Storm Signals

Houston/Galveston National Weather Service Office

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Happy New Year!

El Niño Continues To Develop : What Does That Mean For Southeast Texas This Winter?

By Mike Castillo

Looking at the recent weather patterns that have developed across North America…as well as a continuation of observed increases in sea surface temperature anomalies across the Tropical Pacific Ocean (Figure 1)…an El Niño Southern Oscillation event continues to develop across the Pacific Ocean. El Niño…the Spanish word for a male child…is the name for the warm ocean current that develops across the Eastern Pacific. It was named by Peruvian fishermen for the unusually warm water that developed near South America during Christmas time. Hence the name El Niño…for the birth of the Christ child.

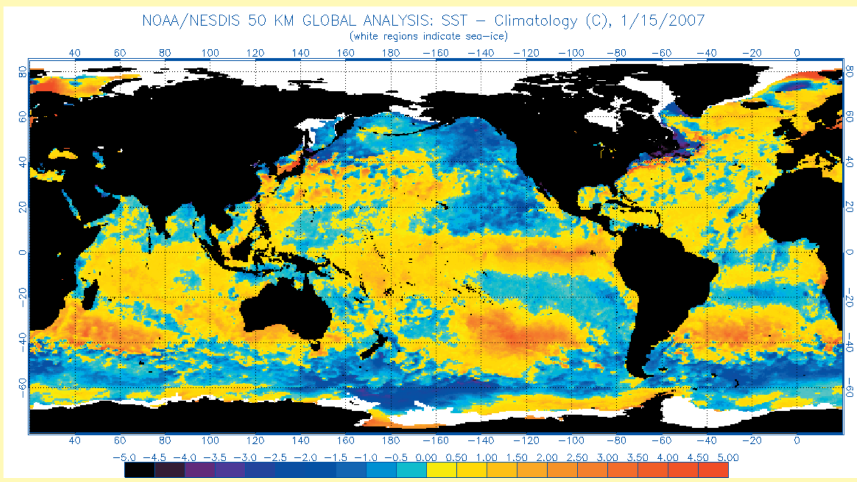


Figure 1. Sea surface temperature anomalies as of January 15, 2007 (NOAA)

In this Issue

The El Niño Southern Oscillation (also known as an ENSO event) occurs as a result of the trade winds across the central and eastern Equatorial Pacific region weakening which does not allow for the efficient upwelling of cooler water temperatures below the surface of the ocean to cool the surface water temperatures across the Eastern Pacific. With the warmer sea surface temperatures…the general circulation pattern across the Western Hemisphere is affected producing a stronger than normal Pacific jet stream across the southern tier of North America. This results in significant changes in the weather patterns across the United States. During the Winter, the main effect from a moderate to strong El Niño event is to block the typically stronger polar jet stream over the northern tier of North America farther north than normal (Figure 2). With the polar jet farther north, polar and much colder arctic air does not normally move into the United States as it does during a non-El Niño event. As a result…more storm systems develop across the eastern North Pacific and move eastward across the southern United States producing more precipitation than normal. In addition…cooler conditions are usually observed across portions of the southern United States as the increase in cloud cover and precipitation provides cooler temperatures.

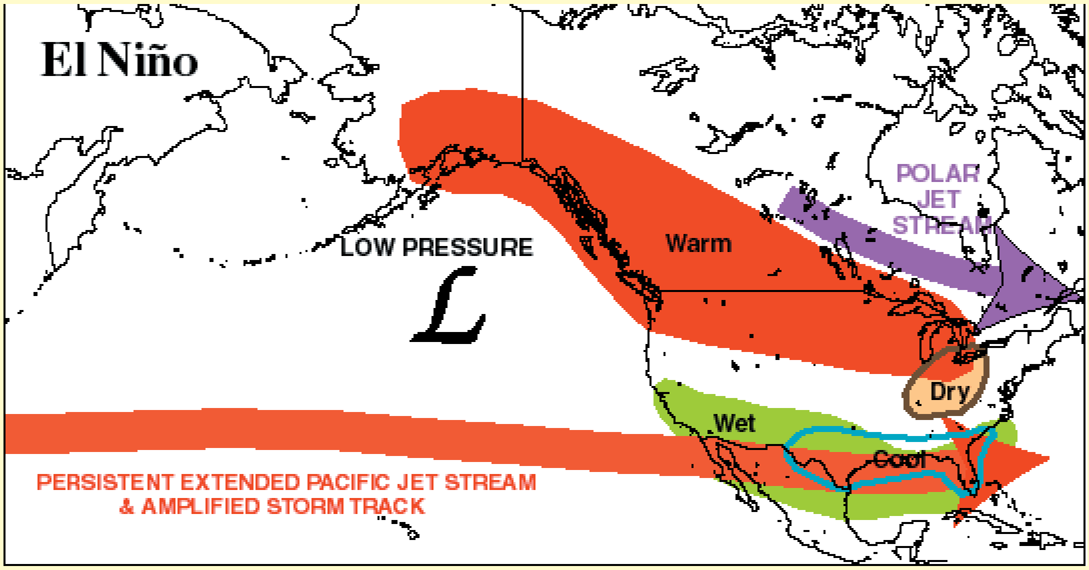


Figure 2. Polar and Pacific jet stream locations during Winter El Niño event

Looking at recent El Niño events for southeast Texas, which were relatively moderate to strong, temperatures were mostly below normal (Figure 3a, 3b, and 3c) and rainfall amounts were above normal (Figure 4a, 4b, and 4c) during the fall and winter season. Another interesting observation was some of the above normal rainfall amounts for the month of October for the College Station, Houston, and Galveston climate records. With the recent third wettest October for College Station (12.88 inches which is 8.66 inches above normal) and the fourth wettest October for Houston (14.53 inches which is 10.03 inches above normal)...it appears this winter will be similar to some of these past El Niño events.

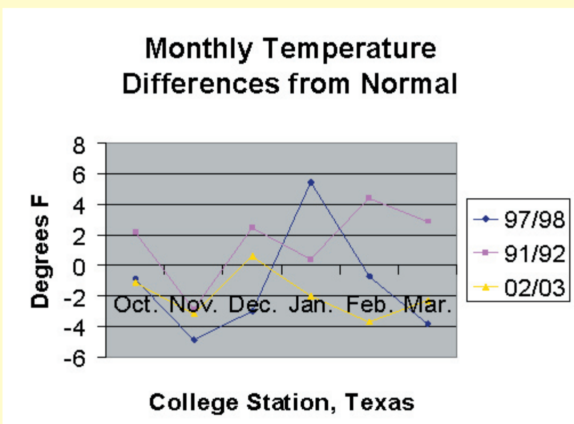


Figure 3a. Differences of average monthly temperatures from normal for College Station

