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Hurricane Katrina

National Oceanic and Atmospheric Administration

National Climatic Data Center

[Overview](#) | [Meteorology and Background](#) | [Rain, Wind, and Storm Surge](#) | [Impacts](#) | [Useful Links](#) | [NOAA technical report](#)

Note: Data in this report are compiled from preliminary statistics

Updated 29 December 2005

Overview

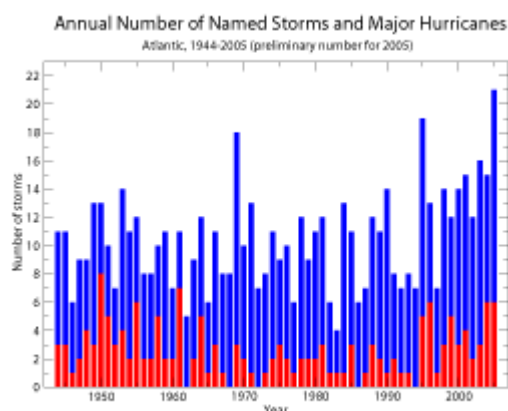
[Hurricane Katrina](#) was one of the strongest storms to impact the coast of the United States during the last 100 years. With sustained winds during landfall of 125 mph (110 kts) (a strong category 3 hurricane on the Saffir-Simpson scale) and minimum central pressure the third lowest on record at landfall (920 mb), Katrina caused widespread devastation along the central Gulf Coast states of the US. Cities such as New Orleans, LA, Mobile, AL, and Gulfport, MS bore the brunt of Katrina's force and will need weeks and months of recovery efforts to restore normality.

Other storms have had stronger sustained winds when they made landfall including the following:

- [The Labor Day Hurricane](#), Florida Keys, September 2, 1935, Category 5, 892 mb, Approaching 200 mph
- [Hurricane Camille](#), Mississippi, August 17, 1969, Category 5, 909 mb, Approaching 190 mph
- [Hurricane Andrew](#), Southeast Florida, August 24, 1992, Category 5, 922 mb, 165 mph
- [Hurricane Charley](#), Punta Gorda, Florida, August 13, 2004, Category 4, 941 mb, 150 mph

The [most deadly hurricane to strike the U.S.](#) made landfall in Galveston, Texas on September 8, 1900. This was also the greatest natural disaster to ever strike the U.S., claiming more than 8000 lives when the storm surge caught the residents of this island city by surprise.

As shown in the figures to the right, tropical cyclone activity in the Atlantic basin has been above normal since 1995. This has been largely in response to the active phase of the [multi-decadal signal](#). The average number of named storms since 1995 has been 13, compared to 8.6 during the preceding 25 years during which time the multi-decadal signal was in an inactive phase. An average of 7.7 hurricanes and 3.6 major hurricanes since 1995 compares to 5 hurricanes and 1.5 major hurricanes from 1970-1994.

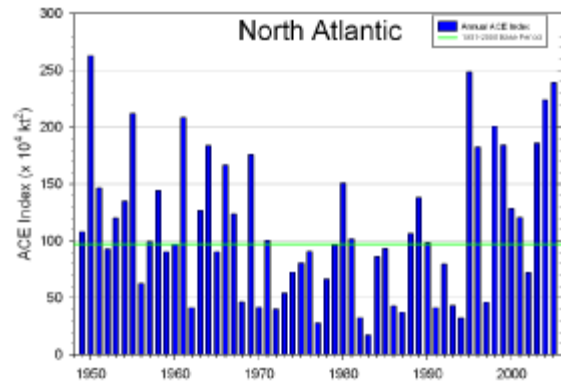


Annual Number Named Storms and Major Hurricanes

Characteristics of an active multi-decadal signal in the Atlantic include: warmer SSTs in the tropical Atlantic region, an amplified sub-tropical ridge at upper levels across the central and eastern North Atlantic, reduced vertical wind shear in the deep tropics over the central North Atlantic, and an African Easterly Jet (AEJ) that is favorable for promoting the development and intensification of tropical disturbances moving westward off the coast of

Africa. Recent studies also indicate that in addition to this multi-decadal oscillation the destructive power of hurricanes has generally increased since the mid-1970s, when the period of the most rapid increase in global ocean and land temperatures began.

