

# Outlook



## 2005 Hurricane Season: A Record Setting Year

The names Katrina, Rita and Wilma will be infamous for generations to come, as Camille, Gilbert, Andrew have been for more than a decade and Charley, Ivan, and Jeanne have been for about a year. The devastation brought by these three Category Five hurricanes (a record for one year) is phenomenal. Dennis struck the Pensacola Bay area in July and was just short of Category Five status at its peak intensity.

The Gulf of Mexico and Bay of Campeche were affected by nine of these tropical cyclones. The only stretch of the coastline surrounding these two bodies of water that were not affected by such activity is along the middle Texas coast. Portions of South Texas are still in drought conditions as a result of this.

The 2005 Hurricane Season has been a record setting season. There have so far been 26 storms and 30 total tropical cyclones. Each is a new record. The U.S. mainland has been hit by 7 named storms, including all three Category Five hurricanes and one Category Four. The 2005 season has had six hurricanes of Category Three or greater and twelve total hurricanes to date.

Prior to the start of the hurricane season, many forecasters were going for above normal tropical cyclone activity, but no one foresaw a record setting season with such destruction. Of the last 10 years, only 1997 had less than 10 tropical cyclones in the Atlantic Basin. And for the first time, the National Hurricane Center used all the names on its list for the year and had to start using the letters of the Greek alphabet. Alpha crossed Hispaniola from south to north, Beta formed in the southwestern Caribbean Sea, Gamma formed in the northwestern Caribbean Sea, and Delta and Epsilon formed in the central Atlantic Ocean. There have even been December tropical storms during the past two years. If this trend toward more active seasons continues, the climatology for an average season may have to be raised from the present 10 tropical cyclones.

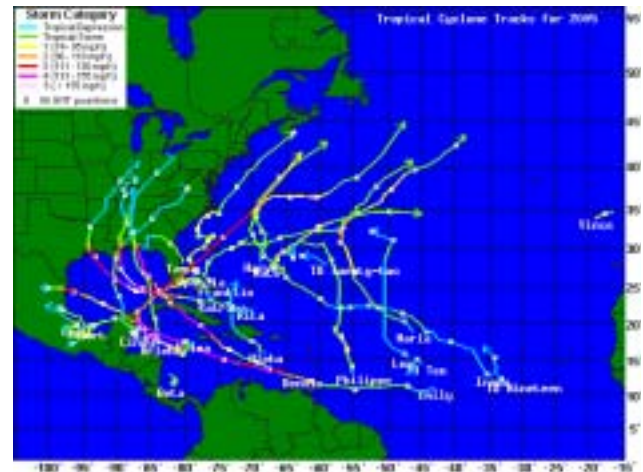


Figure 1- Tropical Cyclone Tracks for 2005

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## 2005 Hurricane Season- Cont.

Congress approved \$62.3 billion in disaster relief after Hurricane Katrina struck the U.S. Gulf Coast. The total damage for the 2005 hurricane season in U.S. dollars has yet to be assessed and will likely not be until early next year or later, but it should easily exceed that of any previous year.

**Table 1:** The 7 costliest tropical cyclones to strike the U.S. mainland. Damages are listed in US dollars and are not adjusted for inflation. From the National Hurricane Center/Tropical Prediction Center.

Rank	Hurricane	Year	Category	Damage
1	Andrew (SE FL, SE LA)	1992	5	26,500,000,000
2	Charley (SW FL)	2004	4	15,000,000,000
3	Ivan (AL/NW FL)	2004	3	14,200,000,000
4	Frances (FL)	2004	2	8,900,000,000
5	Hugo (SC)	1989	4	7,000,000,000
6	Jeanne (FL)	2004	3	6,900,000,000
7	Allison (TX)	2001	TS <sup>a</sup>	5,000,000,000

Many scientific experts point to global warming as the primary cause of the increased tropical cyclone activity, which includes an increase in the number of intense hurricanes forming each year. This is difficult to dispute due to the coincidence of the two events. The extra warming of the earth has brought about a warmer than normal sea surface. This is certainly true for most of the North Atlantic Ocean at the present time. Another factor is the La Niña event, or the cooler than normal sea surface temperatures (SSTs) in the eastern tropical Pacific Ocean, evident in the lower left hand corner of the image below. The year 1995 had just such an occurrence, and it too had a very active hurricane season with 19 named storms. La Niña events typically cause environmental conditions favorable for tropical cyclone development during the Northern Hemisphere's summer and early autumn.