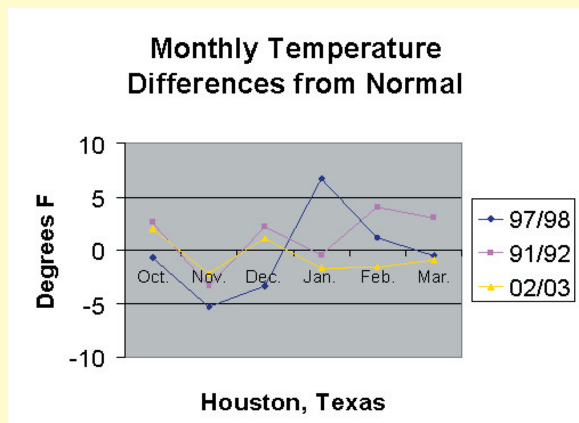


Figure 3b. Differences of average monthly temperatures from normal for Houston

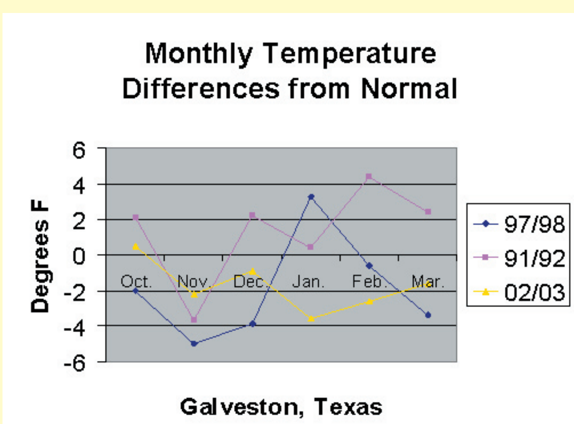


Figure 3c. Differences of average monthly temperatures from normal for Galveston

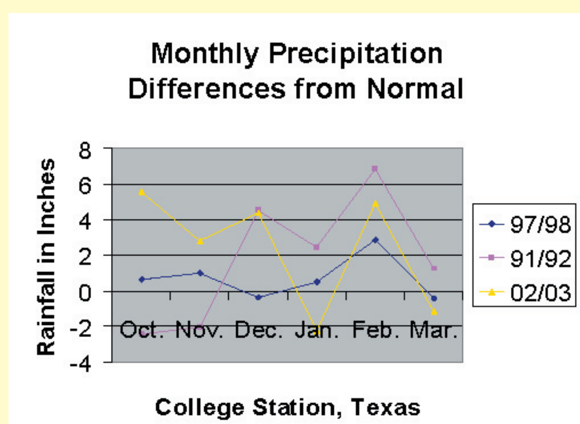


Figure 4a. Differences of average monthly rainfall from normal for College Station

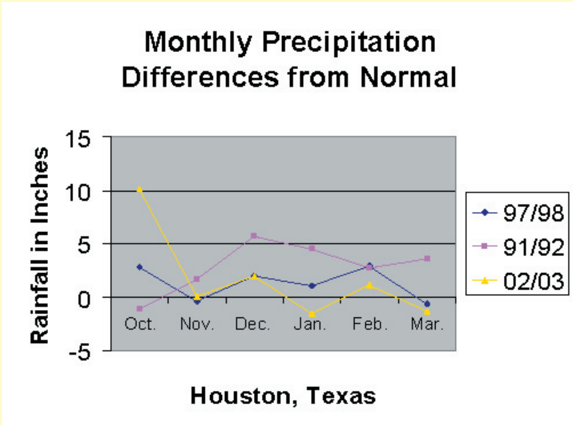


Figure 4b. Differences in average monthly rainfall from normal for Houston

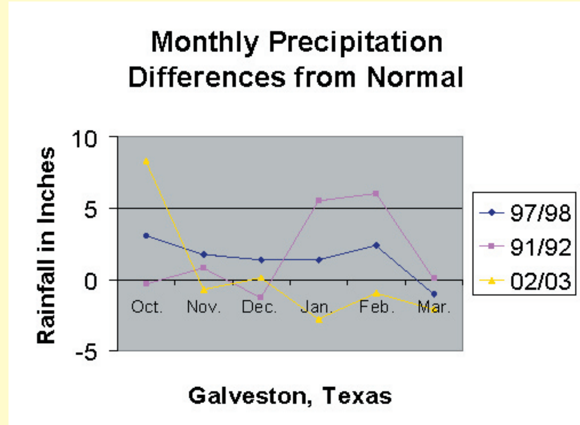


Figure 4c. Differences in average monthly rainfall from normal for Galveston

Based on the latest prediction from the National Weather Service Climate Prediction Center (CPC), the current ENSO event is expected to intensify in the next one to three months but should remain much weaker than the very strong 1997-98 El Niño event. For southeast Texas, that means a wetter than normal winter is expected for precipitation (Figure 5) as well as an equal chance of either a warmer than normal winter, a cooler than normal winter, or a near normal winter for temperatures (Figure 6) as per the latest CPC seasonal outlooks for the United States.

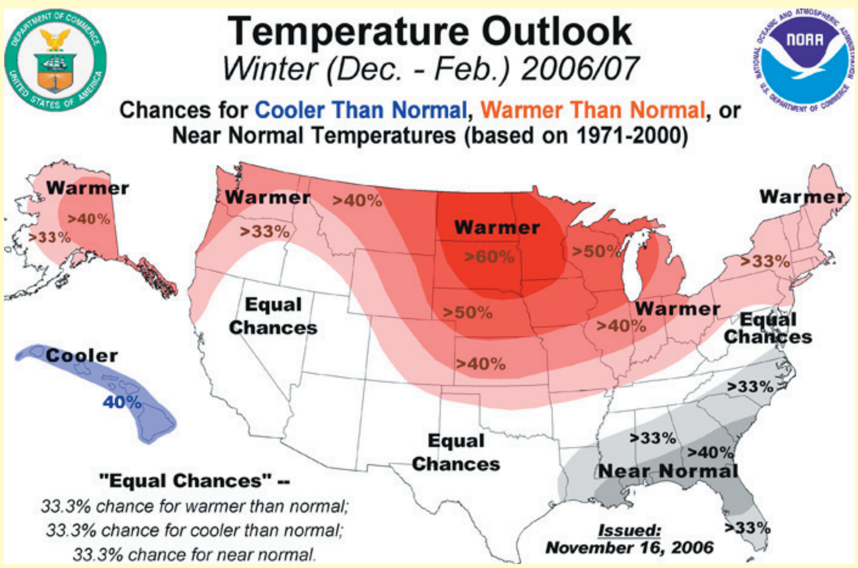


Figure 5. NWS Climate Prediction Center U.S. Seasonal Temperature Outlook (NOAA)

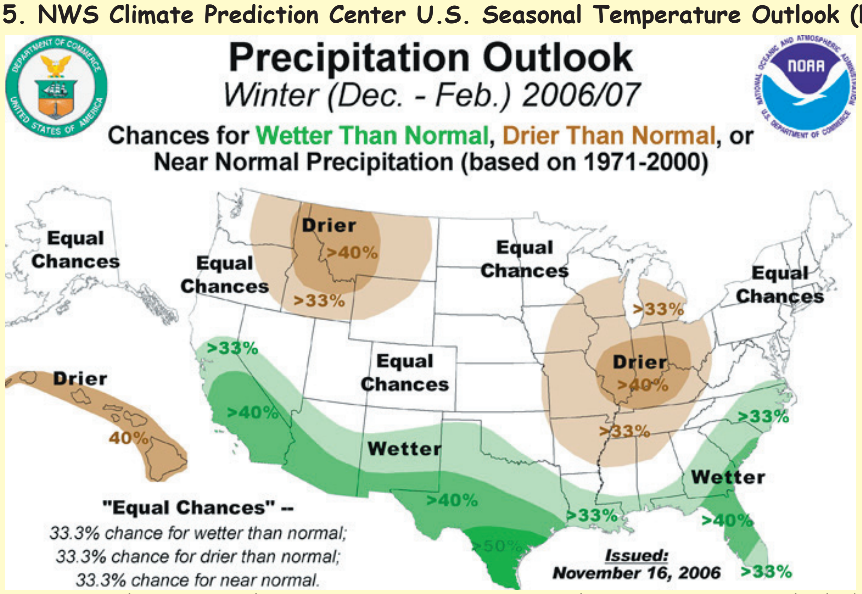


Figure 6. NWS Climate Prediction Center U.S. Seasonal Precipitation Outlook (NOAA)

2007 SKYWARN

As southeast Texas residents, we are all well aware that severe weather can occur every month of the year. However, statistically, the majority of severe weather episodes occur in the springtime months of March, April, and May. Another peak time for severe weather is the months of October and November. Is your town, county, or community properly prepared to handle a severe weather outbreak? One of the ways you and those around you can be better prepared is to become more aware of these violent storms. Our office hosts SKYWARN training sessions preceding spring's severe weather season with the goal of educating the public to be safe, informative storm spotters.

