, it was a strong Category 2 storm as it crossed South Padre Island. Credit: Herald-Tribune and Google

FIGURE 4. Slow-moving Dolly brought 8 to 12 inches of rain to south Texas. As shown here, some isolated areas received as much as 20 inches and experienced severe flooding.

FIGURE 5. Roof damage was common throughout the area and some properties, such as this structure, lost entire walls as well.

High H2

Hurricane Gustav

Landfall Louisiana

$2.2 billion in insured property damage

Hurricane Gustav was the seventh tropical cyclone, third hurricane and second major hurricane of the 2008 Atlantic hurricane season. It caused serious damage and casualties hitting Haiti, the Dominican Republic, Jamaica, the Cayman Islands, Cuba and the United States. Gustav caused at least $8.5 billion (2008 USD) in total damages, of which $2.2 billion was insured. Gustav also triggered the largest evacuation in United States history when over three million people fled the oncoming hurricane.

Gustav formed on the morning of August 25, 2008, about 260 miles (420 km) southeast of Port-au-Prince, Haiti. It rapidly strengthened into a tropical storm that afternoon and into a hurricane early on August 26. Later that day, Gustav made landfall near the Haitian town of Jacmel. It swept through Jamaica and Western Cuba and then steadily moved across the Gulf of Mexico.

Gustav hit the United States on Monday morning, September 1, as a relatively fast-moving Category 2 hurricane with maximum sustained winds of 110 mph and central pressure of 957 mb. Landfall location was near Cocodrie, Louisiana, about 70 miles southwest of New Orleans. At landfall, Gustav's hurricane force winds extended outward up to 70 miles and tropical storm force winds extended outward up to 200 miles.

The damage Hurricane Gustav caused was extensive. Over 150 people died as a result of the hurricane worldwide, including 53 in the United States. Millions of people were left without power. Hurricane Gustav's effect was felt across the southeastern United States from Texas to Florida.

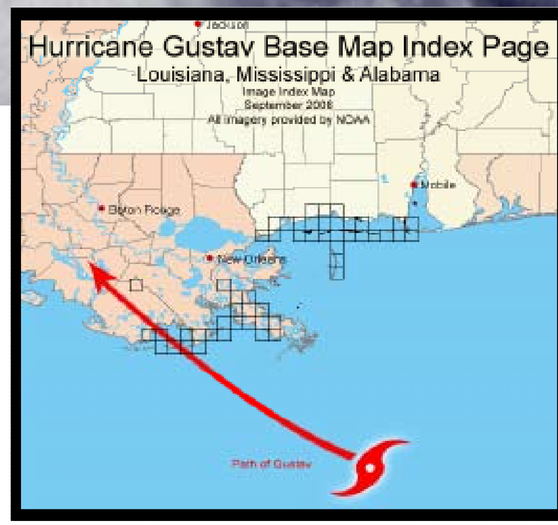


FIGURE 6. Gustav made landfall approximately 70 miles southwest of New Orleans as a strong Category 2 hurricane. It weakened from a Category 4 storm while crossing the Gulf of Mexico. Credit: USGS

FIGURE 7. Numerous ships and barges broke their mooring lines and damaged each other, bridge supports, seawalls and docks, and blocked access to the industrial canal near New Orleans.

FIGURE 8. Levees surrounding New Orleans held, but roadways and bridges were impassable due to flooding from heavy rain.

H2

Hurricane Ike

Landfall near Galveston, Texas

$10.7 billion in insured property damage

Hurricane Ike started as a tropical disturbance off the coast of Africa near the end of August. On September 1, 2008, it became a tropical storm west of the Cape Verde islands. By the early morning hours of September 4, Ike was a Category 4 hurricane, with maximum sustained winds of 145 mph (230 km/h) and a pressure of 935 mb. It was a Category 3 hurricane when it passed over Cuba on September 7. When Ike made landfall in Galveston, Texas on September 13, it was a Category 2 hurricane.

Power loss was experienced as far north as Ohio as wind and rain swept through the Midwest. As much as ten inches of rain fell in Indiana, Illinois and Missouri and hurricane-force winds blew in Ohio and Kentucky. More than 80 deaths were reported in the United States, although hundreds were reported missing immediately after the hurricane. Overall, Hurricane Ike was blamed for more than 195 deaths worldwide.

Damages from Ike in the United States were estimated at over $24 billion (2008 USD), with $10.7 billion in insured property damage. Ike was the third costliest U.S. hurricane of all time, behind Hurricane Andrew of 1992 and Hurricane Katrina of 2005.

