Storm Signals

Houston/Galveston National Weather Service Office

Volume 76 Fall/Winter 2007

Houston/Galveston Meteorologist In Charge - Bill Read Detailed to National Hurricane Center

In August, I was given the unique opportunity to serve as Acting Deputy Director of the Tropical Prediction Center/National Hurricane Center (NHC) for an as yet to be determined period of time beginning Labor Day. This came about when the Director position became vacant and Dr. Ed Rappaport, the current Deputy Director, was elevated to Acting Director until such a time as the vacancy can be filled through the competitive process. My duties are to administer some ten actions that arose from the report of a Management Assessment Team which looked at the operation during late June and early July. Operationally, I will oversee the activities of the Hurricane Liaison Team (HLT). Gene Hafele and I have served as meteorologists on the HLT a number of times over the recent past, hence this was a natural task for me to take on.

As of this writing (September 17th), I have been on the job only two weeks, but a lot of interesting events have happened. Operationally, NHC covers all systems in the Atlantic and Eastern Pacific, so almost every day this time of year there is either a storm or suspect area requiring our attention. In addition to the well known tropical cyclone warning process, another branch, known as the Tropical Analysis and Forecast Branch, works 24/7 producing forecasts and analyses of the tropical Atlantic and eastern Pacific oceans. Detailed analysis maps are produced and sent to the marine community, as are high seas and offshore wind and seas forecasts, similar to the coastal waters forecast we produce at the local forecast office.

The first week of September we worked landfall of Felix in the Atlantic, Henriette on the Baja and again on the mainland of western Mexico, and then the development and landfall over the weekend of Tropical Storm Gabrielle on the Outer Banks of North Carolina. Sandwiched around keeping up with the action and trying to learn the NHC way of doing things were meetings about administrative issues and the day to day nuances of a busy organization. Then there was the second week…

Monday the 10th and Tuesday the 11th were fairly routine, all supposedly rather quiet for the peak of hurricane season though we were anticipating what would become Ingrid in the central Atlantic and monitoring an area of disorganized thunderstorms associated with low pressure in the Gulf of Mexico. Models were unexcited about either system so it appeared like it would be a rather quiet week…so we thought.

Wednesday morning I got in around 7 am and the specialists were preparing a draft first advisory on a now much more interesting system in the northwest Gulf. Before the aircraft was in the storm, the decision was made to start a Depression 9 and go with a Tropical Storm Warning for the upper Texas Coast and southwest Louisiana. For the rest of the day I got the unique experience of watching a depression approach and then impact home base as a hurricane from the other side of the Hurricane Hotline.

Some observations… even though Humberto went through a genesis to hurricane at landfall in what we believe is record time, this was just the type of storm we continually try to get our citizens and officials to keep in mind. We have had numerous examples of storms like this in the past…1932, 1943, Alicia, Allison, and even Erin this summer, to name a few. Because it crossed the threshold to a Hurricane, it became even more of a noteworthy event. Another observation; watching the staff at NHC work this event reinforced my opinion of the degree of expertise and dedication these folks have when the tropics get active. Every possible piece of data was being looked at for clues as to what the storm would do. Off duty specialists would call in with concerns they had watching the system from home. We all agonized over what more we need in order to better forecast the rapid genesis and intensification of storms like Humberto. The coordination between NHC and the forecast offices seemed to work quite well.

I'm sure there will be many more learning opportunities during may stint here in Miami. Meanwhile I'll be "roughing" it in an apartment in Coral Gables while the Houston/Galveston Forecast Office is in very good hands with Gene Hafele as Acting Meteorologist In Charge (MIC).

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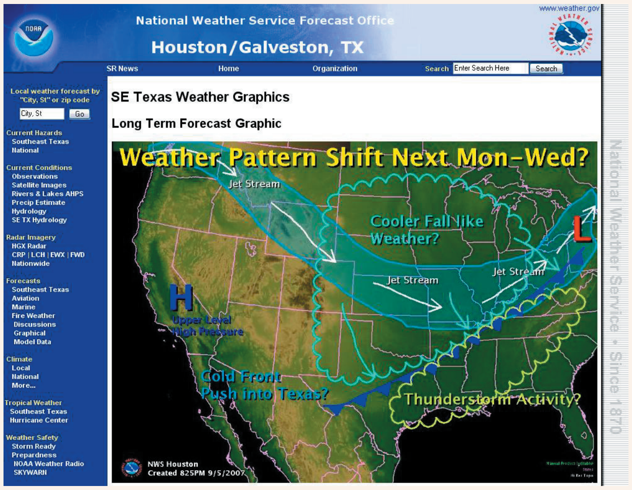
By Scott Overpeck



The point and click forecasts on the webpage are one of the most visited features on the Houston/Galveston National Weather Service website. A visitor to the website can click on their location and get a forecast. The temperature and rain chance forecasts are enough for most people, but still, what does a 30 percent or even 70 percent chance of rain mean? What does heavy rainfall or severe thunderstorm wording in the forecast mean? Is that hurricane going to impact my area? There will always be some uncertainty to the forecast, and some weather hazard that is a threat to a person's property or even weekend plans. It is one thing to actually say the forecast, but a picture can better describe these types of high impact weather events.

The old cliché, a picture is worth a thousand words, applies to the idea behind a graphical weather outlook. The Houston/Galveston NWS website boasts a new feature called "Southeast Texas Graphical Weather Hazards." The idea behind this new website feature is to bring visitors to the website a quick and easy way to understand the forecast as well as inform users of any weather hazards including hurricane information. During major weather events like hurricanes, the website will have graphics explaining the latest information about the tropical system impacting southeast Texas and any hazards such as winds, flooding and storm surge. A banner link on the front page will take users to this new webpage, and also inform users of immediate weather threats including tropical weather, severe weather and flooding. During normal weather situations, the page will have a short term and long term forecast graphic that will depict important weather situations that are occurring or will occur. The graphics will outline any hazards or forecast challenges expected during the seven day forecast period. Forecasters will be creating these images each day, so bear with us as we learn how to create and update the images. The graphics will be posted in the morning, and updated as needed throughout the day. Please look for this new web feature this fall and winter. Any feedback is appreciated!

American Meteorology Society - Houston Chapter

Preview: 2007 - 2008 Season

Our goal of being the nation's top chapter through providing cutting-edge scientific information & community involvement

Welcome back everyone! Our main goal this coming season is to be the best chapter in the country. The Houston-Galveston region has one of the largest meteorological communities, per capita, in the U.S.. Hence, this very-attainable goal of being the local chapter leader is ultimately about you & me. To be the best we have to overachieve in two areas. First, we will continue our commitment of providing the highest standard of scientific education through cutting-edge meteorological topics, presented by the nation's experts, that affects us in southeast Texas. Secondly, we must be more of an active participate within our communities' humanitarian, or charitable, efforts.

Our monthly meetings began in mid-October and run through early June. Anyone who has attended one of our meetings can attest to the fact that we bring in knowledgeable professionals to discuss the most pertinent and important topics within the science; from whether global warming is directly affecting hurricane frequency to what the weather will be like tomorrow….on Mars! So, since there will always be a great meeting to look forward to every month, this lofty goal will continue to be achieved on a monthly basis.

What needs improvement is our involvement within the community. All excuses aside, we can always find the time to give back to our community. There are those that give more-than-enough back and those who don't give at all. We, as a chapter, would like to fall in between those two extremes. We are always open to any suggestion on how we can better improve upon our humanitarian endeavors. Our chapter is looking to volunteer in your charitable event. Which is it? A 5K walk/jog or environmental clean-up event? 'Habitat for Humanity' or feeding the homeless? Science fair judging or Big Brother mentoring? Once again, please feel free to contact us and invite us to your cause.

We, in turn, would like to invite you to our monthly meetings. What is scheduled for this 2007-8 season? Well, for starters, here are just a few of the topics on this season's docket:

- The logistics behind the Hurricane Center/ National Weather Service/Emergency Management's mission of protecting life and property in these post-Rita times.
- Texas A&M's Storm Chasers
- Space Weather
- Forensic Meteorology
- Houston's Air Quality Problem / Allergy Issues
- Visit a local TV station to meet a broadcast meteorologist

For those who are not yet members, we would like to extend an invitation to all interested in meteorology to highly-consider becoming a part of our exciting local American Meteorological Society Chapter. If you are interested in becoming a member, please feel free to contact us at these e-mails, so we can place you on our monthly e-newsletter list:

President: Anthony Yanez (ayanez@kprc.com) Vice-President: Patrick Blood (patrick.blood@noaa.gov)
Secretary: Dorri Breher (dbreher@impactweather.com) Treasurer: Brain Plantz (brian.planz@wilkensweather.com)

Have a great year and we look forward to seeing you at the next meeting or event!

The Houston Lightning Detection and Ranging Network

By: Joe Jurecka HGX SCEP

If one listens to AM radio much, they will probably be able to relate to the strong crashes of noise on the signal when thunderstorms are in the area. It turns out that lightning generates radio signals over a wide range of frequencies and this information can be used to both detect and locate lightning flashes.

Since the early 1980s, a national lightning detection network has been in place to detect cloud to ground flashes. National Weather Service meteorologists have had access to that data for a number of years. However, intra-cloud flashes, which account for between two to four times the number of cloud to ground flashes, have not been operationally available…that is, until just recently and only in select locations. Thanks to a National Science Foundation grant to the Department of Atmospheric Sciences at Texas A&M University, the Houston/Galveston National Weather Service Forecast Office now receives updated intra-cloud flash information every two minutes. What's more, the data is also available to the general public via the World Wide Web.

Why is lightning important?

Lightning kills an average of 66 people each year as well as providing a hazard for aviation, starting forest fires, and causing property damage. However, at a deeper level, lightning data provides other valuable insight for the forecaster as well as the general public. Lightning research of intra-cloud flashes is an active area of investigation both within NOAA and academia with interesting findings.

It turns out that many times, intra-cloud lightning begins before cloud-to-ground flashes occur. Detection of intra-cloud flashes, in many storms, precedes ground strokes by several minutes. While more research in this area is needed, there exists the possibility that, in the future, individuals could receive notification of impending lightning hazards in their area.

Lightning also displays certain characteristics when dealing with severe weather. Many times, lightning activity will peak and then suddenly drop immediately preceding a tornado or large hail. While it does not guarantee severe weather will occur, it is another tool which the forecaster can use to assess severe weather potential.

How does the Houston lightning system work?

The Houston Lightning Detection and Ranging system (LDAR) detects intra-cloud lightning. When lightning occurs, electromagnetic energy is emitted in all directions. The "static crashes" one hears on the radio is associated with lightning. These static crashes are precisely what the sensor network listens for on a continuous basis. Each site is comprised of an array of antennas, a Global Positioning System (GPS) receiver, a GPS locked timing circuit, digital signal processing, and a means to both transmit and store the acquired data. When a lightning flash occurs, every sensor notes the precise time (within billionths of a second) of the static crashes and reports this information to a central server located in College Station via the Internet. Based on the arrival time of the static crash at each site, it is possible to determine the latitude, longitude and altitude of each "source" of the lightning flash. This is accomplished by noting the precise time of the flash derived from the arrival of the flash energy at each site with the knowledge that the energy travels at approximately the speed of light. The system takes this information, adds maps and a bit of color, and the end-user is able to view the results. Residents of southeast Texas can view near-real time lightning via their internet browser at **http://www.met.tamu.edu/ciams/ldar/**

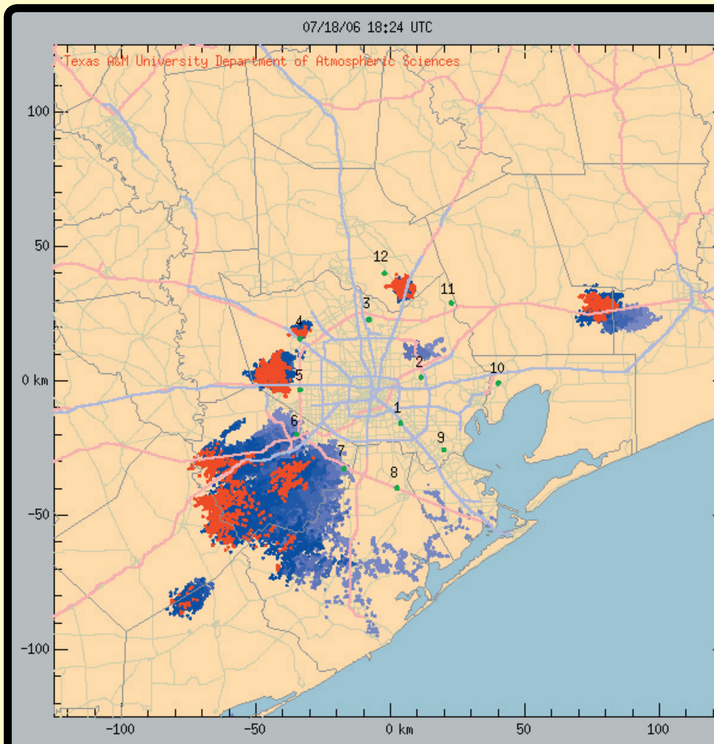


Figure 1 Intra-cloud lightning between 12:54 pm and 1:24 pm on 7/18/2006 using the Texas A&M Lightning Detection and Ranging Network (receiver frequency ~70 MHz.)