What is SKYWARN?
SKYWARN is a program sponsored by your local National Weather Service Office to train you and your neighbors to be storm spotters. When the threat for severe weather arises, these trained spotters will watch the skies and report important weather information back to their local emergency manager's office, law enforcement agency, or National Weather Service Office. This information is vital in aiding the forecaster's decision process in warning local citizens and schools of severe weather. Your information is also utilized by the National Weather Service to enhance the warning program.

Who can be a Storm Spotter?
Anyone who has the interest in helping their community can be a spotter. Folks who make good spotters are generally people who have an interest in weather and the safety of their fellow man or woman in mind. In the past, people from all walks of life have attended our sessions with the highest representation being those who work in the law enforcement, fire-fighting, or EMT fields. There are always a few amateur radio operators in the audience, as well! The key is good communication. It is important to relay your reports as quickly as possible to the local authorities or weather service office.

How do you become a trained spotter?
SKYWARN training classes take place throughout southeast Texas from late winter through early spring; generally from early February through mid April. Classes last between two to three hours and are usually given during the evening hours or on Saturdays. Each participant receives a certificate, a SKYWARN sticker for their vehicle, and additional informational materials to further enhance their severe weather understanding. How and what types of information to report are also discussed during our time together. If you are interested in helping the National Weather Service by becoming a trained SKYWARN spotter, please plan on attending one of our early 2007 training sessions. You can check out our website for the times and locations of upcoming SKYWARN classes.

If you are an emergency manager, sheriff, or other public official and are interested in scheduling a SKYWARN class, please contact the Houston/Galveston National Weather Service Office at 281-337-5074. This coming season's class schedule will be posted on the web at:
www.srh.noaa.gov/hgx/severe/skywarn/schedule07.htm which will be continuously updated throughout the spring months.

Preview: 2006 - 2007 Season

American Meteorology Society
Houston Chapter

The new season of the local area's Houston American Meteorology Society (AMS) Chapter is currently underway! We would like to invite all interested parties to our monthly meetings around the metro area. This is an all-inclusive club; if you have an interest in weather, or the earth sciences, then this is the club for you! Our local chapter will continue the American Meteorology Society's mission of furthering the education of the atmospheric sciences by providing our members an opportunity to experience interesting gatherings. Cutting-edge science & research that relates to our region's weather and climate, presented by the respective experts, is our main goal in continuing this national mission.

The season began in a unique way this past September when the chapter hosted a "Meet & Greet" at the Armadillo Palace on Kirby. It was nice to see and visit with veteran and new members and discuss how we wanted the chapter to evolve this coming year. A simple survey handed out at this meeting proved that folks still wanted to meet in a monthly fashion and had a thirst for a continued eclectic mix of topics. To kick things off in October, we hosted Dr. Orville from Texas A & M's Atmospheric Science Department. Dr. Orville caught us up on the Houston area's Lightning and Detection network and its current performance. November's meeting took us back to the ever-welcoming Houston Museum of Natural Science for a personal tour of the Benjamin Franklin exhibit. Why Big Ben? Well, other than flying that infamous kite in a thunderstorm, he is credited for discovering the Gulf Stream.

Meetings on this season's docket include (but are not limited to) a holiday party down on Galveston Island at Moody Gardens, Space Weather, SKYWARN Storm Spotter Training, and discussing Houston's Air Quality Issues.

See you there!

Patrick G. Blood – V.P., Houston AMS Chapter

2007 Houston/Galveston Hurricane Workshop

Plans are underway for the 2007 Houston/Galveston Hurricane Workshop on Saturday, June 9th from 10 a.m. to 4 p.m. at the George R. Brown Convention Center. The workshop will provide vital information to families on how to be prepared for the eventual impact of a major hurricane in the southeast Texas region.

CenterPoint Energy will be the presenting sponsor for the third consecutive year. CenterPoint Energy also brings a wealth of experience and knowledge to the workshop in preparing and recovering from a major hurricane and the restoration of power to your home. The City of Houston will once again provide the George R. Brown Convention Center at no cost to the National Weather Service to present this very important program.

If you would like additional information concerning the Hurricane Workshop, please feel free to contact Gene Hafele at 281-337-5074 x 223 or gene.hafele@noaa.gov.

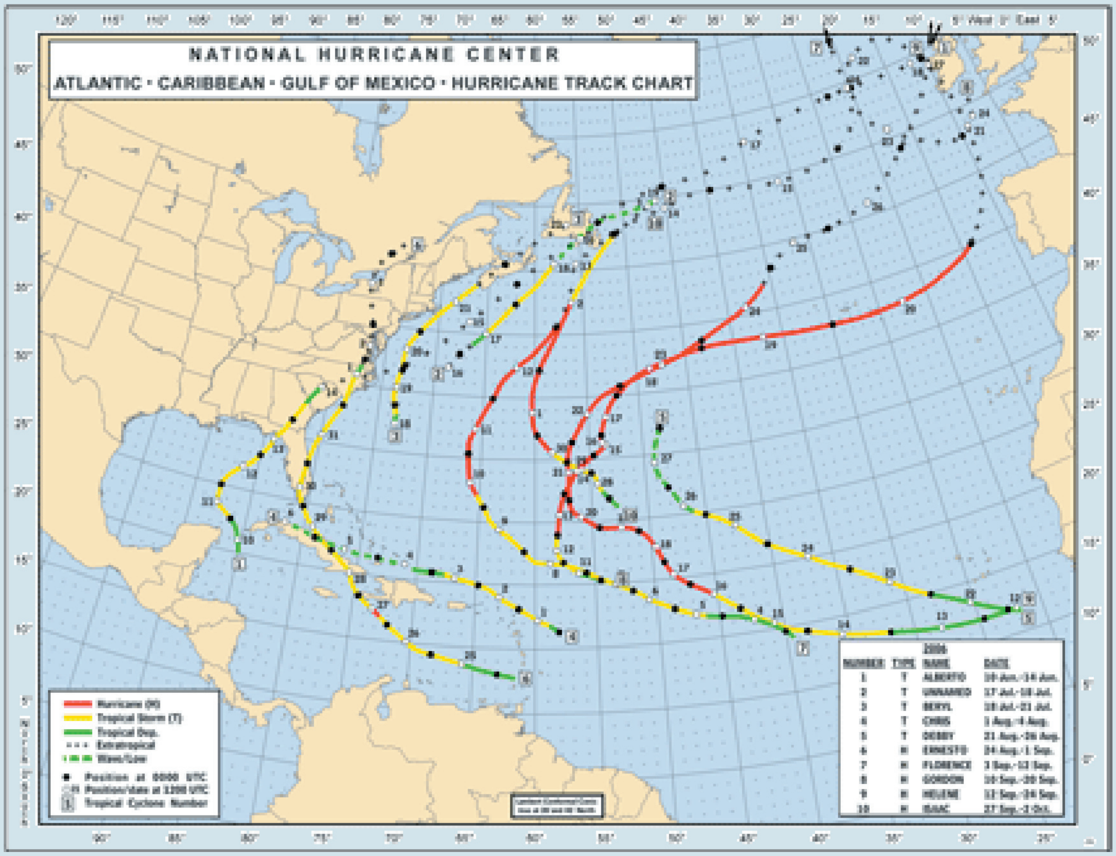
Cooperative Weather Observers Get 40 Years of Service Awards