BEFORE AFTER

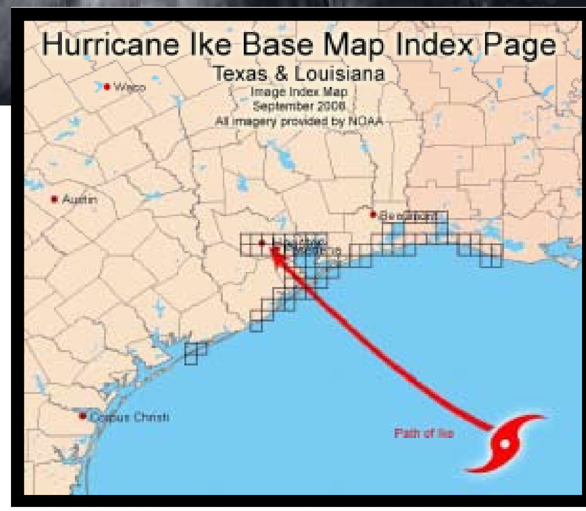


FIGURE 9. It could have been worse. By the time Ike made landfall it had degraded from a strong Category 4 hurricane to a Category 2. Credit: USGS

FIGURE 10. Roads were impassable in Galveston for many days following Hurricane Ike.

FIGURE 11. In many instances, flooding made emergency response impossible.

Residential Buildings

High wind, flooding and storm surge all contributed to the severe damage to residential properties experienced in the storms of 2008. In coastal locations, placing a home on piers designed to absorb the storm-surge impact is not enough. The structure also has to withstand the high wind forces.

This is not the first time that Galveston Island has been devastated by a hurricane and it is unlikely to be the last. In spite of past hurricane events to warn us, the combined pressure of population growth, potential for short-term financial gain, and the lack of political will on the part of our elected officials has resulted in construction in marginal, high-risk areas. Many areas along the coasts of Florida, and North and South Carolina, for example, have not experienced hurricanes in many years and, in that time, explosive growth has occurred. In fact, there are some areas which are probably better left undeveloped.

Commercial Buildings

Damage to commercial structures was not limited to coastal areas. The Chase-Morgan tower in downtown Houston experienced extensive window damage, possibly due to higher-than-design wind pressures caused by wind votices created by adjacent buildings, and by debris from a nearby construction site that became airborne.

Some Gulfport, Mississippi buildings escaped serious damage by being built on piers, thereby creating a break-away first floor.

Throughout the Galveston and Houston areas, numerous businesses experienced heavy damage to signage, awnings, roof overhangs, canopies and light-gage, steel-framed structures.

Industrial Facilities

Except for manufacturing facilities within reach of storm surge or other flooding, heavy industrial facilities largely escaped serious damage. This is partly due to the inherent ruggedness of their most common construction types: steel-braced frame and reinforced concrete structures.

The most common damage to industrial facilities was roof membrane damage and window damage. Weakly anchored roof-mounted equipment often blew off, leaving gaping holes in the roof and further damaged the membrane as it tumbled across the roof. Resulting water intrusion into process equipment and controls caused significant damage and downtime.

A number of facilities experienced damage to critical equipment such as cooling towers. Fortunately for some, they had undertaken risk audits to identify this exposure and had stockpiled adequate spare parts and signed repair/maintenance agreements. What would have been many weeks of business interruption was reduced to a few days of downtime.

Infrastructure

Roads, bridges, rail lines, port structures, and other infrastructure were damaged by storm surge and by impact from floating or wind-driven debris. Flooding also caused damage to roadways, under- and over-passes, even in the Houston metro area.

Of roughly 3500 offshore oil platforms in the gulf, three were total losses and 49 others were damaged. One platform was literally “lost” until March 2009 when a tanker collided with the submerged superstructure.

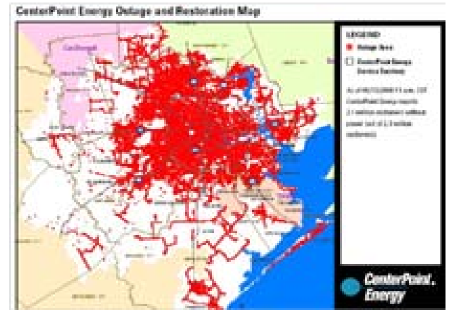
Major airports in Houston and New Orleans were not seriously damaged. Flight operations at IAH were briefly impacted by water intrusion into communications equipment. The Port of New Orleans saw only minimal damage from Gustav. Damage at the Port of Galveston from Ike was more severe due to the 14-foot surge that flooded most of the port’s ground level assets, damaged access roads and bridges, and silted-up the harbor. Limited cargo shipping was available within two weeks. Servicing cruise ships took longer, with return to full port operations taking approximately two months.