Case Example

Let us consider a thunderstorm that occurred over Fort Bend County on July 18, 2006. This day had thunderstorms activity across a large portion of southeast Texas. **Figure 1** depicts a 30 minute window of lightning activity over the Houston area. The red dots showed the last two minutes of activity with varying shades of blue depicting lightning over the prior 28 minutes where lighter shades are from earlier in the 30 minute period. With the color coding, one can determine the general movement of the storm (red to dark blue to light blue). In this case, storms were moving westerly.

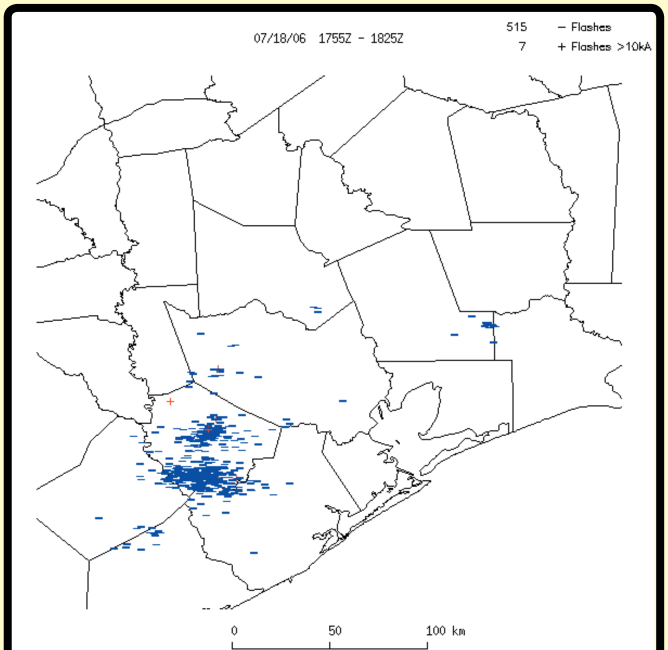


Figure 2 Cloud to ground lightning from 12:55 pm to 1:25 pm on 7/18/2006 using the North American Lightning Detection Network (Receiver Frequency < 0.1 MHz.)

Of particular interest is a long appendage that stretches from far southern Fort Bend County all the way to Texas City. This depicts what meteorologists often call an anvil crawler, also known as spider lightning. This type of lightning often branches great distances along the upper level clouds around 30,000 feet. Most of the time, the branching features remain high above the surface. However, occasionally, a flash will propagate to the ground presenting a hazard to life and property. This emphasizes the need to remain indoors well after thunder is no longer heard.

Compare the number of points depicted in Figure 1 with the number of detected cloud to ground flashes showing in **Figure 2**.

It becomes very clear that there is much more data available with the intra-cloud lightning. In addition, the intra-cloud lightning is available in three dimensions such that vertical distributions of where lightning maxima occur can be obtained.

Unfortunately, no lightning detection network is perfect and there will always be flashes that show up on one system versus the other. Examining both Figures 1 and 2, there are flashes, for example, in Southeast Harris County, that appear in the National Network that do not appear in the Texas A&M Network. Similarly, there are flashes which appear in Northeast Harris County in the A&M Network that do not appear in the National Network. In practice both datasets must be used in concert to obtain the maximum amount of information possible. Researchers are diligently working to find the best possible way to incorporate both sets of data (with other data) into a single, timely product for use by forecasters.

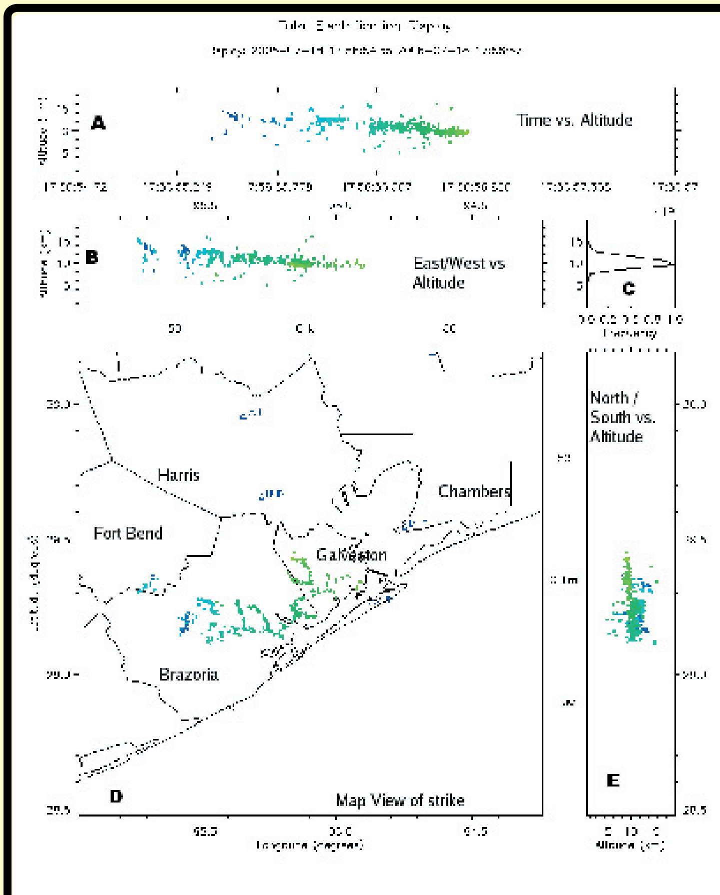


Figure 3 LDAR Data for a 1.5 second flash over Fort Bend, Brazoria, and Galveston counties on June 18, 2006.

How about in 3D?

As mentioned previously, LDAR data allows the display of lightning in three dimensions. While 3D data is only available to researchers at Texas A&M, we believe our scientifically curious readers might wish to look at an example flash which occurred over southeast Texas. Let's take a deeper look at a flash with long vertical extent. First it is necessary to break down a busy diagram.

Figure 3 provides a multi-dimensional view into the life of an "anvil crawler" flash. Box "A" in Figure 3 depicts a time vs. height view of the short time interval of nearly three seconds from 17:56:54.7 – 17:56:57.0 Coordinated Universal Time (12:56:54.7 pm to 12:56:57.0 pm Central Daylight Time.) Each dot in Box "A" depicts a detected lightning electromagnetic energy source. The source times are color coded such that the earliest detected sources are in dark blue transitioning to the latest sources in a light green. The first detected source was just after 17:56:55.3 at an altitude of 8km or 26,200 feet.

Next, look at the map-like plan-view in box "D". A geographically large flash starts from west central Brazoria County and branches all the way to eastern Galveston County above Texas City, Texas spanning a distance of 75km or nearly 50 miles.

Following the color coding, one can visualize the time-sequence of the large flash (blue to light blue to green to light green) as it branches eastward. Careful inspection also yields a second, simultaneous, unrelated flash over southern Fort Bend

County. Both of these flashes correlated with a cloud to ground discharges.

Imagine looking at a three dimensional box of the area from the south and projecting all sources viewed from the south onto the northern vertical wall of the box. Then, fold this wall down flat against the earth. This is what is depicted in the East/West vs. Altitude box "B". Similarly, viewing from the West of the area projecting onto the Eastern wall then folding down is covered by Box "E". Combining the data presented in "B" and "E", we can deduce that the lightning sources generally decreased in altitude going east and north although there are a few excursions to as low as 5km and as high as 16km. Finally, box "C" provides a histogram of the total number of sources vs. height. A strong peak is noted around 10km. This is due to the charging mechanisms of super cooled water and ice at temperatures found at that level.

Correlating Lightning with Other Data

After viewing all the different aspects of lightning data alone, it is time to compare the observations to other remote sensing techniques such as radar just as we do at the National Weather Service. Recalling the large geographic extent of the flash over Brazoria and Galveston Counties, what conditions exist in the atmosphere that might allow this?

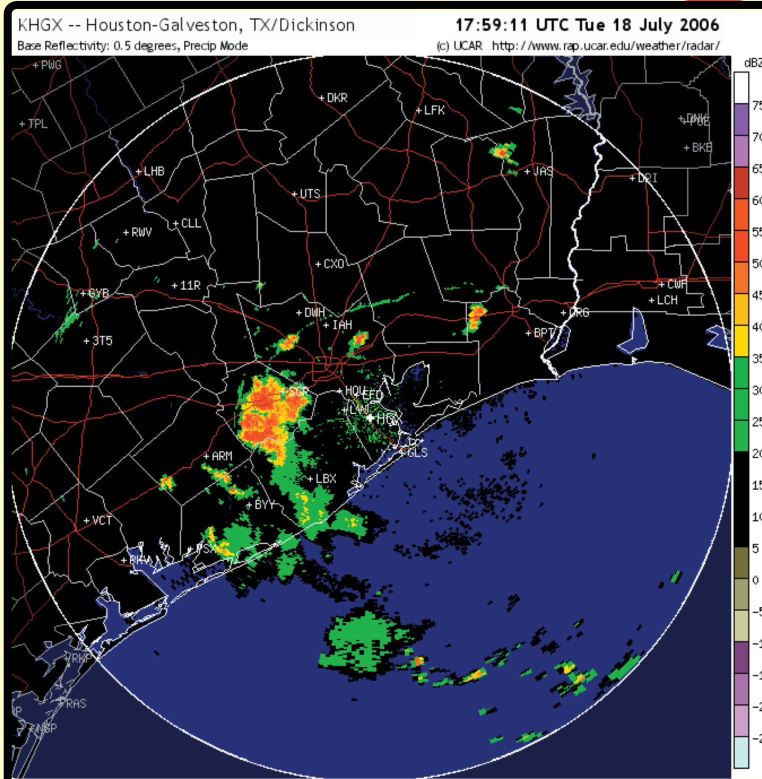


Figure 4 Base reflectivity from KHGX radar filtering all echoes less than 30dBz.

Figure 4 depicts base reflectivity of the Houston radar site scanning one half degree above the horizon at the time of the large flash. Some ground clutter is evident around the radar site in Dickinson, but nothing substantial suggesting a path for lightning is evident. Since the radar is scanning at the horizon, all echoes which appear are in the lowest levels (under 3000 feet on the map edges in Figure 4). However, the majority of the flash occurred around 30,000 feet. In order to see what is going on at the higher levels, we must take a look at greater radar tilt angles.

If we combine radar data for the many tilt angles that are received during each volume scan, a three dimensional radar representation is possible.