Mr. Bill Read, Meteorologist in Charge of the Houston/Galveston National Weather Service, presented two 40 year length of service awards to Cooperative Weather Observers last fall. Receiving the award in October was Mr. Erwin Knippel of Columbus, Texas and receiving the award in December was Irineo Reyes of Richmond, Texas. This award is in recognition of their unselfish dedication to the Co-Operative Weather Service Program over the past 40 years. Both of these gentlemen record the weather each day around 7a.m. to keep a continuous record of weather observations for their community that can be used for years to come.

The National Weather Service (NWS) Cooperative Observer Program (COOP) is truly the Nation's weather and climate observing network of, by and for the people. More than 11,000 volunteers take observations on farms, in urban and suburban areas, National Parks, seashores, and mountaintops. The data are truly representative of where people live, work and play. Volunteer weather observers conscientiously contribute their time so that observations can provide the vital information needed. These data are invaluable in learning more about the floods, droughts, heat and cold waves affecting us all. The data are also used in agricultural planning and assessment, engineering, environmental-impact assessment, utilities planning, and litigation. COOP data plays a critical role in efforts to recognize and evaluate the extent of human impacts on climate from local to global scales.

2006 Atlantic Hurricane Season Summary

The 2006 Atlantic hurricane season produced near-normal activity with nine named storms, including five hurricanes, two of which became major hurricanes of Category 3 strength or higher (see Track Map and Summary Table below), and one unnamed tropical storm. An average Atlantic hurricane season has eleven named storms, with six becoming hurricanes and two becoming major hurricanes. The 2006 season was compact and had four hurricanes that formed during September. This is above the long-term average for that month. Three systems made landfall in the United States as tropical storms. Unlike the past three seasons, the stronger hurricanes stayed well out at sea, sparing the Americas and the Caribbean Islands from major hurricane damage this season. No hurricanes hit the United States this year, which is the first time this has occurred since 2001.



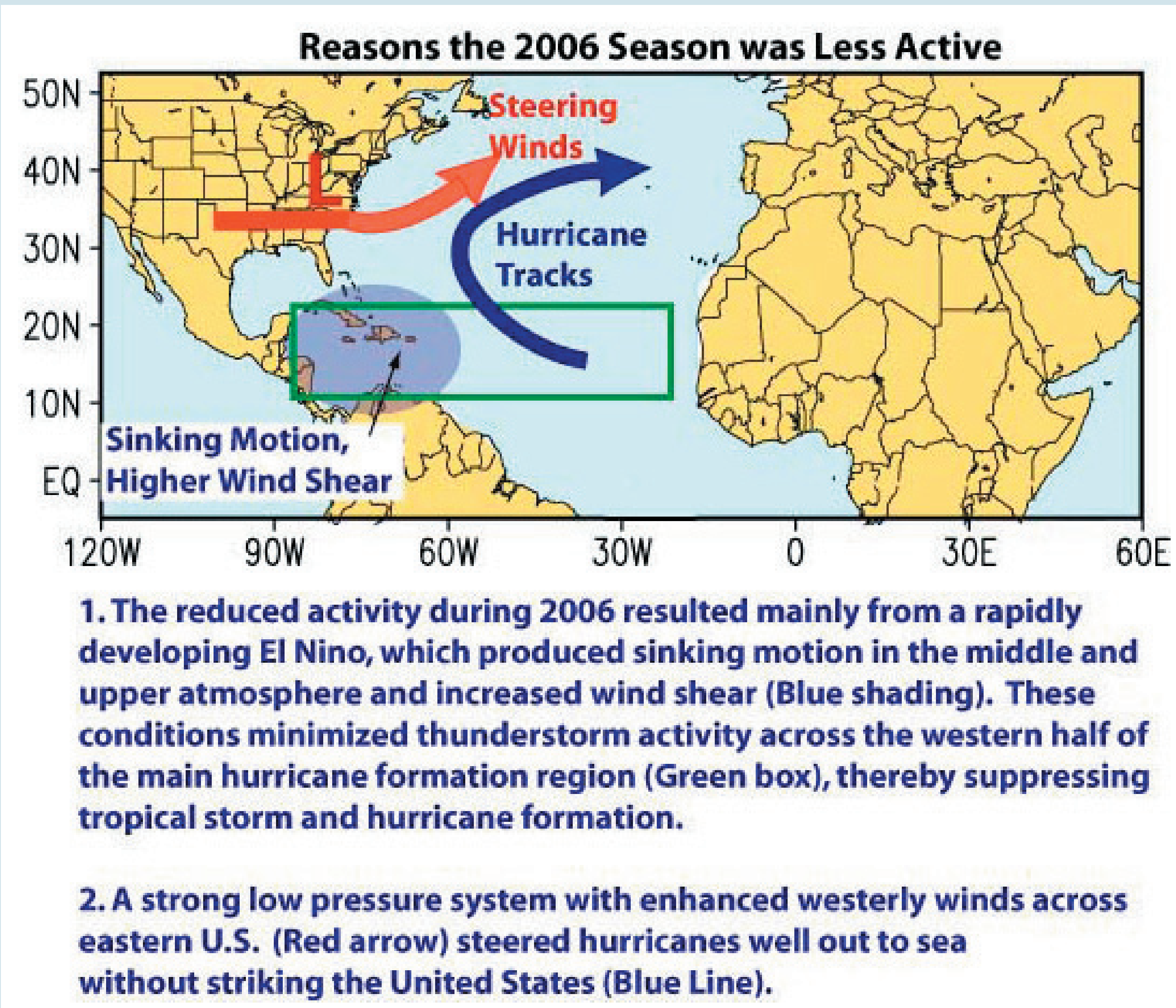
2006 Atlantic Hurricane Season Track Map
http://www.nhc.noaa.gov/tracks/2006atl.gif

Summary Table

Name	Dates	Max Wind MPH	Deaths	U.S.Damage $Million
Alberto (TS)	10-14 Jun	70	0	Minor
Unnamed (TS)	17-18 Jul	50	0	0
Beryl (TS)	18-21 Jul	60	0	0
Chris (TS)	1-5 Aug	65	0	0
Debby (TS)	21-26 Aug	50	0	0
Ernesto (H)	24 Aug-2 Sep	75	5	500
Florence (H)	3-12 Sep	90	0	0
Gordon (H)	10-20 Sep	120	0	0
Helene (H)	12-24 Sep	120	0	0
Isaac (H)	27 Sep-2 Oct	85	0	0

Note – Dates based on Coordinated Universal Time (UTC) / TS = Tropical Storm / H = Hurricane

2006 seasonal activity was lower than expected due to the rapid and unexpected development of El Niño, a periodic warming of the ocean waters in the central and eastern equatorial Pacific, which influences pressure and wind patterns across the tropical Atlantic (see Illustration below). El Niño, combined with the large-scale weather patterns over the southeastern U.S., produced sinking air in the middle and upper atmosphere, along with higher than anticipated wind shear (the change in winds through the atmosphere) over the Atlantic Ocean, Gulf of Mexico and Caribbean Sea. These conditions minimized thunderstorm activity, which inhibited tropical storm and hurricane formation. El Niño's rapid development and intensification has been linked to a series of large subsurface ocean waves that affect ocean temperatures, which began in June. These waves produced a progressive warming of the tropical Pacific Ocean during the summer months. A particularly strong wave led to a significant warming of the entire eastern half of the equatorial Pacific in early September. This led NOAA in early September to report that an El Niño had developed. These warmer waters produced enhanced rainfall near the international date line, resulting in suppressed hurricane activity.