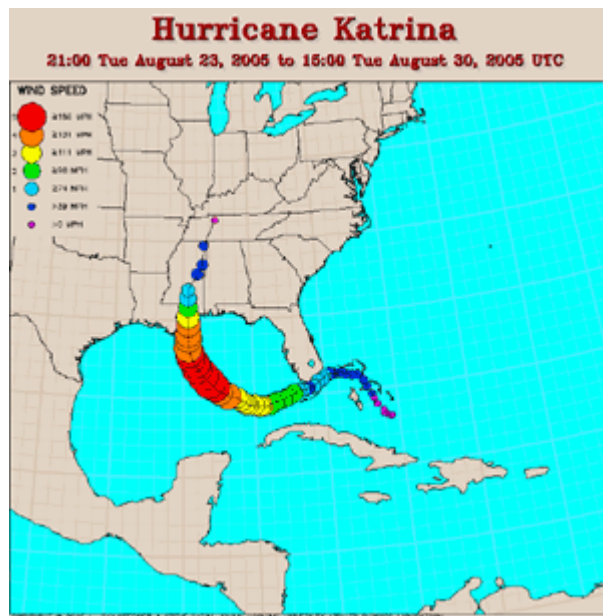
However, it is important to note that increased tropical cyclone activity does not necessarily translate into an increase in the number of landfalling tropical storms or hurricanes. [Six of the past 11 years have had one or fewer landfalling hurricanes along the Gulf Coast](#), and there is no long-term trend in the number of landfalling hurricanes since 1900.



Annual Totals of Atlantic Basin
Accumulated Cyclone Energy (ACE)
Index

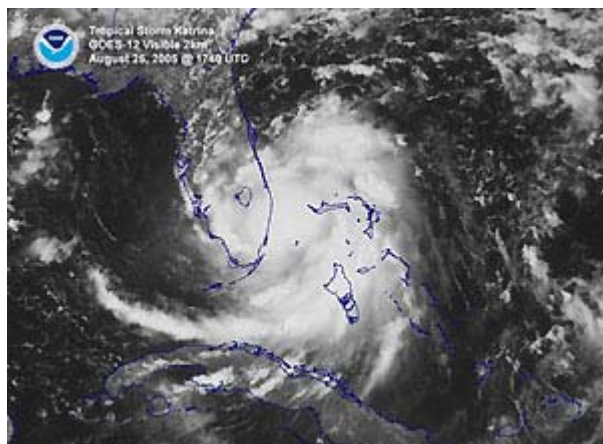
Meteorology

The following is a synopsis of the conditions that produced historic Hurricane Katrina, as well as some information of [rain and wind records](#) and a very preliminary description of the [major impacts](#). Note that reports are constantly being updated as a result of new information, and this page will reflect information as acquired by the date at the top of the page. There is also a complete [technical summary](#) of the storm available



Map of Katrina's track

measured as Katrina came ashore. As the storm moved southwest across the tip of the Florida peninsula, Katrina's winds decreased slightly before regaining hurricane strength in the Gulf of Mexico. Given that Katrina spent only seven hours over land, its strength was not significantly diminished and it quickly re-intensified shortly after moving over the warm waters of the Gulf.

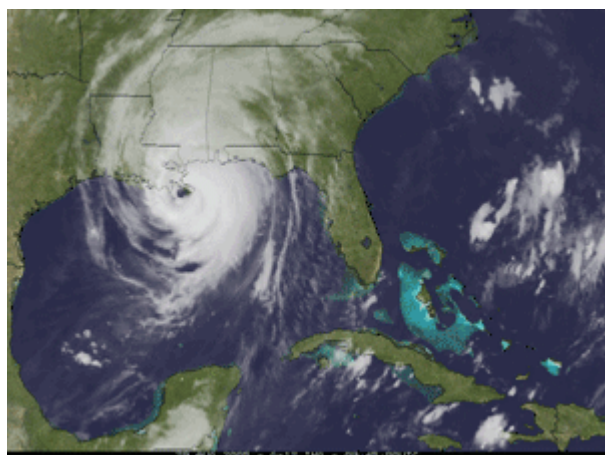


Satellite Image of Katrina

Hurricane Katrina developed initially as a tropical depression (TD #12 of the season) in the southeastern Bahamas on August 23rd. This tropical depression strengthened into Tropical Storm Katrina the next day. It then moved slowly along a northwesterly then westerly track through the Bahamas, increasing in strength during this time. A few hours before landfall in south Florida at around 6.30 EDT on August 25th, Katrina strengthened to become a category 1 (windspeeds of 75mph or greater) hurricane. Landfall occurred between Hallandale Beach and North Miami Beach, Florida, with windspeeds of approximately 80 mph (70 kts). Gusts of above 90 mph (78 kts) were