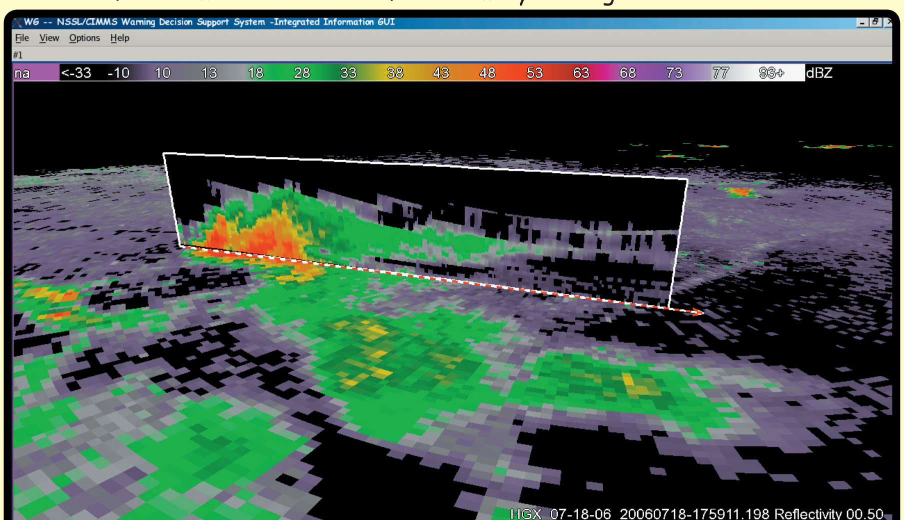


Figure 5 Angled, 3D aerial viewed base reflectivity image from KHGX radar filtering all echoes less than 30dBz.

Figure 5 represents an angled, 3D aerial view of radar data south of the thunderstorm complex. Compare the lack of echoes near Galveston at low levels which matches the radar imagery in Figure 4. Also note the descending nature of the green precipitation echoes from west to east and compare with the descending pattern in the LDAR data in Figure 3. Comparisons such as these are one way that scientists can gain confidence in the data and ensure that all systems are working as expected.

Conclusion

Lightning is an active area of meteorological research and while much has yet to be learned, data collected by sensor networks is already proving to be a useful complement to the many tools that meteorologists use to help provide timely warnings to help save lives. The Houston/Galveston National Weather Service Office is one of very few offices with access to intra-cloud lightning data and forecasters regularly use this data to issue more definitive short-term forecasts and warnings. We are fortunate to have a strong partnership with Texas A&M University, which allows us to use this cutting edge technology.

Galveston County Citizens Learn How To React And Respond To Disasters

By Colin Rizzo

In Galveston County local first responders prepare and respond to normal everyday emergencies. However, during a disaster, the number and scope of incidents can overwhelm conventional emergency services. To combat this problem the Galveston County Community Emergency Response Team (CERT) program was created. The CERT program is all-risk, all-hazard training for the general public. This valuable course is designed to help citizens protect themselves, their family, and their neighbors in an emergency situation.

The CERT concept was developed and implemented by the Los Angeles City Fire Department (LAFD) in 1985. The Whittier Narrows earthquake in 1987 underscored the area-wide threat of a major disaster in California. Further, it confirmed the need for training civilians to meet their immediate needs. As a result, the LAFD created the Disaster Preparedness Division with the purpose of training citizens and private and government employees. Currently there are thousands of CERT teams around the United States.

CERT is a positive and realistic approach to emergency and disaster situations where citizens may initially be on their own and their actions can make a difference. While people will respond to others in need without the training, one goal of the CERT program is to help them do so effectively and efficiently without placing themselves in unnecessary danger.

CERT continued

In the CERT training, citizens learn:

- The types of hazards most likely to affect your home and community
- The function of CERT and your role in the immediate response
- How to take steps to prepare for a disaster
- How to identify and reduce potential fire hazards in your home and workplace
- How to work as a team to apply basic fire suppression strategies, resources, and safety measures to extinguish a small fire
- How to apply techniques for opening airways, controlling bleeding and treating shock
- How to conduct triage under simulated conditions
- How to perform head-to-toe assessments
- How to select and set up a treatment area
- How to employ basic treatments for various wounds
- How to identify, plan and size-up requirements for potential search and rescue situations
- How to use safe techniques for debris removal and victim extrication
- The most common techniques for searching a structure
- Ways to protect rescuers during search and rescue

The CERT program helps train people to be better prepared to respond to emergency situations in their communities. When emergencies happen, CERT members can give critical support to first responders, provide immediate assistance to victims and organize spontaneous volunteers at a disaster site. CERT members can also help with non-emergency projects that help improve the safety of the community. The CERT course is taught in the community by a trained team of first responders and emergency managers from across the county. Training alongside these professionals not only allows CERT students to learn the needed skills but also provides the opportunity for the students to meet the emergency responders they may be assisting during a disaster situation.

Galveston County CERT will have close to 100 trained citizens by the end of the year. In 2008 the CERT program aims to more than double the number of participants, who complete the 20-plus hours of training to become a member of a CERT team.

If you are a Galveston County resident and would be interested in becoming a member of CERT or you would like more information on the Galveston County CERT program please contact the CERT coordinator at colin.rizzo@co.galveston.tx.us

Southeast Texas Skywarn

by Paul Lewis II

Another season of successful Skywarn training in Southeast Texas concluded this past July. Of the almost 650 people who attended the 19 classes, over 400 were new to the program. Three of the classes in Harris County were part of Community Emergency Response Team (CERT) training which averaged 50 trainees per class.

Since Skywarn can cover material that is entirely foreign to someone not familiar with severe weather, the classes are designed to introduce the basics of spotting techniques. The training does cover advanced spotting techniques; although, advanced Skywarn classes are available upon request.

If you have a general interest in weather and want to provide a public service in your community, you are encouraged to join the Skywarn program. The classes vary slightly from office to office but cover the following topics:

- Basics of thunderstorm development
- Fundamentals of storm structure
- Identifying potential severe weather features
- Information to report
- How to report information
- Basic severe weather safety

Skywarn spotters include police and fire personnel, dispatchers, EMS workers, public utility workers, and other concerned private citizens. Individuals affiliated with hospitals, schools, churches, nursing homes, or who have a responsibility for protecting others are encouraged to become a spotter. Anyone who has attended Skywarn training in the past are invited to repeat the class on a regular basis.

Nationwide nearly 280,000 trained severe weather spotters participate in the Skywarn program. These volunteers provide timely and accurate severe weather reports to warning meteorologists in the National Weather Service. The reports help verify and pinpoint data seen on the WSR 88-D radar. The efforts of volunteer Skywarn spotters coupled with satellite, radar, and other sensor data has led to more timely and accurate warnings for tornadoes, severe thunderstorms, and flash flooding. Four main roles the volunteer spotter provides during severe weather include validating severe storm warnings, providing vital information for the National Weather Service, providing a link to the community in the warning process, and aiding in local weather hazard awareness.

Skywarn classes are available through all 122 National Weather Service forecast offices and concerned citizens can initiate a class through their local office's Warning Coordination Meteorologist. In the 23 counties of Southeast Texas served by WFO Houston-Galveston, the classes are normally organized with help by a community's local Emergency Management Coordinator. Since the peak of the severe weather season for Southeast Texas occurs in March, April, and May, Skywarn classes are usually held in the late winter and spring. However, the classes can be held at anytime as severe weather is possible throughout the year. The classes are free and typically range between two to three hours in length.

For more information about taking a Skywarn Class offered by the Houston-Galveston office of the National Weather Service, contact Gene Hafele at Gene.Hafele@noaa.gov or call 281-337-5074. A schedule of classes available is kept current at www.srh.noaa.gov/hgx – look for the "Skywarn" link in the "Weather Safety" section on the left panel of the homepage. Nationwide contacts for setting up Skywarn classes can be obtained through the Internet at http://www.weather.gov/skywarn.

From the Advanced Spotter Slide Set, Supercell Thunderstorm Photo by Dr. Howard Bluestein

Erin and Humberto - Our Two Tropical Cyclones in 2007

Figure 1. Hurricane Humberto caused wind damage to a Food Mart/ Gas Station on High Island. Note the awning collapse at a gas station in the lower right, wooden debris in the center and fences blown down in the upper left. Photo is courtesy of the Galveston County Office of Emergency Management.

Although the upper Texas coast did not experience a major hurricane during the 2007 Hurricane Season, the area was visited by one tropical storm and one hurricane. Tropical Storm Erin made landfall along the central Texas coast in the Port Aransas area on the morning of August 16th. Erin caused significant flooding in and around portions of the Houston area resulting in a disaster declaration for Harris County. Hurricane Humberto made landfall along the upper Texas coast just east of High Island early on September 13th and produced wind damage across the High Island area and far eastern Chambers County.

Erin

Tropical Storm Erin made landfall along the middle Texas coast around the Port Aransas area as a minimal tropical storm early on August 16th. A southeast to northwest feeder band developed around 10:00 AM CDT from Katy to the western end of Galveston Island and moved slowly eastward to a line from Clear Lake to Humble by 5:00 PM CDT. Training of the cells along this southeast to northwest line combined with rainfall rates upwards of 4 to 5 inches per hour resulted in major street flooding and minor flooding of several bayous in Harris County. Widespread major street flooding occurred throughout the afternoon across the eastern half of Harris County with SH 288 impassable near the 610 south loop, I-10 east closed at Wayside, and numerous secondary roads closed along I-45 S, SH 225, and I-10 E. Flooding of homes and businesses occurred in the La Porte area where some structures were inundated with more than a foot of water. House flooding also occurred in the Pasadena area. There were also at least a dozen schools that received water damage. In WFO Houston/Galveston's area, there were three deaths from Erin. Two fatalities were from a supermarket roof collapse under the weight of the heavy rainfall, and the third fatality was from a vehicle that drove into a flooded retention pond.

Humberto

Humberto was the first hurricane to make landfall in the United States since Wilma struck South Florida in October 2005 and the first hurricane to make landfall along the Texas coast since Rita struck the Texas-Louisiana area in September 2005. Humberto is notable for its exceptionally rapid intensification near the coast of Texas from a tropical depression into a hurricane within 19 hours. Humberto caused wind damage across far eastern Chambers County and the High Island area of Galveston County (see Figure 1). Maximum rainfall totals from Humberto ranged from around 2 inches to over 14 inches mainly along and east of a line from Freeport to the Hitchcock-Texas City area to around Winnie. In WFO Houston/Galveston's area, there were no injuries or deaths from Humberto.

This hurricane season was yet another reminder that it does not take a major hurricane strike to make the year a bad one for portions of Southeast Texas. The majority of us will call this a quiet year. Those affected by Erin or Humberto will disagree. This season reminds all of us living across Southeast Texas that it is important to have a hurricane plan in place before the season begins. Make sure you have the supplies needed to ride out a storm. Know your evacuation route you will take when you must leave your home to be safe. Make sure you have the necessary insurance coverage for your home and/or business. Before you know it, the 2008 hurricane season will be here.

2007 Atlantic Hurricane Season Summary

Andrea
The 2007 Atlantic hurricane season got off to an early start when Subtropical Storm Andrea formed in early May. Andrea was the first pre-season storm to develop since Tropical Storm Ana in April 2003. Additionally, the storm was the first Atlantic named storm in May since Tropical Storm Arlene in 1981.

Andrea originated from a strong extratropical low pressure system that had formed off the coast of the Carolinas on May 6th, and gradually acquired some tropical characteristics over the next few days. Andrea became a subtropical storm while centered about 150 miles east of Jacksonville, Florida early on the 9th. Northerly wind shear and dry air caused Andrea to weaken below storm strength early on the 10th and to degenerate into a remnant low on the 11th. The remnant low later became absorbed by a front on the 14th.

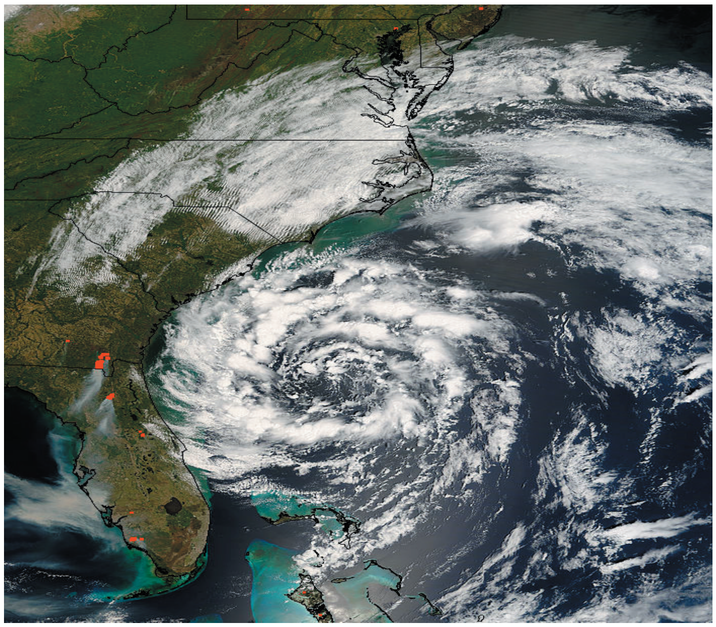


Figure 1. Terra satellite image of Subtropical Storm Andrea off the Southeastern U.S. coast at 1600 UTC on May 8, 2007.