ALBERTO

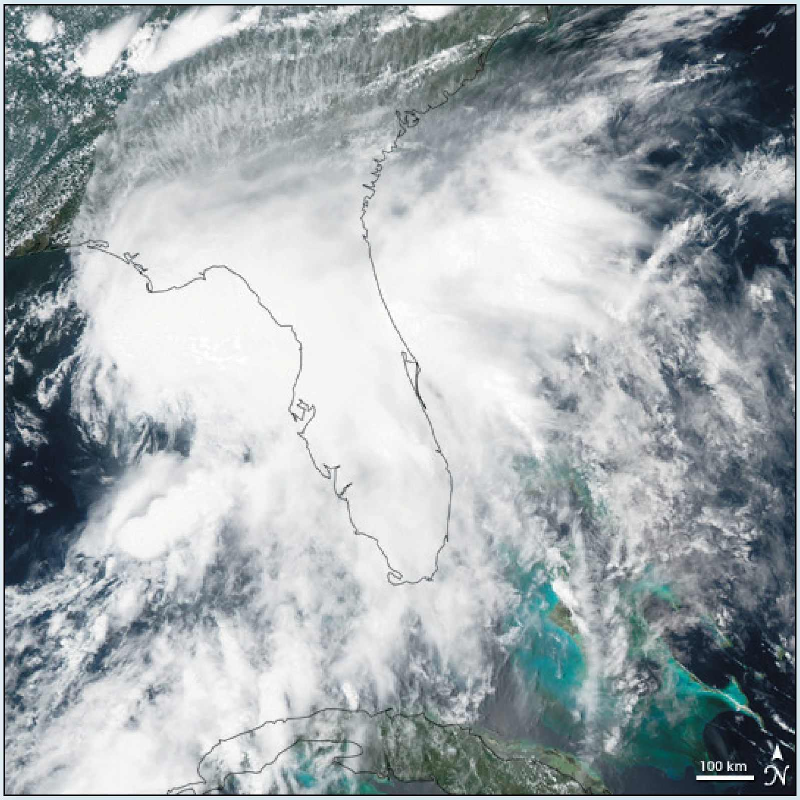


Figure 1. Aqua satellite image of Tropical Storm Alberto mid-afternoon on June 12th.

Alberto formed from an area of disturbed weather that persisted for several days over Central America and the northwestern Caribbean Sea. The thunderstorm activity increased on June 8th with the arrival of a westward moving tropical wave and became concentrated between the Yucatan Peninsula and Cuba where pressures began to fall. It is estimated that early in the morning on June 10th, there was a surface circulation and organized convection to classify the system as a tropical depression. It was then centered about 120 miles south of the western tip of Cuba. The depression moved slowly northwestward toward a region of a strong southwesterly wind shear and the center of circulation became displaced to the southwest of the main area of convection. The winds increased over the eastern semicircle and the depression became a tropical storm in the early evening hours on the 10th. By then, the cyclone was located about 60 miles northeast of the northeastern tip of Yucatan. Thereafter, Alberto turned northward and northeastward, producing intermittent bursts of deep convection (see Figure 1). The cyclone intensified and reached its peak intensity of 70 mph and a minimum pressure of 995 mb about 100 miles south of Apalachicola, Florida in the early evening on June 13th.

Thereafter, the cyclone began to weaken as it moved toward the coast and Alberto made landfall with 45 mph winds near Adams Beach, Florida before noon on June 13th (see Figure 2). Alberto continued toward the northeast farther inland and weakened. It began to lose tropical characteristics over South Carolina and became extratropical at around sunrise on June 14th and then moved back over the Atlantic, where it became a powerful extratropical storm just south of Nova Scotia. The cyclone was tracked all the way to the British Isles where it was absorbed by a frontal system.

Numerous houses received flood damage as two feet of water covered the road to downtown in Levy County, FL. Storm surge flooding near Homossassa, Citrus County put three feet of water into a restaurant and damaged twenty homes (see Figure 3). A few trees were downed in Tallahassee causing power outages. There were no direct deaths associated with Alberto as a tropical storm. However, it caused one death and some damage after it became extratropical. An eight year old boy drowned in Franklin County, NC north of Raleigh. He was chasing a ball which was going down the drainage system and was pulled in. There was also a press report of four sailors missing about 200 miles south of Nova Scotia when Alberto was a strong extratropical storm. The American Insurance Services Group indicated that the property loses associated with Alberto were small.

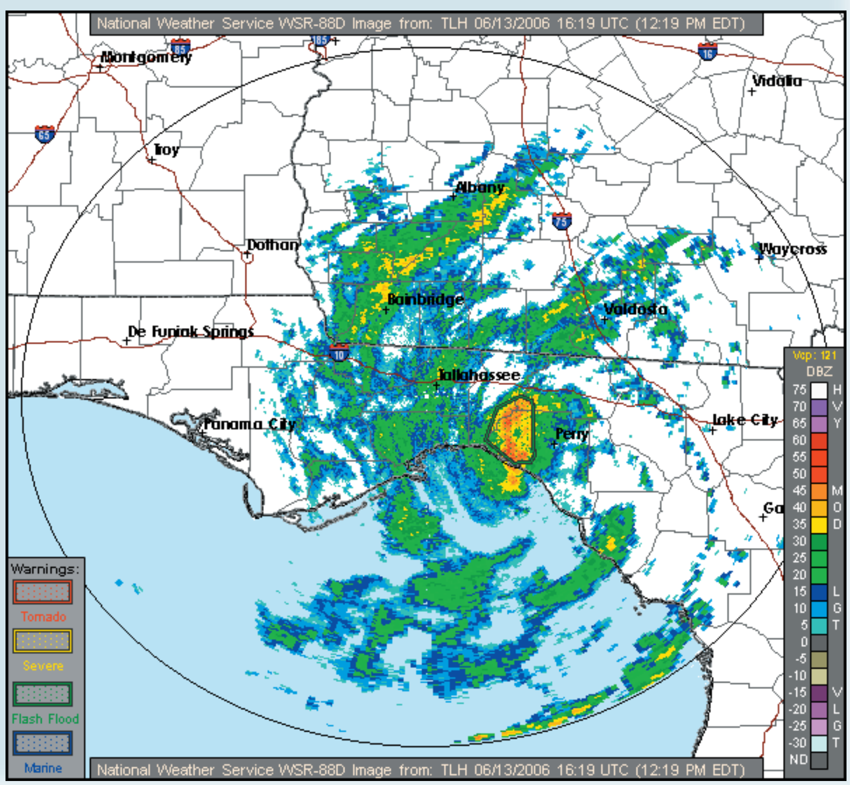


Figure 2. Doppler radar base reflectivity image from the KTLH Doppler radar valid 1619 UTC (1219 PM EDT) 13 June 2006 showing Tropical Storm Alberto near the time of landfall along the Florida Big Bend coast. The outlined area southeast of Tallahassee is for a Flash Flood Warning.