measured as Katrina came ashore. As the storm moved southwest across the tip of the Florida peninsula, Katrina's winds decreased slightly before regaining hurricane strength in the Gulf of Mexico. Given that Katrina spent only seven hours over land, its strength was not significantly diminished and it quickly re-intensified shortly after moving over the warm waters of the Gulf. Katrina moved almost due westward after entering the Gulf of Mexico. A mid-level ridge centered over Texas weakened and moved westward allowing Katrina to gradually turn to the northwest and then north into the weakness in the ridging over the days that followed. Atmospheric and sea-surface conditions (an upper level anticyclone over the Gulf and [warm SSTs](#)) were conducive to cyclone's rapid intensification, which lead to Katrina attaining 'major hurricane' status on

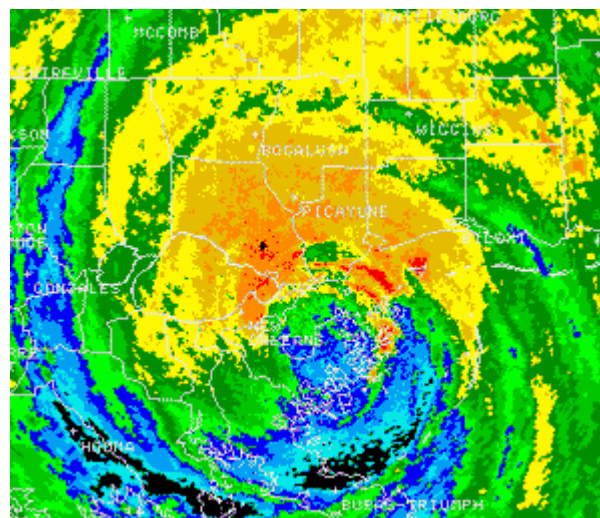
the afternoon of the 26th.



Landfall

Continuing to strengthen and move northwards during the next 48 hours, Katrina reached maximum windspeeds on the morning of Sunday August 28th of over 170 mph (150 kts, category 5), and its minimum central pressure dropped that afternoon to 902 mb - the 4th lowest on record for an Atlantic storm. Although Katrina, at its peak strength was comparable to Camille's intensity, it was a significantly larger storm and impacted a broader area of the Gulf coast.

Although tropical cyclones of category 5 strength are rarely sustained for long durations (due to internal dynamics), Katrina remained a strong category 4 strength hurricane despite the entrainment of dryer air and an opening of the eyewall to the south and southwest [before landfall on the morning of the 29th](#) (go to NCDC's NEXRAD viewer site for [additional radar imagery and animations of Katrina](#)). Landfalling windspeeds at Grand Isle, LA were approximately 125 mph (110 kts) (strong category 3 intensity) with a central pressure of 920mb - the 3rd lowest on record for a landfalling Atlantic storm in the US. [Rainfall amounts](#) for Louisiana and along the Gulf are described below along with other [impacts of the storms](#).



Radar Animation of Landfall

Rain, Wind, Storm Surge

Eastern Florida

During its initial landfall in southern Florida, Katrina generated over 5 inches of rainfall across a large area of southeastern Florida. [An analysis by NOAA's Climate Prediction Center shows that parts of the region received heavy rainfall, over 15 inches in some locations](#), which caused localized flooding.

[Winds at landfall](#) north of Miami were 80 mph (category 1 strength), leading to some damage and extensive power outages.

Gulf Coast

Rainfall from Katrina's outer bands began affecting the Gulf coast well before landfall. As Katrina came ashore on August 29th, rainfall exceeded rates of 1 inch/hour across a large area of the coast. NOAA's [Climate Reference Network](#) Station in [Newton, MS \(60 miles east of Jackson, MS\)](#) [measured rainfall rates](#) of over an inch an hour for 3 consecutive hours, with rates of over 0.5 in/hr for 5 hours during August 29th. [Precipitation analysis from NOAA's Climate Prediction Center show that rainfall accumulations exceeded 8-10 inches](#) along much of the hurricane's path and to the east of the track.