Barry
Barry was a short-lived June tropical storm that brought beneficial rains to Florida. There were three tornadoes associated with Barry.

Tropical Storm Barry formed from a tropical wave that spawned a broad area of low pressure near the eastern coast of the Yucatan Peninsula on May 30th. The low moved north-northeastward on the 31st and thunderstorm activity gradually became more concentrated near the center early on June 1st. The organization continued to improve and a tropical depression formed on the 1st just northwest of the western tip of Cuba. Six hours later, the depression strengthened into a tropical storm. Barry reached a peak intensity of 60 mph in the early evening on the 1st while centered about 150 miles west-southwest of the Dry Tortugas. Thereafter, strong upper-level southwesterly winds resulted in weakening and Barry made landfall in the Tampa Bay area as a tropical depression early on the 2nd. Barry quickly lost tropical characteristics and became an extratropical low while located over eastern Georgia early on the 3rd. The exratropical low then intensified and moved northeastward along the east coast of the United States. The low was absorbed by a larger extratropical system near the St. Lawrence River on June 5th. There were no reports of deaths or significant damage associated with Barry.

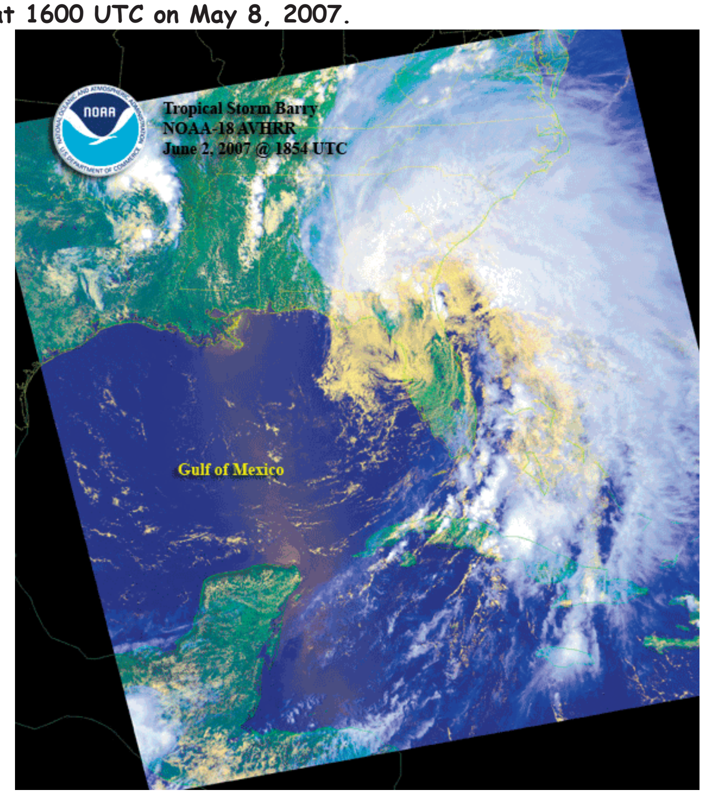


Figure 2. NOAA satellite image of Tropical Storm Barry moving inland across Florida at 1854 UTC on June 2, 2007.

Chantal

Tropical Storm Chantal was the only tropical cyclone to form during July which matches the long-term average for the month. On average, the third tropical storm of the year forms around August 12th.

Chantal formed from a low pressure system of non-tropical origin about 240 miles north-northwest of Bermuda early on July 31st. It moved north-northeastward to northeastward at an increasing forward speed and reached its peak intensity of 50 mph later that day. Chantal was short-lived, and it lost its tropical characteristics by early on August 1st as it approached southeastern Newfoundland.

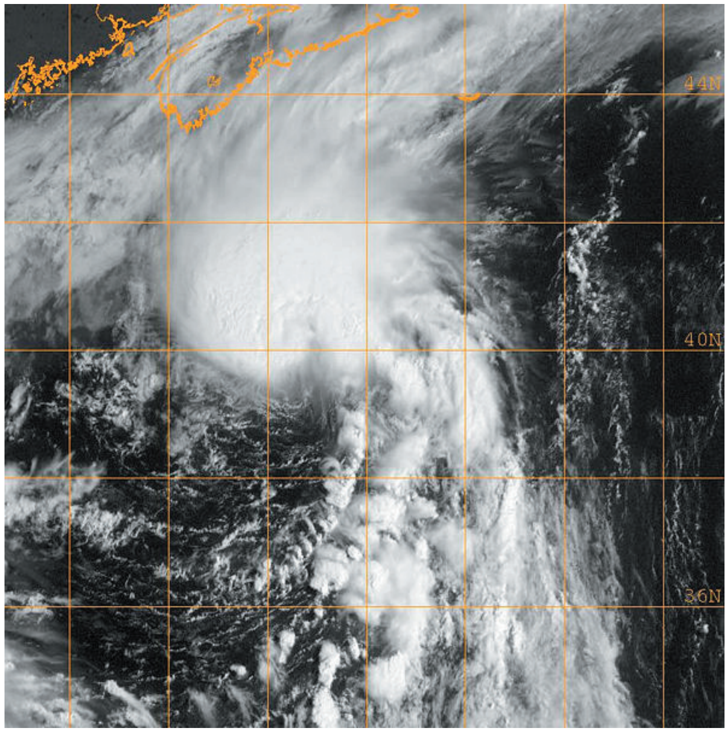


Figure 3. NOAA satellite image of Tropical Storm Chantal south of Nova Scotia on July 31, 2007.

Dean

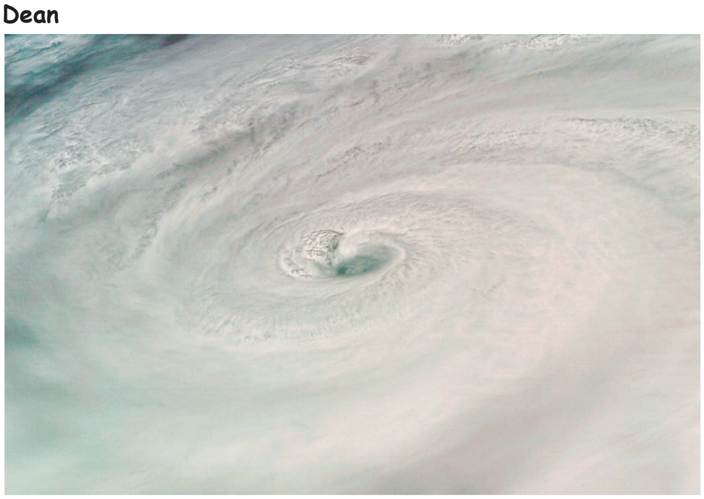


Figure 4. Photograph of Hurricane Dean in the central Caribbean Sea at Category 4 intensity (150 mph winds) taken from the Space Shuttle Endeavor around Noon CDT on August 18, 2007.

Dean, which made landfall as a Category Five hurricane on the east coast of the Yucatan Peninsula near Costa Maya, Mexico, formed from a tropical wave in the far eastern Atlantic on August 13th. The cyclone became a tropical storm the next day about 1500 miles east of the Lesser Antilles and continued to strengthen as it moved just north of due west. Dean became a hurricane on the 16th about 500 miles east of Barbados, and continued to strengthen as it moved closer to the Lesser Antilles. The center of Dean passed between St. Lucia and Martinique during the morning of the 17th, with the northern eyewall passing over Martinique with Category Two sustained winds of about 100 mph. After clearing the Leeward Islands, Dean became a major hurricane later that day, and its winds reached 150 mph early the next day about 700 miles east-southeast of Jamaica. Continuing on a track just north of west, the center of Dean passed about 25 miles south of the south coast of Jamaica on the 19th. At that time, Dean was a Category Four hurricane with maximum winds of 145 mph, although these strongest winds likely remained just offshore.

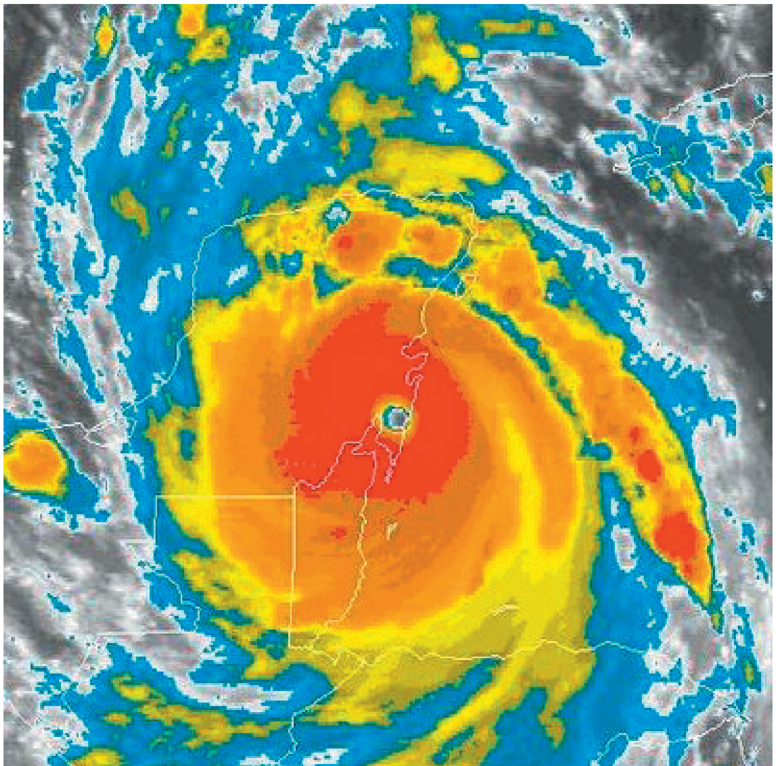


Figure 5. NOAA Satellite image of Category 5 Hurricane Dean making landfall along the Yucatan Peninsula on August 27, 2007.

Dean's heading remained remarkably constant and it continued over the deep warm waters of the northwestern Caribbean. Dean became a Category Five hurricane very early on the 21st about 200 miles east of Chetumal, Mexico, and reached its peak intensity of 165 mph, with a minimum pressure of 906 mb, just before landfall near Costa Maya on the Yucatan Peninsula. Dean weakened to a Category One hurricane during its traverse of the Yucatan, and emerged into the Bay of Campeche late on the 21st. Dean strengthened to a Category Two hurricane, with winds of about 100 mph, just before making its final landfall near midday on the 22nd about 40 miles south of Tuxpan, Mexico. The cyclone dissipated early on the 23rd over the high terrain of central Mexico.

Preliminary reports from various media sources indicate that Dean was responsible for roughly 40 deaths across the Caribbean, with the largest tolls in Mexico and Haiti. Official totals are not yet available.

Erin

Erin formed in association with a tropical wave early on August 15th over the Gulf of Mexico about 450 miles east-southeast of Brownsville, Texas. Moving northwestward, the cyclone became a tropical storm with maximum winds of 40 mph later that day while centered about 200 miles east of Brownsville, but Erin did not strengthen any further over the gulf.

The center of circulation made landfall near Lamar, Texas on the morning of the 16th, and by that time Erin had weakened to a tropical depression with maximum winds of 35 mph. The depression continued northwestward and inland during the 16th and 17th and turned northward over west Texas on the 18th. Surviving remarkably over land, the cyclone entered southwestern Oklahoma very early on the 19th. While moving northeastward over Oklahoma that morning, Erin produced sustained winds of tropical storm force and gusts to hurricane force in isolated locations. Post-storm analysis of this unusual event is ongoing to determine the strength and status of Erin over Oklahoma. The cyclone dissipated later on the 19th over northeastern Oklahoma, but remnant moisture continued northeastward into Missouri. Overall, Erin and its remnants brought heavy rains to portions of southeastern, south-central and western Texas, Oklahoma, and southern Missouri. Storm-total rainfall amounts of 3-7 inches were common in many of these areas...with some locations receiving more than 10 inches.