Figure 3. Photo of storm surge flooding at Horseshoe Beach, FL, associated with Alberto on the afternoon of Tuesday, 13 June 2006.

BERYL

The genesis of Beryl can be traced back to a frontal system that stalled off the coast of North Carolina around July 16th. Over the next day or two, this system gradually decayed into a surface low pressure trough while remaining nearly stationary over sea surface temperatures of 26 to 27 degrees Celsius. By around sunrise on July 18th, a low pressure center formed near the southwestern end of the trough with sufficient organized deep convection to designate the system as a tropical depression, centered about 250 miles east-southeast of Wilmington, North Carolina. Six hours later, as convective banding features became more prominent over the eastern semicircle of the circulation, the cyclone became a tropical storm.

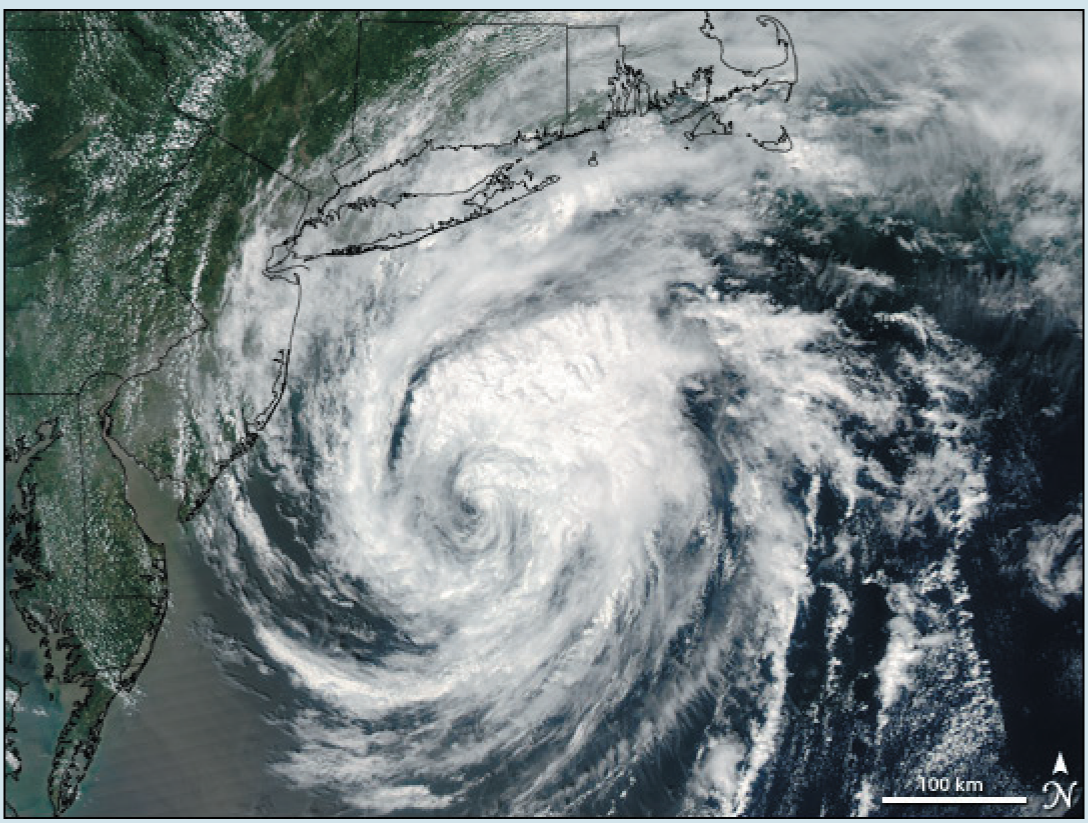


Figure 4. Aqua satellite image of Tropical Storm Beryl offshore of New Jersey, Long Island, and Connecticut at 1800 UTC on July 20th.

From July 18th through the 20th, the tropical storm moved mainly northward along the western periphery of a subtropical high pressure area, and paralleled the coast of the mid-Atlantic states. Vertical shear was not strong and upper-level anticyclonic outflow became established over the system, allowing Beryl to strengthen to its maximum intensity of 60 mph around noon on July 19th. The minimum pressure in Beryl was 1001 mb. This intensity was maintained for a little less than 24 hours. By around noon on the 20th (see Figure 4), as Beryl passed over cooler waters, a slow weakening trend began. Steering winds ahead of a mid-tropospheric trough moving through the Great Lakes caused the storm to turn toward the north-northeast and northeast with a gradual increase in forward speed. The center of Beryl passed over Nantucket, Massachusetts just before midnight on July 20th, at which time the maximum sustained winds were estimated to be 50 mph. Thereafter, the cyclone continued to accelerate northeastward. Beryl lost tropical characteristics around sunrise on July 21st. The system crossed Nova Scotia and moved over Newfoundland where it merged with another extratropical cyclone around sunrise on July 22nd. There are no reports of casualties associated with Beryl. The storm did not have a serious impact on Nantucket; the storm surge there was only about 1 foot, no wind damage was reported on the island, and the rainfall was relatively light. There were also no reports of damages elsewhere due to Beryl.

Figure 5. Tropical Storm Chris was located to the east of Puerto Rico and the Leeward Islands around mid-morning on August 2nd when one of the members of the Expedition 13 crew onboard the International Space Station recorded this still image.

CHRIS

On July 26th, a tropical wave formed off the coast of Africa and slowly tracked westward. It slowly developed due to poor environmental conditions and it became a tropical depression late on July 31st about 160 miles east of Antigua. The depression soon strengthened further and was named Tropical Storm Chris six hours later. National Hurricane Center forecasters dismissed some computer models which dissipated Chris quickly, as they did not have a handle on the strength of the storm. Tropical Storm Chris moved to the northwest and gradually strengthened before reaching its peak strength on August 2nd with winds of 65 mph and a central pressure of 1001 mb, when it was to the northeast of the United States Virgin Islands (see Figure 5). The storm was forecast to strengthen further and become a hurricane as it moved into the Bahamas. However, Chris began to be affected by wind shear and became disorganized. The storm weakened to a tropical depression on August 4th, and dissipated as it approached the Cuban coast.

On August 2nd, approximately 600 tourists evacuated the Puerto Rican islands of Vieques and Culebra as tropical storm warnings had been issued. Some cruise lines re-routed their ships to avoid the storm. In Puerto Rico, rainfall from the storm caused the Fajardo River to overflow its banks. The overflown waters temporarily closed a highway in the northeastern portion of the island. Rainfall reached up to 2 inches across portions of Hispaniola, the Turks and Caicos, the Bahamas and eastern Cuba, and reached 4 inches in some mountainous areas.