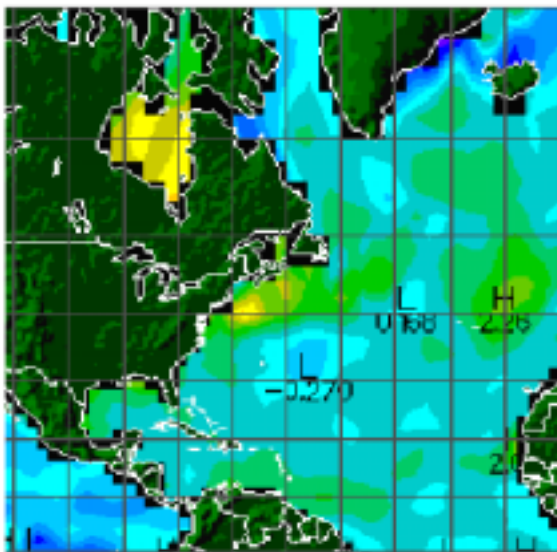


Figure 2. Sea surface temperature anomalies for 21 October 2005. From Unisys.

## WWT Forecaster Chases Katrina and Rita

By Ryan Fuller, Staff Meteorologist

Tropical season 2005 was exceptional for Gulf Coast Hurricanes. Typically, several years can pass without major hurricanes in the Gulf of Mexico. However, an unprecedented five major hurricanes hit the Gulf Coast this season, including Dennis, Emily, Katrina, Rita, and Wilma. While most forecasters prefer to watch hurricanes from their computer and coastal residents evacuate, I am personally drawn to the eye of the storm. I have come away with a personal love and respect for hurricanes and an addiction to learn about and witness more hurricanes in the future.

This hurricane season I experienced Dennis, Katrina, and Rita. Dennis was a very early season major hurricane. Packed with water, food, 2 canisters full of gas, laptop computer with a wireless connection, eyes goggles, rain suit, and cell phone, I headed off for a long drive across the Gulf Coast thinking this was my best chance to see a hurricane for the year. I left Houston around midnight with my travel companion, my Toyota Tacoma. Landfall was expected near Mobile Bay the following day. Along the way, I stopped in Gulf Port, Mississippi, and took pictures of the once surreal white sandy beaches. During the drive there, Dennis had quickly strengthened from 125 mph to 145 mph over about 8 hours. Having one hurricane under my belt and recalling the feel of raindrops and sand pelting me at 90 mph in Hurricane Claudette in 2003, I began to think 145 mph winds would probably be too strong to actually go into the center of the storm. I decided to position myself on the western side of the storm, where typically the weaker winds are found. As I later learned, Hurricane Dennis was more like Hurricanes Andrew and Charley - with a small radius of hurricane force winds, yet still powerful. My storm chasing experience from Dennis was that while I was only 40 miles away from Pensacola (in Mobile, where I had taken refuge in a hospital parking garage), it was indiscernible that a terrific hurricane was occurring nearby. So from a hurricane chasing standpoint, Dennis was a bust. Only light rain fell most of the time, and some minor tree damage occurred (including a small tree that fell onto my truck during a squall where winds exceeded 58 mph). After traveling al-

most 1000 miles round trip, I vowed that for my next chase, I was driving straight to the eye no matter what. I didn't have to wait long for the next hurricane.