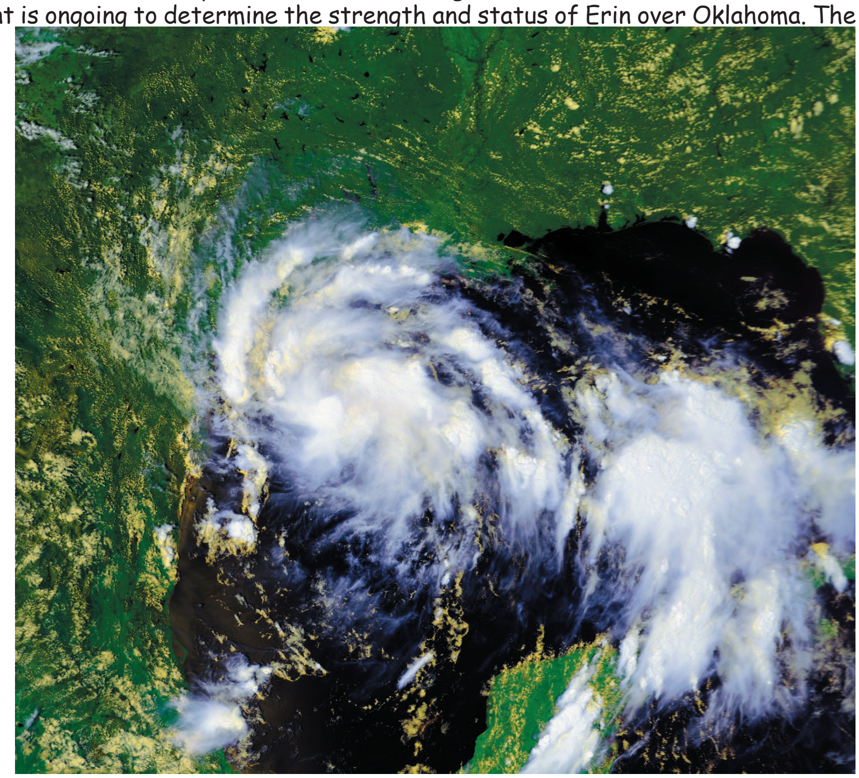


Figure 6. NOAA satellite image of Tropical Storm Erin centered off the Texas coast at 1939 UTC on August 15, 2007.

Felix

Felix was the sixth named storm, second hurricane, and second Category 5 hurricane of the season. Felix made landfall just south of the border between Nicaragua and Honduras in a region historically known as the Mosquito Coast. When Felix reached category 5 status, 2007 became one of four recorded Atlantic seasons that have had more than one category 5 storm; the others being 1960, 1961, and 2005, and the only time two Atlantic hurricanes have ever made landfall at Category 5 strength in the same season.

Felix formed from a tropical wave that moved westward from the coast of Africa on August 24th. The associated shower activity began showing signs of organization on the 28th, and the system developed into a tropical depression on the 31st

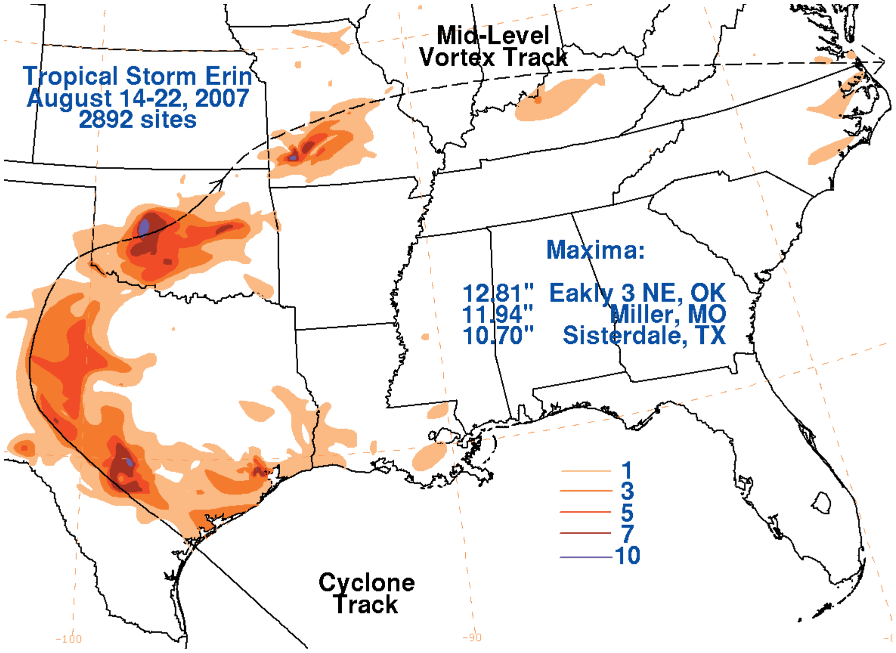


Figure 7. Storm total rainfall graphic for Tropical Storm Erin (from the Hydrometeorological Prediction Center).

Figure 8. International Space Station photograph of Hurricane Felix at 1139 UTC on September 3, 2007.

about 100 miles southeast of Barbados. The depression intensified into a tropical storm as it passed near Grenada and The Grenadines early on September 1st. Felix moved westward and intensified into a hurricane later that day over the southeastern Caribbean Sea. Rapid intensification followed, and Felix became a Category 5 hurricane late on the 2nd about 390 miles southeast of Kingston, Jamaica. The hurricane weakened to Category 3 status on the 3rd as it underwent an eyewall replacement cycle. It then re-intensified to Category 5 status just before landfall on the 4th near Punta Gorda, Nicaragua. Felix weakened quickly after landfall and became a broad area of low pressure over Central America on the 5th. The remnants of Felix moved into the Pacific Ocean where they dissipated on the 9th.

Media reports indicate that Felix was responsible for 101 deaths in Nicaragua and Honduras, with more than 100 others reported missing as of this writing. The hurricane caused major damages in the landfall area in northeastern Nicaragua, with numerous buildings damaged or destroyed along the coast near and north of Puerto Cabezas. Additional damages occurred due to inland flooding over portions of Central America. Felix also produced minor damage on Grenada, Aruba, Bonaire and Curacao.

Gabrielle

Gabrielle developed from a non-tropical low pressure area that formed on September 3rd. During the next several days this low moved slowly eastward between the southeast coast of the United States and Bermuda. The low became better defined late on the 7th and became a subtropical storm early on the 8th about 425 miles southeast of Cape Hatteras, North Carolina. As Gabrielle moved northwestward it acquired tropical characteristics and became a tropical storm later that day. Gabrielle strengthened

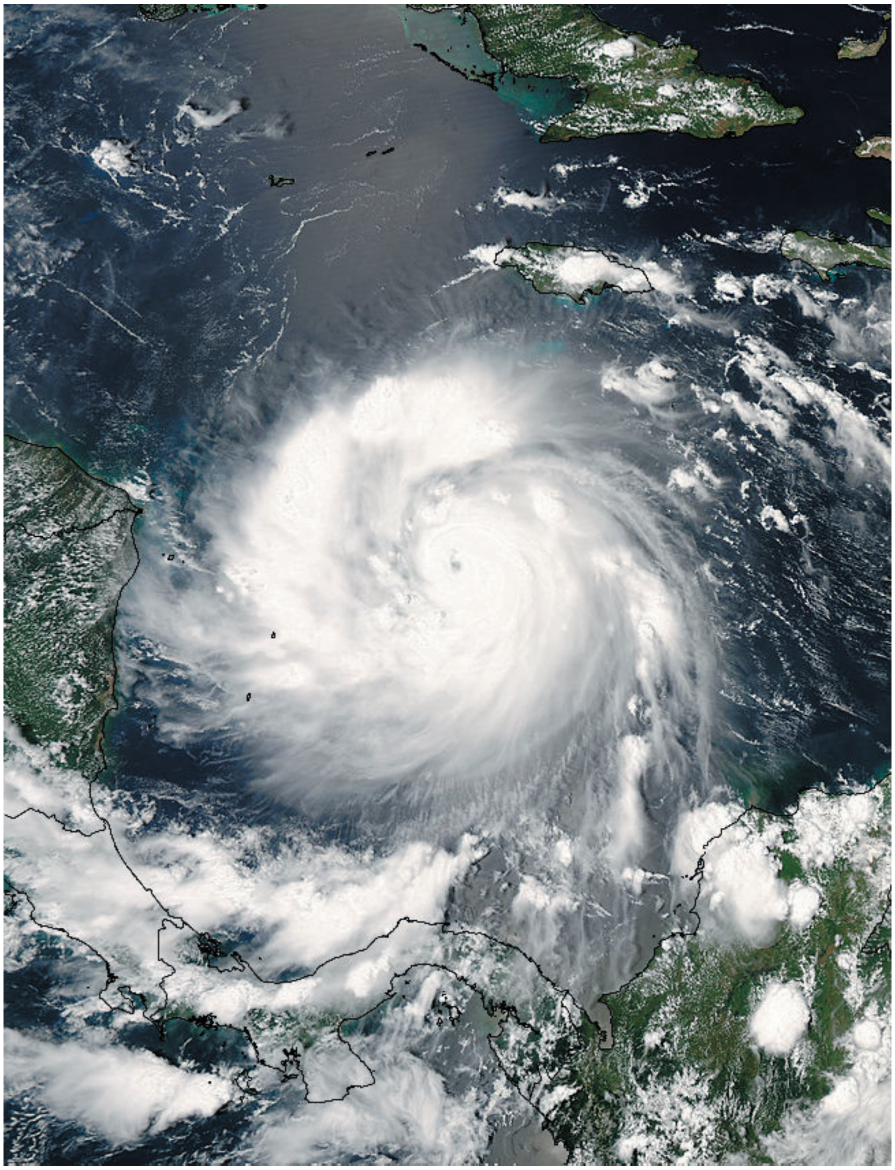


Figure 9. MODIS satellite image of Hurricane Felix approaching Central America at 1830 UTC on September 3, 2007.

early on the 9th and reached a peak intensity of 50 mph while located just south-southeast of Cape Lookout, North Carolina. A few hours later, the tropical storm made landfall along the Cape Lookout National Seashore. After landfall, Gabrielle turned northeastward and weakened due to land interaction and northerly wind shear.

Gabrielle moved back over the Atlantic waters, exiting the North Carolina coast near Kill Devil Hills early on the 10th, and then weakened to a tropical depression a few hours later. The next day the circulation became ill-defined and the depression dissipated about 300 miles south of Nova Scotia. Heavy rainfall associated with Gabrielle was confined to a rather small area near Cape Lookout, and overall the impacts from Gabrielle in eastern North Carolina were minimal.