Emergency Response

For a number of reasons, the emergency response activities were far more successful than in 2005 when Hurricane Katrina occurred. First, the devastation of Hurricane Katrina was fresh in the minds of people in the path of the 2008 hurricanes, and warnings were taken far more seriously.

Such warnings prior to Gustav resulted in one of the largest evacuations in U. S. history. Unfortunately, the warnings were not so well-heeded during Ike in Galveston, Texas, where a number of residents could not be rescued for fear of rescuer injury.

FEMA and other local emergency crews were also better prepared with sufficient resources and equipment on standby, just waiting for the worst of the flooding to recede. Loss of access roads and damage to bridges significantly slowed the emergency response.



Lifelines

Electric power availability was heavily affected by all of the storms but especially by Ike. CenterPoint Energy, the largest supplier of power to the Houston area, reported that immediately following Ike, 2.1 million customers were without power (out of a total of 2.3 million customers). The duration of the outage was from one to three weeks for most customers. The most common damage was downed distribution lines and flooding.

Loss of power also resulted in “boil water notices” being issued all across the area. Water supplies were not lost but lost pumping capability reduced system pressures to the point that back-flow and contamination was a concern.

Cell phone communication was sporadically available during all three storms. Cell towers were generally undamaged, but flooding of backup generator rooms caused loss of power. Where flood protection was provided, lack of access to refill the generator fuel tanks brought down the systems after 12 to 24 hours.

Conclusion

We were once again reminded that coastal locations subject to storm surge can see far more damage than would otherwise occur from simply high-wind and debris impacts. And simply building atop piers to elevate above the storm surge or flooding isn't good enough if the structure still can't take the wind forces.

Building owners were again surprised that their properties were damaged even though they were designed to "the code" and construction was inspected and approved. The fact is, building codes do not try to prevent all damage but simply to create a high probability that structures will not collapse and cause serious injury or death. In addition, building codes do not require structures be designed for the largest imaginable event, be it an earthquake, a hurricane, or a flood. Rather, the codes use probabilistic approaches to define the magnitude of event that has only a small chance of being exceeded in a given time frame. Unfortunately, as we saw in 2005 with Katrina, nature can, and sometimes does, present us with events that exceed expectations.

Some corporate risk managers were surprised to find that their individual property did not perform as predicted by desktop catastrophe models. While such software can provide reasonable estimates of overall portfolio damage and loss for insurers with large numbers of properties, they can be grossly misleading at the individual site level. These "CAT" models make assumptions that can either underestimate or overestimate damage, making insurance limit and deductible decisions difficult for the risk manager.

Global Risk Miyamoto (GRM) specializes in providing risk managers with site-specific engineering-based investigations to eliminate the high uncertainty in CAT model damage estimates. The outcome of a GRM evaluation is (1) an individual property estimate of the probable maximum loss, or "PML", (2) the specific failure modes driving that PML, (3) the specific retrofit measures that can eliminate or reduce the PML (and downtime) to a client-specified level, and (4) the likely construction costs of those measures. One client recently stated: "The money we spent on the study was a great investment for two reasons. First it allowed us to determine the appropriate amount of insurance to buy and we were able to negotiate lower premiums because the risk was better identified. Second, and more importantly, we were able to prepare for the business risks that were identified and as a result, our actual loss was lower after one of our main plants took a direct hit from Hurricane Ike."

GRM is a joint venture formed by Global Risk Consultants, the worldwide leader in unbundled property loss control, and Miyamoto International, one of the top structural engineering firms in California. Its purpose is to provide the risk management community with accurate site-specific risk identification and mitigation—focusing on earthquake, hurricane/windstorm, and flood.

Global Risk Miyamoto

Headquarters - Sacramento
1450 Halyard Drive, Suite One
West Sacramento, CA 95691
t 916.373.9194
f 916.373.1466

San Francisco Bay Area
3470 Mt. Diablo Blvd., Suite A210
Lafayette, CA 94549
t 925.284.3700
f 925.284.3710

www.grmcat.com