I worked the night before Hurricane Katrina made landfall. I hastily packed my usual storm chasing supplies, plus extra gas canisters and a video camera this time. I headed for Slidell, Louisiana around midnight, and it was a race to make it in time. I made it to within 50 miles of Slidell before I decided to stop and wait for sunrise. Driving had begun to get difficult and I was still far away. Luckily, the hotel where I parked had an Internet connection until the electricity went out about 2 hours before sun rise. A quick phone call to a WWT employee, Penny Zabel, confirmed Katrina would pass just east of Slidell. I took off eastward in a driving, horizontal rain just as it became light enough to see. About 14 miles west of Slidell, conditions began to deteriorate. At one point, a squall ahead of me looked like a Plains hail storm as the road turned black and the sky green. This was the western edge of a Category 4 hurricane. As I drove further, I soon witnessed the complexity of winds. They were not horizontal

as I had previously experienced but came down in bursts with numerous "gustnadoes." Instead of objects simply blowing over, I witnessed trees exploding as tornado-like vortices spun around. I had gotten so caught up in the excitement of the storm that I had passed Slidell and was now near the Mississippi State line. I found myself on the freeway, now with the winds too strong to drive farther or to even turn around. My best hope was that the eye of Katrina would pass over, and I could retreat to safety. For a paralyzing 2 hours of being stranded on the median of the freeway, thinking that every burst of wind was my last, the 927mb eye finally did come. I was so dazed, I didn't even stop to think to

turn on the radio or video tape or dare venture out of my truck. I managed to drive less than a mile and got under an overpass that provided some protection to ride out the backside of the storm. Despite the wind coming to a dead stop during the eye, a light drizzle persisted, and the roar of the wind from the upper levels could be heard at the surface. The downburst winds of Katrina had a distinct sound of jet engines, a sound I had never before associated with a hurricane. The second round of winds was not quite as strong as the first, and I decided I had seen enough. I began to drive around and see some of the damage. The worst of the storm had passed just 15 miles to the east of me, near Bay Saint Louis. Almost nothing was left. In the confusion of returning back to Houston and the fact that the signs had been blown away, I took a wrong turn and ended up heading south to New Orleans. I was stopped on the north side of Lake Pontchartrain, due to the Gulf of Mexico and the lake merging over the interstate and sweeping it away. I later ran into another driver that was in shock but who helped guide me the right way. I had to use the wrong lanes at many times due to objects that had fallen onto the highway. I was surprised I had made it home without a flat tire due to all the debris that I had to run over.



After Katrina, I seriously thought that I was done chasing for the season. Yet three weeks later, computer models aimed Hurricane Rita toward the Houston area, and for a brief time, I thought I might be able to witness a hurricane from home base. I began to feel what it must be like to have a major hurricane pointed at me. I admit I got caught up in the preparation and bought non-perishable food and searched unsuccessfully for batteries and gasoline. However, Rita spared Houston and drifted to the Louisiana border. Rita had begun to significantly weaken prior to landfall, and I had serious doubts on whether it would be intense enough to validate another chase. I made a last minute decision, however, and left for Beaumont only 3 hours ahead of landfall in the middle of the night. After all, I had just bought a new video camera for the event! The drive there made me doubt whether I could even make it in time; hurricane winds had already moved inland. The wind was blowing from the north, and I was driving east, making for a perfect scenario for a tip-over. I placed a pillow over the driver side window as I was afraid the wind would break the glass. For the first time, I thought I had gotten myself into something from which I couldn't get out. The wind seemed endless and unrelenting. The winds were too strong

to turn around so I plowed through them towards the first major intersection in Beaumont and found refuge under the I-10 bridge. Underneath the overpass, I was protected from the winds, and had an excellent opportunity to witness the force of the wind slowly rip apart the numerous businesses around this normally busy intersection. From the moment I was able to get out of the truck, I heard glass shatter, car alarms going off, and objects crashing into each other. The darkness made this hurricane more frightful than Katrina, as I could only guess as to what was going on. I soon realized that this hurricane was significantly different in two ways. The first was the sound - Katrina sounded like jet engines, whereas Rita sounded more like locomotives moving overhead. Second, Katrina generated numerous downbursts, while Rita produced more stereotypical horizontal winds. For more than 5 hours, hurricane force winds persisted. I was frozen under the freeway unable to move anywhere. I was sure that when morning came nothing would be left surrounding me. The most amazing site that I had witnessed in any hurricane this season, better than any movie or storm chase video I had seen, was when a building was swept out of the dark and landed on the freeway right in front of me. Despite the deafening roar from the wind, it made an ear-piercing sound like crushing

metal as it landed into the intersection and then continued to slide across the freeway into a parking lot full of cars, finally putting an end to the ongoing car alarms. Luckily, I was safe, and as the conditions lessened, I proceeded on my return journey to Houston.