Humberto

Humberto formed from the remnants of a frontal trough that moved offshore of South Florida on September 5th. The western end of the trough moved slowly westward for the next several days, occasionally producing disorganized thunderstorm activity, and was located in the northwestern Gulf of Mexico on the 11th. On the morning of the 12th, convection rapidly increased near the trough and became organized enough to become a depression by 4:00 AM CDT about 120 miles south of Galveston, Texas. Based on a ship report and radar data, the depression quickly became Tropical Storm Humberto just three hours later. Intense thunderstorm activity in well-defined spiral bands continued near Humberto, and the small tropical cyclone continued to rapidly strengthen just offshore of the upper Texas coast. Later that day, the system turned to the north-northeast. Based on radar data, Humberto became a hurricane about 20 miles south of High Island, Texas at 11:00 PM CDT and reached its peak intensity of 90 mph as it made landfall just east of High Island in McFaddin National Wildlife Refuge around 2:00 AM on the 13th. Humberto moved over extreme southeastern Texas and southwestern Louisiana and weakened to a tropical storm later on the 13th about 75 miles west-northwest of Lafayette, Louisiana. The storm soon became a tropical depression near Alexandria,

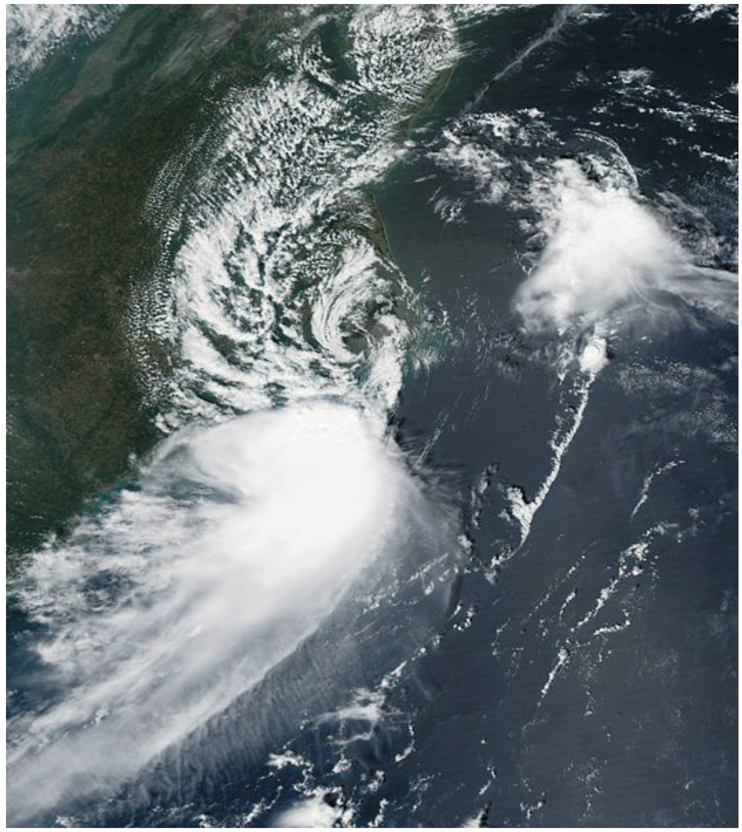


Figure 10. MODIS satellite image of Tropical Storm Gabrielle at 1800 UTC on September 9, 2007.

Louisiana and dissipated over central Mississippi on the 14th. The media reported one fatality directly attributable to Humberto and preliminary damage figures of around $50 million. Humberto will be noted for its exceptionally rapid intensification near the coast of Texas from a tropical depression into a hurricane within 19 hours.

Ingrid

Ingrid developed from a large tropical wave that exited the coast of Africa on September 6th. At that time, strong easterly shear was inhibiting development over the eastern Atlantic, and it was not until the 9th that a broad area of low pressure developed along the wave axis about midway between Africa and the Lesser Antilles. Environmental conditions gradually became more favorable

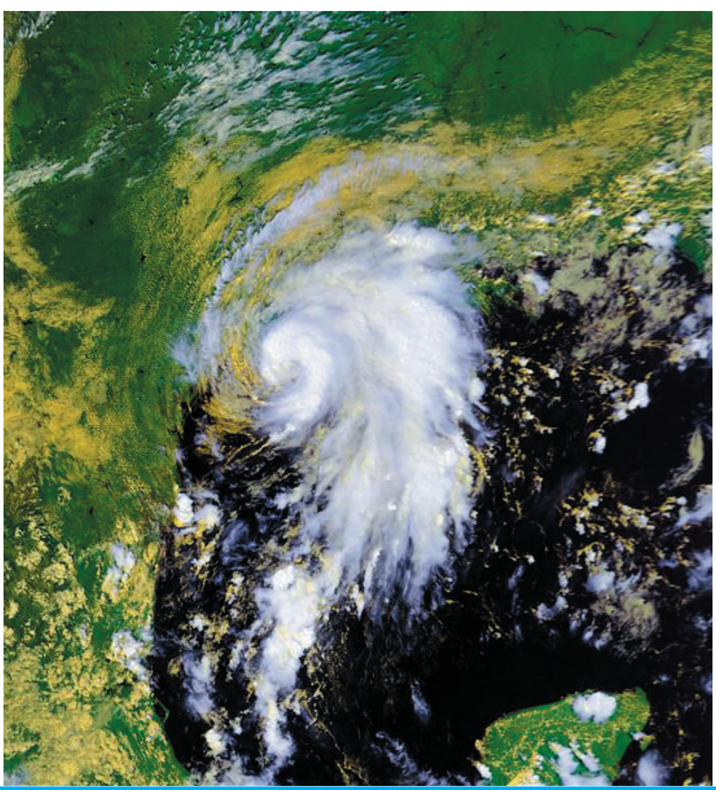


Figure 11. NOAA Satellite image of Tropical Storm Humberto at 1946 UTC on September 12, 2007.

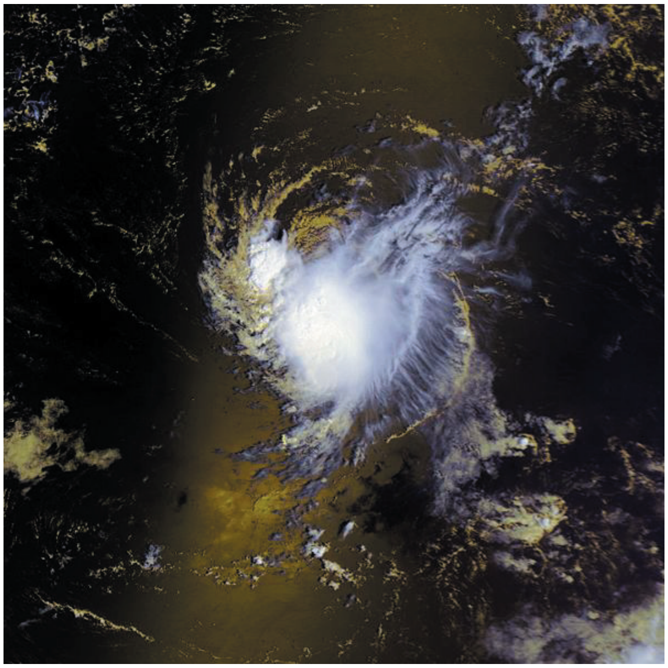


Figure 12. NOAA Satellite image of Tropical Storm Ingrid at 1310 UTC on September 14, 2007.

for development during the next several days, and thunderstorm activity became persistent near the low on the 11th. By the morning of the 12th, when the low was centered about 1125 miles east of the Lesser Antilles, the system finally acquired sufficient organization to be designated as a tropical depression. The depression moved on a general west-northwestward track within weak steering flow along the southern periphery of a mid-tropospheric ridge. Despite moderate westerly wind shear, the cyclone became a tropical storm early on the 14th while centered about 850 miles east of the Lesser Antilles, and reached its maximum intensity of 45 mph about 12 hours later. The shear then increased and Ingrid weakened to a tropical depression on the 15th. The strong shear persisted and Ingrid degenerated to a broad remnant low early on the 17th about 115 miles east-northeast of Antigua.

Tropical Depression Ten

Tropical Depression Ten formed in part from a decaying frontal boundary that became stationary off the southeast U.S. coast on September 17th. On the 18th, an upper-level low formed over Florida and the eastern Gulf of Mexico, and a westward-moving tropical wave was moving over the Bahamas. These features combined to produce a weak area of low pressure over the western Bahamas later that day. The system moved slowly westward over Florida and into the eastern gulf during the 19th-20th. On the 21st, thunderstorm activity increased near the surface low, and a subtropical depression formed that day about 45 miles southwest of Apalachicola, Florida. The system gained tropical characteristics later that day and became a tropical depression as it moved northwestward, but its maximum winds never exceeded 35 mph. The depression made landfall late on the 21st near Fort Walton Beach, Florida, and it dissipated a few hours later. Impacts in the areas along the path of the depression were minimal.

Jerry

Jerry formed from a non-tropical low over the north-central Atlantic, about 1060 miles west of the Azores early on September 23rd. It began as a subtropical depression since the cyclone was well-involved with an upper-level low. Moving slowly northward, the system strengthened slightly later that day, becoming a subtropical storm with maximum winds of 40 mph. Jerry acquired tropical characteristics very early on the 24th as the thunderstorm activity increased near the center, but it never gained any more strength. Jerry weakened back to a depression later that day as it accelerated toward the northeast ahead of an approaching cold front, and it dissipated near the end of that day when it lost its closed circulation. By then the system was about 800 miles northwest of the Azores.

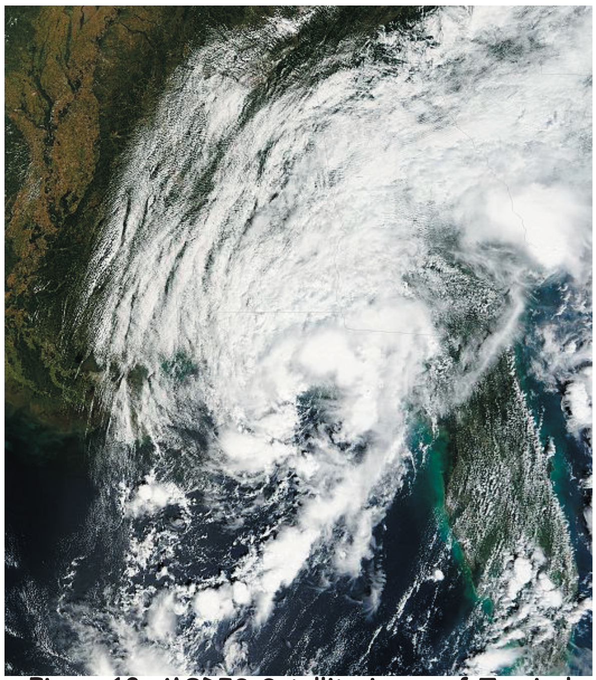


Figure 13. MODIS Satellite image of Tropical Depression Ten at 1650 UTC on September 21, 2007.

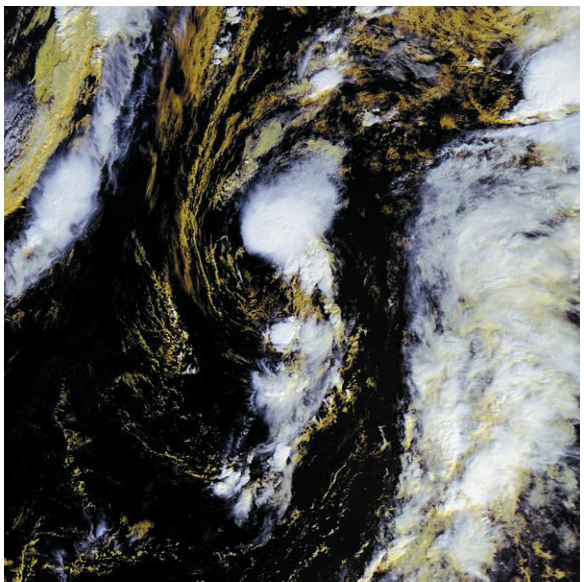


Figure 14. NOAA satellite image of Tropical Storm Jerry at 1259 UTC on September 24, 2007.

Karen

Karen formed early on September 25th over the eastern tropical Atlantic from a large area of disturbed weather associated with a tropical wave that moved off the coast of Africa several days earlier. After formation, the cyclone quickly strengthened into a tropical storm. Karen moved mostly west-northwestward over the tropical Atlantic and strengthened to near hurricane intensity on the 26th while centered about 1200 miles east of the southern Windward Islands. A little later that day, however, southwesterly vertical wind shear caused

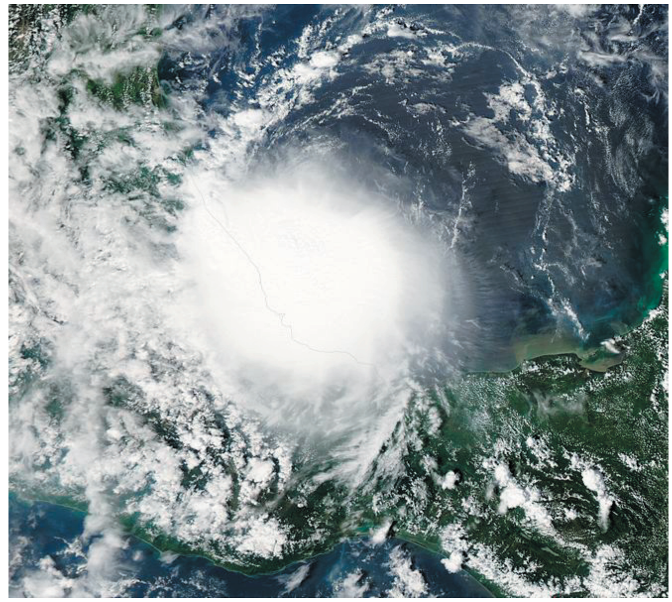


Figure 15. NOAA Satellite image of Tropical Storm Karen at 1220 UTC on September 26, 2007.