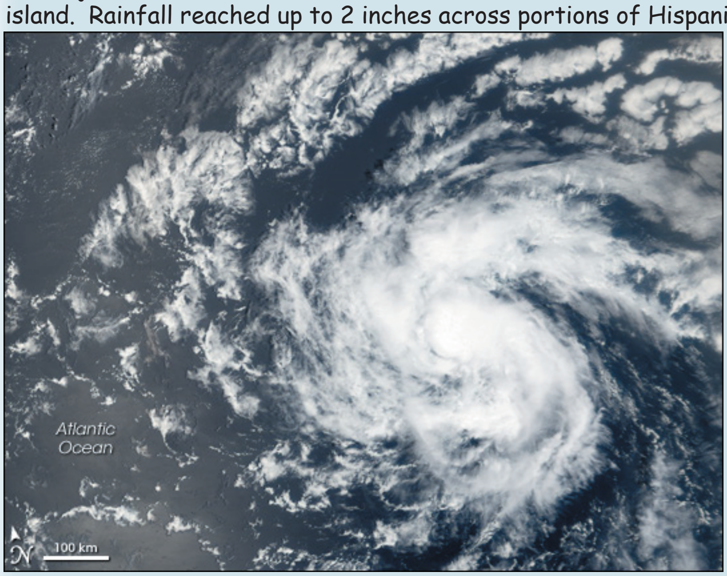


Figure 6. Tropical Storm Debby in the central Atlantic Ocean with 45 mph winds early on August 24, 2006. This MODIS photo is from NASA's Earth Observatory.

DEBBY

A system off the coast of Africa, which the National Hurricane Center was monitoring for several days, was upgraded to tropical depression status on August 21st and designated as Tropical Depression Four. Consequently, a tropical storm warning was immediately issued for the Cape Verde Islands, as the system moved west-northwestward and threatened to pass over or near the southern part of the archipelago. However, the system failed to strengthen into a tropical storm before passing the chain of islands (about 100 miles to the southwest), and the warning was discontinued the following morning.

The depression was upgraded to a tropical storm and was named Debby late on August 22nd about 300 miles west of the Cape Verde Islands (see Figure 6). Debby moved west-northwestward with little change in strength over the next couple of days. While it had been expected to strengthen into a hurricane, this never occurred as southerly wind shear began to weaken the system on August 25th. Debby weakened into a tropical depression on August 26th. It continued to the north and lost tropical characteristics on August 27th ahead of an approaching frontal system.

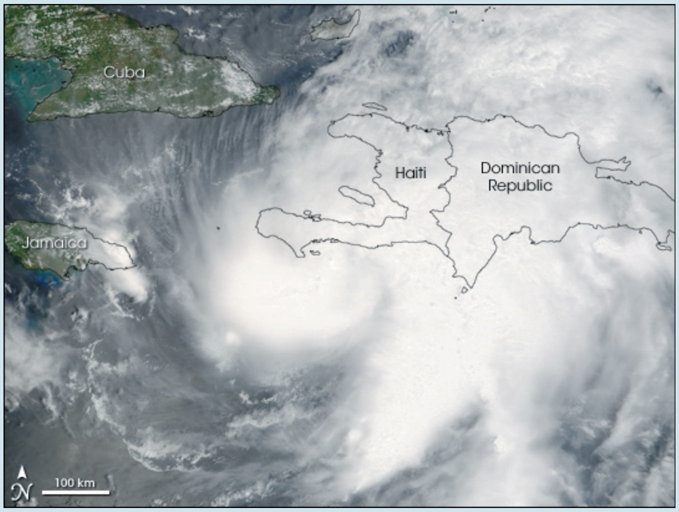


Figure 7. Hurricane Ernesto at 15:50 UTC on August 27, 2006 centered about 115 miles southwest of Port Au Prince, Haiti with 75 mph winds. This MODIS photo is from NASA's Earth Observatory.

ERNESTO

In the afternoon on August 24th, a reconnaissance flight determined that a tropical wave passing through the Windward Islands had developed a closed tropical circulation, and advisories were commenced on Tropical Depression Five. By late afternoon on August 25th, a second flight had found sustained tropical-storm force winds, and the system was named Ernesto, centered 300 miles south of Puerto Rico. Continuing west-northwestward, Ernesto slowly strengthened and had maximum winds of 50 mph by the next morning. The storm turned northwestward on August 26th over the central Caribbean and continued to intensify. Early on the morning of August 27th while centered about 70 miles south of the southern coast of Haiti, Ernesto was briefly a hurricane with maximum winds of 75 mph (see Figure 7). Ernesto steadily weakened back into a tropical storm during the next day as it passed very near the southwestern tip of Haiti. There were two deaths in Haiti due to rainfall.

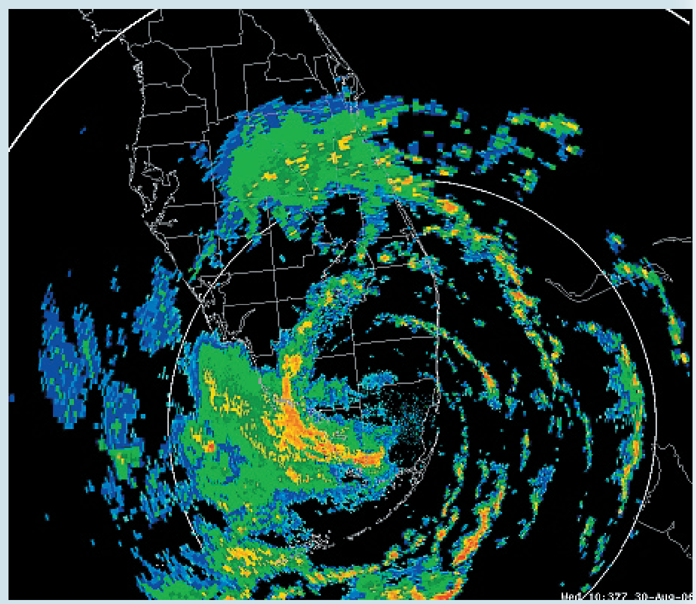


Figure 8. Miami, FL National Weather Service radar image of Tropical Storm Ernesto centered in South Florida west of the Miami-Fort Lauderdale area at 10:37 UTC on August 30, 2006.

Ernesto then made landfall just west of Guantanamo Bay, Cuba early in the morning on August 28th with 40 mph winds. Ernesto turned northwestward and its center remained over Cuba for about 18 hours before emerging off the north-central coast early on August 29th. At one point the storm was predicted to become a major hurricane in the Gulf of Mexico and threaten parts of the Gulf Coast, a grim possibility in light of the one-year anniversary of Hurricane Katrina's landfall. However, Ernesto moved much further east than initially anticipated, and made landfall as a tropical storm (45 mph winds) on the southern tip of Florida early on August 30th (see Figure 8). Ernesto weakened to a depression later that day while moving northward over the Florida peninsula. Two people died in Florida in road traffic accidents attributed to the weather conditions. After departing the east coast of Florida near Cape Canaveral early on August 31st, Ernesto restrengthened into a tropical storm over the warm waters of the Atlantic while heading northeastward. Ernesto was just below hurricane strength when it made landfall again near Long Beach, North Carolina late in the evening on August 31st. Parts of eastern North Carolina and Virginia received 8 to 12 inches of rainfall (see Figure 9). Estimated crop losses were $59 million in North Carolina, while total losses were around $100 million in Virginia.