Reflecting on these personal experiences during the busiest hurricane season ever, I believe that I have acquired a better feel for forecasting hurricanes and preparing people for the possible danger. From a meteorological standpoint, each hurricane behaves differently due to having its own set of weather variables. Not only does this make them difficult to predict, it gives them an almost life-like and unique personality. I have been fortunate to experience several major storms this season, not only as a forecaster but as an eyewitness. While it may not necessarily prepare me for the next storm, the experience has given me a much better perspective.



# Heating Season Outlook 2005-2006

The seasonal cooling of the Northern Hemisphere is progressing, but it started from a higher level of warmth than is normal so it will take a longer period of time for the temperature regime in this part of the Earth to reach normal levels as a whole. The Arctic ice sheet is solidifying and expanding, but until it covers the entire surface of the Arctic Ocean there will be a source of warmth in that region. The exposed water surface will also be a source of moisture for the air, making above normal polar snowfall likely until it is covered by ice.

At the present time, snow covers the ground over much of Alaska, northwestern and northern Canada and the Canadian Rocky Mountains. High pressure and fair skies have allowed many parts of the interior of these areas to become quite cold already. No record-breaking temperatures have been noted, but this is where the coldest air is developing. Temperatures approaching -20 degrees Fahrenheit are already noted in interior northern Alaska. The forecast computer models tend to bear this out, showing the cold in this region intensifying and spreading to the southeast across Canada during the month of November.

There are indications that a large, nearly stationary high pressure area should form over the eastern side of Greenland and the ocean between there and Norway during November. After a week or so, it may then begin a westward drift to north-eastern Canada. These tend to block the eastward progression of storm systems across northern North America, forcing them to go south of the high pressure area, which would bring colder than normal temperatures into central and eastern Canada, the north-central U.S., the Great Lakes region, and the northeastern U.S. on a regular basis during the last half of autumn and the beginning of winter.

Two main storm tracks are expected this winter. One is expected to move from the Arctic north of Alaska southeastward across Canada and into the northeastern United States. The second is forecast to be from the North Pacific and the Gulf of Alaska into southwest Canada and the western United States. This second track should then continue east to northeastward across the remainder of the Lower 48, toward the Gulf of St. Lawrence. An alternating pattern between these two flows should give both the eastern and the western parts of the U.S. times of warmer and drier than normal weather, followed by a stormy period and then times of colder than normal conditions.

Figure 1, the Temperature Anomalies map, shows that the overall, seasonal-average temperature pattern is therefore expected to be mildest in the south-central region, which is out of the direct path of both cold air flows. The northern Plains should see equal parts warm and cold, giving them a near normal cold season (November through March). Despite periods of warmer than normal conditions that are likely from time to time in the Northeast and Northwest, these areas are expected to have colder than normal temperatures more often for the 5-month period.



Figure 1- Shows 2005-2006 Temperature Anomalies

Precipitation across the Lower 48 states is expected to be least from New Mexico to Mississippi with near to above normal rain and snow occurring west, north, and east of this area due to the previously described storm tracks. The Precipitation Anomalies map, Figure 2, shows that the interior West and the interior Northeast are the favored areas for above normal precipitation for the season. Seasonal snowfall totals may tend to be below normal, however, in the Plains and Midwest because of how the Rocky Mountains tend to dry out and warm up weather systems that cross them.

This seasonal forecast was made with respect to the dominant temperature patterns noted over the past several years. These have been generally a degree or so warmer than the 'norms' which are averaged over the 30 year period ending in 2000. As a result, below normal, as mentioned above would be only slightly below normal with regards to the 30 year norms. The above normal areas as previously described would be enhanced slightly with regards to the 30 year norms.



Figure 2- Shows 2005-2006 Precipitation Anomalies