Karen to begin weakening. As the shear increased over the next couple of days, the cyclone continued to become less organized. Karen eventually weakened to a depression on the 29th and dissipated later that day about 500 miles east of the Leeward Islands.

Lorenzo

Lorenzo formed from a tropical wave, developing into a tropical depression on September 25th about 190 miles east of Tampico, Mexico. The depression meandered in the western Gulf of Mexico without development the next day, but abruptly strengthened on the 27th, becoming a tropical storm about 130 miles east-southeast of Tuxpan. Lorenzo continued to strengthen as it moved westward, becoming a hurricane very early on the 28th. Lorenzo's peak winds reached 80 mph before weakening slightly just prior to making landfall with 75 mph winds early on the 28th south of Tuxpan. Lorenzo weakened rapidly and dissipated later that day. Media reports indicate that three persons were killed in a mudslide in the state of Puebla, and that there was roof damage to structures in the town of Nautla.

Melissa

Melissa formed from a tropical wave that left the coast of Africa on September 26th. An area of low pressure formed the next day in association with the wave near the Cape Verde Islands. Thunderstorm activity with the low abruptly increased early on the 28th, and the system became a tropical depression later that day about 120 miles west-southwest of the southernmost Cape Verde Islands. The depression strengthened slightly while inching westward, and it became a tropical storm early on the 29th. After reaching its peak intensity of 45 mph late that day, the storm weakened within an environment of increasing westerly wind shear, while moving a little faster toward the west-northwest. It again became a depression early on the 30th. Thunderstorm activity then became intermittent, and later that day the depression degenerated to a remnant low about 550 miles west of the Cape Verde Islands.

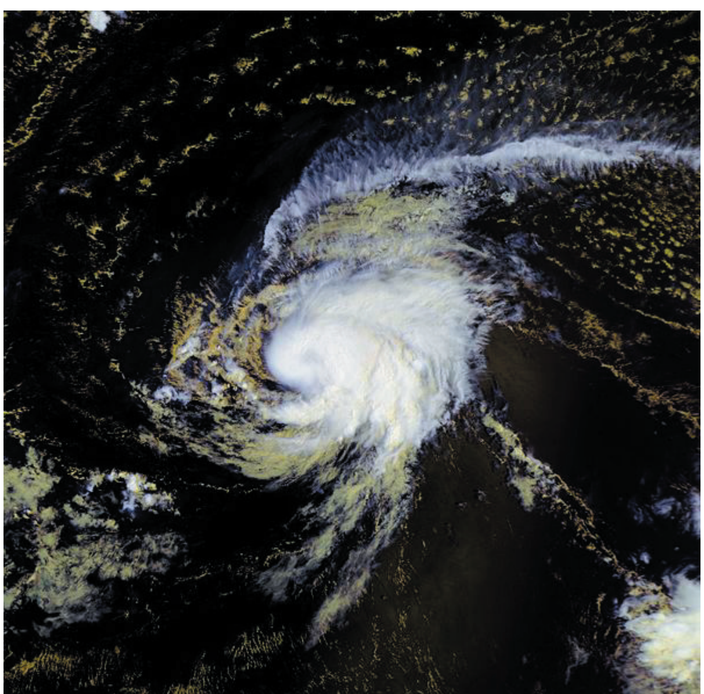


Figure 16. MODIS satellite image of Hurricane Lorenzo at 1920 UTC on September 27, 2007.

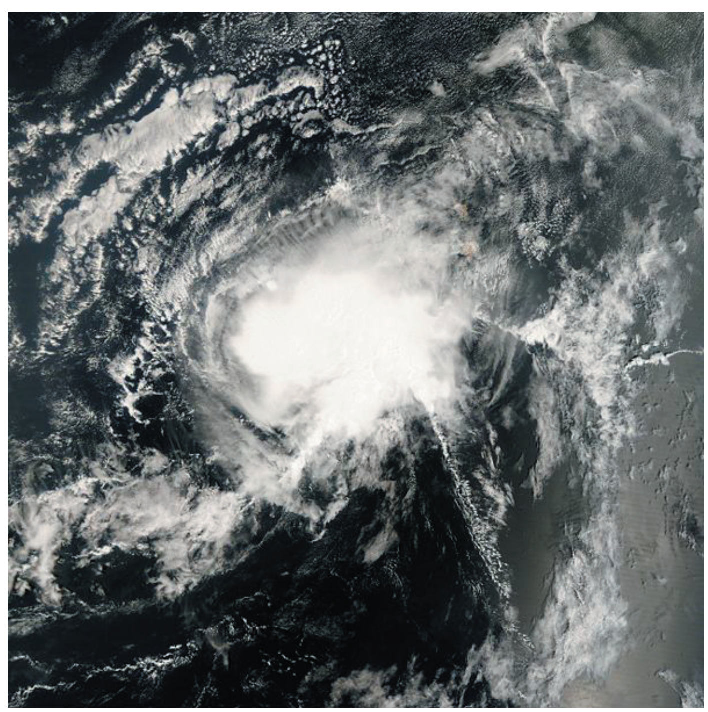


Figure 17. NOAA satellite image of Tropical Depression Fourteen, which later became Tropical Storm Melissa, taken at 1200 UTC on September 28, 2007.

Noel

Tropical Storm Noel formed from a tropical wave that departed the west coast of Africa on October 16th. As this wave approached the Lesser Antilles, it began to interact with an upper-level trough located near Puerto Rico. This interaction lead to the formation of a broad surface low pressure area on the 23rd, about 150 miles east-northeast of the northern Leeward Islands. After forming, the low moved slowly westward to west-southwestward during the next couple of days. Strong upper-level westerly winds that initially inhibited additional development of the low decreased on the 27th. This resulted in the formation of a tropical depression early on the 28th, about 200 miles south of Port-au-Prince, Haiti. The depression turned northwestward and strengthened to a tropical storm shortly thereafter. The maximum winds increased to 60 mph before Noel made landfall along the south coast of Haiti early on the 29th. The low-level circulation of Noel became disrupted over Haiti and the center reformed near the northwestern coast of Hispaniola a few hours later. After the center reformed, Noel tracked westward and made another landfall in eastern Cuba early on the 30th. Noel spent a little more than 24 hours over eastern Cuba before emerging over the Atlantic waters on the 31st. At the month`s end, Noel was centered between Cuba and the Bahamas, about 160 miles south-southwest of Nassau. Convection greatly increased early on November 1st, though initially the center remained to the southwest of the large area of thunderstorms. Noel passed over the Bahamian island of New Providence near the city of Nassau and then accelerated northeastward in the southwesterly flow ahead of an approaching trough. The cyclone maintained a large, round area of deep convection with well-defined outflow, and an eye feature became evident on satellite imagery. Based on reports from Hurricane Hunters, Noel was upgraded to a hurricane early on the 2nd about 180 miles north-northeast of Nassau. Its convection began to wane as it moved through progressively cooler waters, and as it lost tropical characteristics its wind field expanded. By late on the 2nd, the inner core had substantially diminished, and it began transitioning into an extratropical cyclone. Early on the 3rd, the increasingly extratropical cyclone attained winds of 85 mph, and it gradually turned to the north-northeast. As the center of Noel approached Nova Scotia, its large circulation produced strong winds across all of Atlantic Canada and New England, and on the 4th it tracked across Nova Scotia and New Brunswick. The extratropical low then continued to the northeast and made landfall over southwest Greenland on the afternoon of the 5th, bringing tropical storm force winds to the area. The center dissipated over Greenland later that night. While its lowest barometric pressure as a tropical system was 980 mb, on November 4th, while located near Labrador, it registered a minimal pressure of 966 mb.

Noel caused at least 148 deaths along its path, primarily in Hispaniola, due to flooding and mudslides. Noel was the deadliest cyclone of the 2007 Atlantic season. U.S. damage from Noel included at least $3 million in beach erosion along the Florida east coast, downed power lines along the outer banks of North Carolina and across portions of New England and at least $1 million damage from winds and heavy rainfall in Nova Scotia and Quebec.

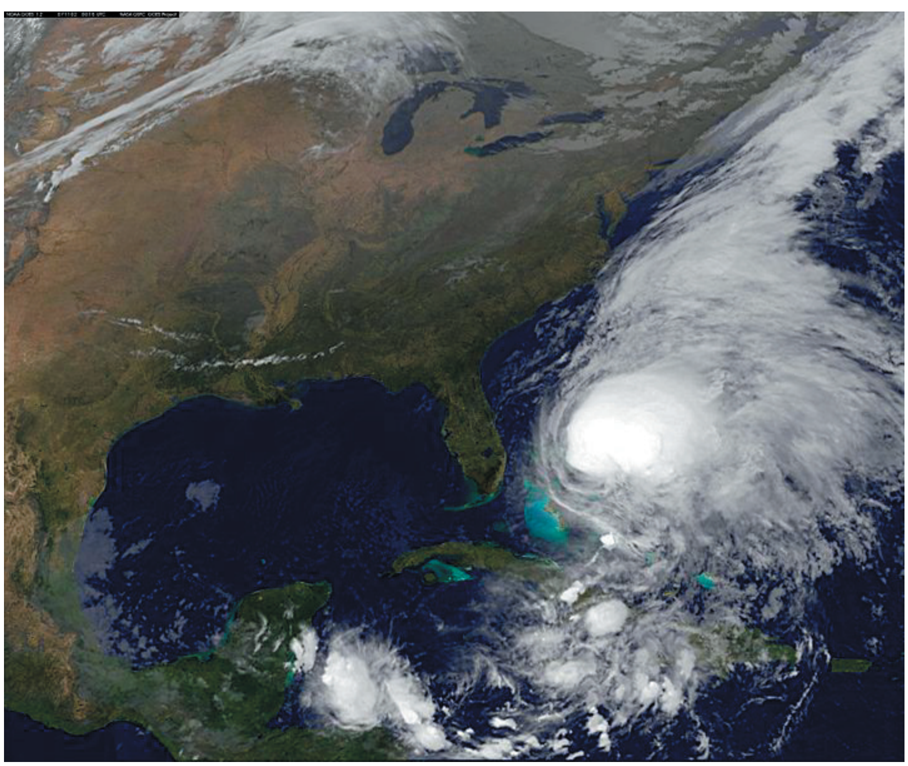


Figure 18. NOAA satellite image of Hurricane Noel at 0015 UTC on November 2, 2007.