Windspeeds over 140 mph were recorded at landfall in southeastern Louisiana while [winds gusted to over 100 mph in New Orleans](#), just west of the eye. As the hurricane made its second landfall on the Mississippi/Louisiana border, windspeeds were approximately 110 kts (125 mph). Gusts of over 80mph were recorded in Mobile and 90 mph in Biloxi, MS.

The central pressure at landfall was 920 mb, which ranked 3rd lowest on record for US-landfalling storms behind Camille (909 mb) and the Labor Day hurricane that struck

the Florida Keys in 1935 (892 mb). Hurricane Andrew in 1992 dropped to fourth, as its central pressure was 922 mb at landfall. Katrina also reached a minimum central pressure of 902 mb at its peak, ranking 4th lowest on record for all Atlantic basin hurricanes.

Inland

As the storm moved inland and weakened to a tropical storm on the 29th, rainfall became the primary impact. Rainfall amounts exceeded 2-4 inches across a large area from the Gulf coast to the Ohio Valley. As a result, flood watches and warnings were common across these regions. Rain bands from Katrina also [produced tornadoes](#) causing further damage in areas such as Georgia.

Impacts

Loss of Life

From the Gulf states (principally Louisiana and Mississippi), the loss of life is unknown but will likely reach well into the hundreds and possibly higher. It is clearly one of the most devastating natural disasters in recent US history. From Katrina's first landfall in Florida, while it was at category one strength, initial estimates suggest 11 deaths resulted.

Flooding

The loss of life and property damage was worsened by breaks in the levees that separate New Orleans from surrounding lakes. At least 80% of New Orleans was under flood water on August 31st, largely as a result of levee failures from Lake Pontchartrain. The combination of strong winds, heavy rainfall and storm surge led to breaks in the earthen levee after the storm passed, leaving some parts of New Orleans under 20 feet of water. Storm surge from Mobile Bay led to inundation of Mobile, Alabama causing imposition of a dusk-to-dawn curfew for the City. Large portions of Biloxi and Gulfport, Mississippi were underwater as a result of a 20 to 30+ foot storm surge which flooded the cities.

Oil Industry

A major economic impact for the nation was the disruption to the oil industry from Katrina. Preliminary estimates from the Mineral Management Service suggest that oil production in the Gulf of Mexico was reduced by 1.4 million barrels per day (or 95 % of the daily Gulf of Mexico production) as a result of the hurricane. Gasoline had reached a record high price/gallon as of Monday August 30th with concerns over refinery capacity apparently driving the increase. More information is available from a [Department of Energy report](#).

Power Outages

Over 1.7 million people lost power as a result of the storm in the Gulf states, with power companies estimating that it will take more than several weeks to restore power to some locations. Drinking water was also unavailable in New Orleans due to a broken water main that serves the city. Power was lost to 1.3 million customers in southeastern Florida from the initial landfall on August 24th.

Cost

Estimates for damages for Hurricane Katrina are still extremely preliminary and properly assessing losses will take many months. However, the total losses as a result of Katrina is estimated to exceed \$100 billion with over \$34 billion in insured losses.

Travel

Both of New Orleans' airports were flooded and closed on August 30th and bridges of Interstate 10 leading east out of the city were destroyed. Most of the coastal highways along the Gulf were impassable in places and most minor roads near the shore were still underwater or covered in debris as of August 30th. Katrina also disrupted travel as it headed inland, with more than 2 inches of rain falling across a large area from the coast to parts of Ohio during the 48 hours after Katrina made landfall.

Useful Links

- [Hurricane Katrina - A Climatological Perspective \(NCDC Tech. Report #2005-01\)](#)
- [NCDC's Tropical Cyclone Overview Page](#)
- [Space Science and Engineering Center Hurricane Katrina Page](#)
- [The National Weather Service](#) (click on the map to take you to local homepages)
- [NOAA's National Hurricane Center](#)
- [NOAA's Climate Prediction Center](#)

Questions?

For all climate questions, please contact the National Climatic Data Center's Climate Services and Monitoring Division:

*Climate Services and Monitoring Division
NOAA/National Climatic Data center
151 Patton Avenue
Asheville, NC 28801-5001
fax: +1-828-271-4876
phone: +1-828-271-4800
email: ncdc.info@noaa.gov
To request climate data, please E-mail: ncdc.orders@noaa.gov*

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Please see the [NCDC Contact Page](#) if you have questions or comments.