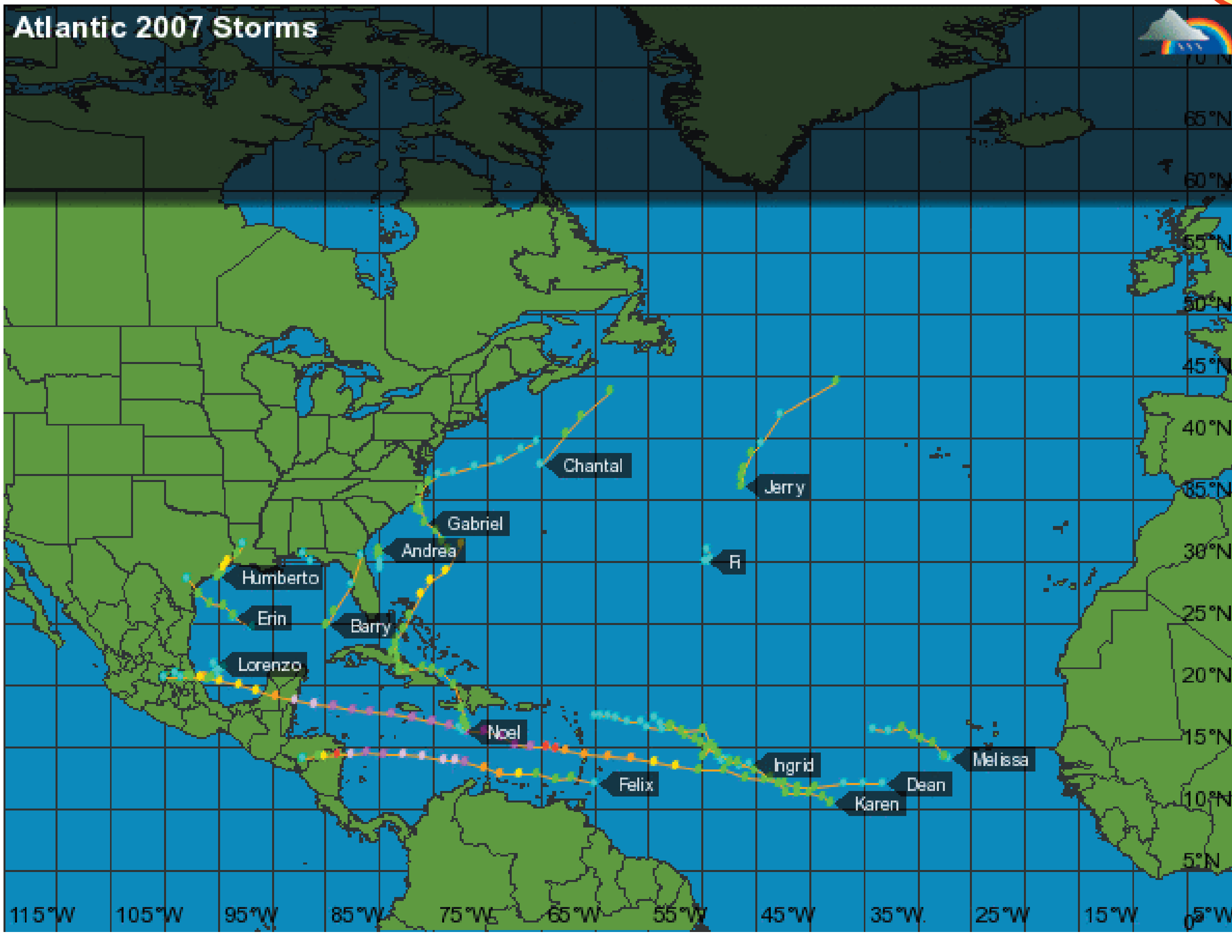


Figure 18. Track map of the 2007 Season (from Weather Underground).

2007 Hurricane Season Summary Table (data is preliminary and subject to change)			
Name	Dates	Max Wind (mph)	Minimum Pressure (mb)
Andrea (STS)	May 9-11	45	1003
Barry (TS)	June 2	50	997
Chantal (TS)	July 31 - August 1	50	994
Dean (H)	August 13-23	165	906
Erin (TS)	August 15-16	40	1003
Felix (H)	September 1-5	165	929
Gabrielle (TS)	September 8-11	50	1004
Ingrid (TS)	September 12-17	45	1002
Humberto (H)	September 12-13	90	985
Jerry (TS)	September 23-25	45	1000
Karen (TS)	September 25-29	70	990
Lorenzo (H)	September 26-28	80	990
Melissa (TS)	September 28-30	45	1003
Noel (H)	October 28 - November 2	80	980
Note - dates based on Coordinated Universal Time (UTC) / STS=Subtropical Storm / TS=Tropical Storm / H=Hurricane			

Winter Safety Rules

Although rare in southeast Texas, winter weather does occasionally occur. January is the month when snow, sleet, or freezing rain is most likely to be observed; yet, winter weather conditions can occur at anytime during the winter and early spring months. Also, people traveling into other parts of the country will likely encounter winter weather harsher than what occurs along the upper Texas Gulf coast. The leading cause of death during winter storms is transportation accidents. Hypothermia and frostbite are other dangers from very cold winter temperatures. The Houston/Galveston National Weather Service Office would like to review some important safety information to help you and your family to prepare for winter weather.

- Limit travel during periods of winter weather. Bridges, overpasses, and elevated roadways are especially vulnerable to ice and snow conditions given the lack of ground insulation under these structures.
- Before the onset of winter precipitation, check your supplies and, if necessary, stock up on groceries, gasoline, and other necessities.
- Have flash lights and extra batteries on-hand in case of possible power outages.
- Wear layers of protective clothing if you are venturing outside—wind makes the air feel much colder.
- Be alert to the signs of hypothermia. These include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion.
- If hypothermia signs occur, seek immediate medical attention. If medical attention is not available, slowly warm the person's body core first by getting them into dry clothing and wrapping them in a warm blanket covering the head and neck.
- Giving warm broth and warm food is better than giving beverages or food that is hot. Alcohol should not be taken.
- Be alert to the signs of frostbite. The most susceptible parts of the body are the extremities such as fingers, toes, ear lobes, or the tip of the nose. If frostbite occurs, seek immediate medical attention. If it is not available, the affected areas should be warmed slowly.

Concerning travel, make sure your vehicle is prepared for the onset of winter weather. Have a mechanic check the coolant system and fluid levels, the electrical system and lights, and the heater and defroster. Also, ensure good winter tires are installed. Keep a windshield scraper and small broom available for ice and snow removal. During periods of winter weather it is a good idea to maintain at least a half tank of gas. If you must travel, allow extra time to reach your destination and leave plenty of space between you and other vehicles. Ice- or snow-covered roadways are especially treacherous and stopping distances are greatly increased. In the event of a winter storm, it is a good idea to carry a winter storm survival kit in your vehicle. Suggested items for the kit for southeast Texas residents include:

- Flashlights with extra batteries
- A first aid kit with a pocket knife
- Necessary medications
- Blankets and an extra set of winter clothes and rain gear
- Matches and a candle for heat
- A brightly colored cloth to use as a flag
- A supply of food and water
- A shovel and a small bag of sand for generating traction under wheels
- Small tools and booster cables

Remember, even though harsh winter weather is rare in southeast Texas, it still occasionally occurs. It is very important to stay informed about the possibility of winter weather in your area. This can be done by tuning into NOAA weather radio, commercial radio, or your local television station. If you would like more winter weather information, you can contact the Houston/Galveston National Weather Service Office.

Wind Chill Terms and Definitions

1. What is wind chill temperature?
A. The wind chill temperature is how cold people and animals feel when outside. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature. Therefore, the wind makes it FEEL much colder. If the temperature is 0 degrees F and the wind is blowing at 15 mph, the wind chill is -19 degrees F. At this wind chill temperature, exposed skin can freeze in 30 minutes.

2. Can wind chill impact my car's radiator or exposed water pipe?
A. The only effect wind chill has on inanimate objects, such as car radiators and water pipes, is to shorten the amount of time for the object to cool. The inanimate object will not cool below the actual air temperature. For example, if the temperature outside is -5 degrees F and the wind chill temperature is -31 degrees F, then your car's radiator will not drop lower than -5 degrees F.

3. What is FROSTBITE?
A. You have frostbite when your body tissue freezes. The most susceptible parts of the body are fingers, toes, ear lobes, or the tip of the nose. Symptoms include a loss of feeling in the extremity and a white or pale appearance. Get medical attention immediately for frostbite. The area should be SLOWLY re-warmed.

4. What is HYPOTHERMIA?
A. Hypothermia occurs when body temperature falls below 95 degrees F. Determine this by taking your temperature. Warning signs include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and exhaustion. **Get medical attention immediately**. If you can't get help quickly, begin warming the body **SLOWLY**. Warm the body core first, **NOT** the extremities. Warming extremities first drives the cold blood to the heart and can cause the body temperature to drop further--which may lead to heart failure. Get the person into dry clothing and wrap in a warm blanket covering the head and neck. Do not give the person alcohol, drugs, coffee, or any HOT beverage or food. WARM broth and food is better. About 20% of cold related deaths occur in the home. Young children under the age of two and the elderly, those more than 60 years of age, are most susceptible to hypothermia. Hypothermia can set in over a period of time. Keep the thermostat above 69 degrees F, wear warm clothing, eat food for warmth, and drink plenty of water (or fluids other than alcohol) to keep hydrated. NOTE: Alcohol will lower your body temperature.

Wind Chill Chart

Temperature (°F)

Wind (mph) / Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

Wind Chill (°F) = $35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

5. Tips on How to Dress during cold weather

A. The best way to avoid hypothermia and frostbite is to stay warm and dry indoors. When you must go outside, dress appropriately. Wear several layers of loose-fitting, lightweight, warm clothing. Trapped air between the layers will insulate you. Remove layers to avoid sweating and subsequent chill. Outer garments should be tightly woven, water repellent, and hooded. Wear a hat, because half of your body heat can be lost from your head. Cover your mouth to protect your lungs from extreme cold. Mittens, snug at the wrist, are better than gloves. Try to stay dry and out of the wind.

6. Avoid Overexertion

A. Your heart is already working overtime in cold weather. The strain from the cold and the hard labor of shoveling heavy snow, walking through drifts or pushing a car may cause a heart attack. Sweating from overexertion could lead to a chill and hypothermia.

7. Is there a Celsius version of the chart?

A. Go to: http://www.wrh.noaa.gov/slc/projects/wxcalc/windChill.php

8. Wind chill factor vs. wind chill temperature.

A. These terms are almost the same. The wind chill factor describes what happens to a body when it is cold and windy outside. As wind increases, heat is carried away from the body at a faster rate, driving down both skin temperature (which can cause frostbite) and eventually the internal body temperature (which can kill). Wind chill temperature is a unit of measurement to describe the wind chill factor. Wind chill temperature is a measure of the combined cooling effect of wind and temperature. On the bottom of the wind chill chart is the updated wind chill temperature formula.

9. Is it possible to get frostbite if the temperature is above freezing but the windchill is below freezing?

The air temperature has to be BELOW freezing in order for frostbite to develop on exposed skin.

10. How is the Wind Chill calculated?

The wind chill temperature is calculated using the following formula:

Wind Chill (°F) = 35.74 + 0.6215T - 35.75(V^0.16) + 0.4275T(V^0.16)

Where: T = Air Temperature (F)

V = Wind Speed (mph)

^ = raised to a power (exponential)

11. When does the Houston/Galveston National Weather Service issue a Wind Chill Warning or Advisory?

Wind Chill Warnings are issued when the Wind Chill Temperature is expected to fall at or below -18 degrees F. Wind Chill Advisories are issued when the Wind Chill Temperature is expected to fall between 0 degrees F.

12. Does wind chill only apply to people and animals?

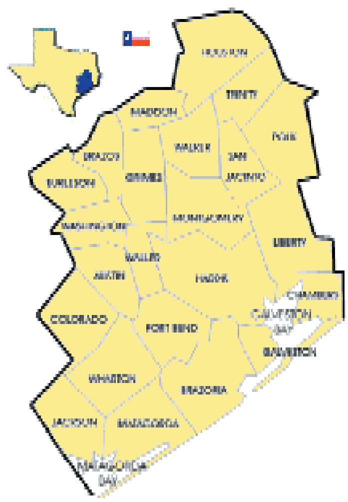
Yes. The only effect wind chill has on inanimate objects, such as car radiators and water pipes, is to more quickly cool the object to cool to the current air temperature. Objects will NOT cool below the actual air temperature. For example, if the temperature outside is -5 degrees F and the wind chill temperature is -31 degrees F, then your car's radiator will not drop lower than -5 degrees F.

13. Does humidity or being near a large water body affect wind chill?

When we tested the new Wind Chill Temperature Index (WCTI), our researchers applied the new index to 12 test subjects. The results of the tests showed that relative humidity was an insignificant weather parameter, less than one degree at worst. To simplify the calculation, relative humidity was left out of the formula.

14. How does this chart apply to children?

The tests that were done on Wind Chill were conducted on adult subjects. For legal and safety reasons, NWS could not ask for child volunteers. Use the existing chart as a starting point and be even more cautious with children, seniors and persons with compromised health.



Storm Signals is a Quarterly Publication of the Houston/Galveston National Weather Service Office

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