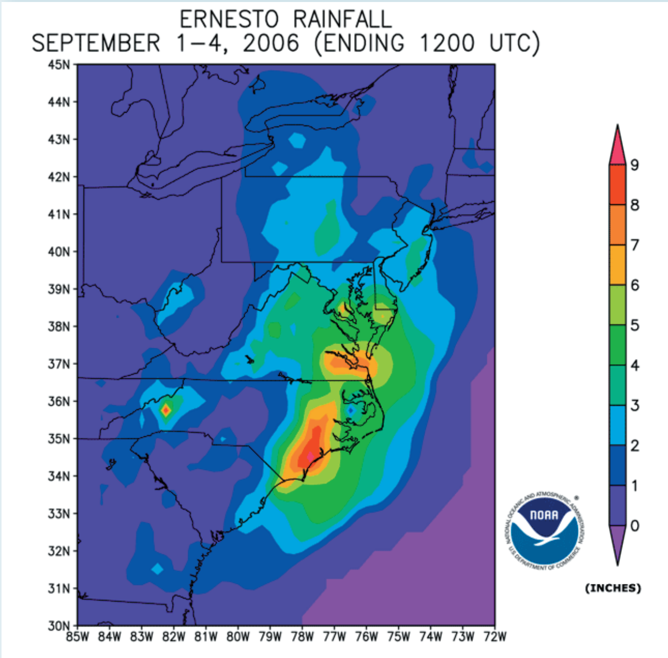


Figure 9. U.S. east coast September 1-4 rainfall totals (in inches) for Ernesto. Image from NOAA.

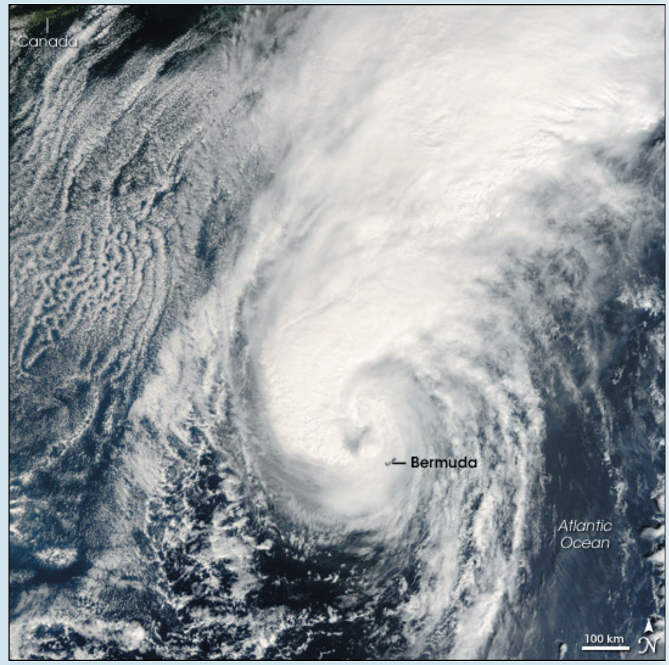


Figure 10. Hurricane Florence around mid-morning on September 11, 2006, passing just west of Bermuda. This MODIS photo is from NASA's Earth Observatory.

FLORENCE

Florence originated from a tropical wave that left the coast of Africa on August 29th, and it developed into a tropical depression on September 3rd about 1525 miles east of the Leeward Islands. The system moved west-northwestward and became a tropical storm on September 5th. Florence turned northwestward and strengthened on September 9th, becoming a hurricane early the next day about 360 miles south of Bermuda. The hurricane turned northward, passing about 60 miles west of Bermuda on September 11th while at its estimated peak intensity of 90 mph (see Figure 10). Florence turned northeastward later that day and became extratropical on September 12th about 600 miles southwest of Cape Race, Newfoundland. As a powerful extratropical low, Florence passed near Cape Race on September 13th and then moved eastward into the open North Atlantic for several days. The extratropical remnants of Florence were absorbed by another low southwest of Iceland on September 19th. Florence brought hurricane conditions to Bermuda, causing widespread power outages, minor damage and a few injuries. As an extratropical low, Florence brought hurricane-force winds to southeastern Newfoundland, where minor damage was reported as well.

GORDON

On the evening of September 10th, a low pressure system gradually became more organized and developed a closed circulation northeast of the Lesser Antilles. As a consequence, it was declared Tropical Depression Seven. The depression continued to intensify, and strengthened into Tropical Storm Gordon on September 11th and Hurricane Gordon late on September 12th. Gordon attained Category 2 status on the evening of September 13th, and was further upgraded to Category 3 status that same night, making it the first major hurricane of the season.

Around September 16th, Gordon was nearly stationary for some time in the mid-Atlantic about 1000 miles east of Bermuda, and weakened to be barely a hurricane. However, as it subequently accelerated eastward, it restrengthened to Category 2 intensity (see Figure 11). On September 19th, hurricane warnings were issued for the Azores, as the predicted path passed through the center of that archipelago. Gordon lost its tropical characteristics on September 20th after passing through Azorean waters (winds gusted to 81 mph in Santa Maria). The extratropical remnants of Gordon brought 85 mph wind gusts to the Spanish coastal region of Galicia on the 21st and strong winds and rain to the United Kingdom on the 22nd. High wind gusts produced power outages to over 100,000 customers, mostly in Northern Ireland.

Figure 11. Hurricane Gordon (80 mph winds) at 18:17 UTC on September 17, 2006, in the central Atlantic Ocean. The photo was taken by one of the crewmembers aboard the Space Shuttle Atlantis.

HELENE

Helene developed from a tropical wave that emerged from the coast of Africa on September 11th. Located over the far eastern Atlantic, the tropical wave acquired enough organization the next day to be classified as a tropical depression. The large depression passed about 200 miles south of the Cape Verde Islands before strengthening to a tropical storm early on September 14th. Moving west-northwestward over the tropical Atlantic, Helene gradually strengthened and became a hurricane on September 16th while located about 1150 miles east of the northern Leeward Islands. The next day, the hurricane slowed down and turned northwestward while continuing to intensify (see Figure 12). Helene became a major hurricane on September 18th (see Figure 13) and shortly thereafter reached an estimated peak intensity of 125 mph. On September 19th, the hurricane moved westward briefly and weakened to a Category 2 hurricane. Helene then turned northward on September 20th ahead of a large deep-layer trough moving off the east coast of the United States. Helene passed about 525 miles east of Bermuda early on September 21st and then turned east-northeastward over the open waters of the central Atlantic. Helene retained hurricane strength until becoming extratropical on September 24th about 600 miles west-northwest of the Azores. The extratropical low gradually weakened and passed near northwestern Ireland and Scotland on September 27th.

Figure 12. Hurricane Helene (90 mph winds) in the Atlantic Ocean approximately 1300 miles east northeast of Puerto Rico around noon on September 17th, 2006. The photo was taken by one of the crewmembers aboard the Space Shuttle Atlantis.

ISAAC

An area of low pressure in the mid-Atlantic generated active thunderstorms for several days and eventually organized into Tropical Depression Nine on September 27th and Tropical Storm Isaac by September 28th. By that time, it was about 810 miles east-southeast of Bermuda. Isaac became a hurricane on September 30th, and passed about 280 miles east of Bermuda before swinging northward toward Newfoundland (see Figure 14). Isaac passed 30 miles to the southeast of Cape Race, Newfoundland on October 2nd late in the afternoon. Strongest winds on land in Newfoundland were reported at Cape Race, where a maximum gust to 60 mph with a sustained wind of 46 mph was recorded.

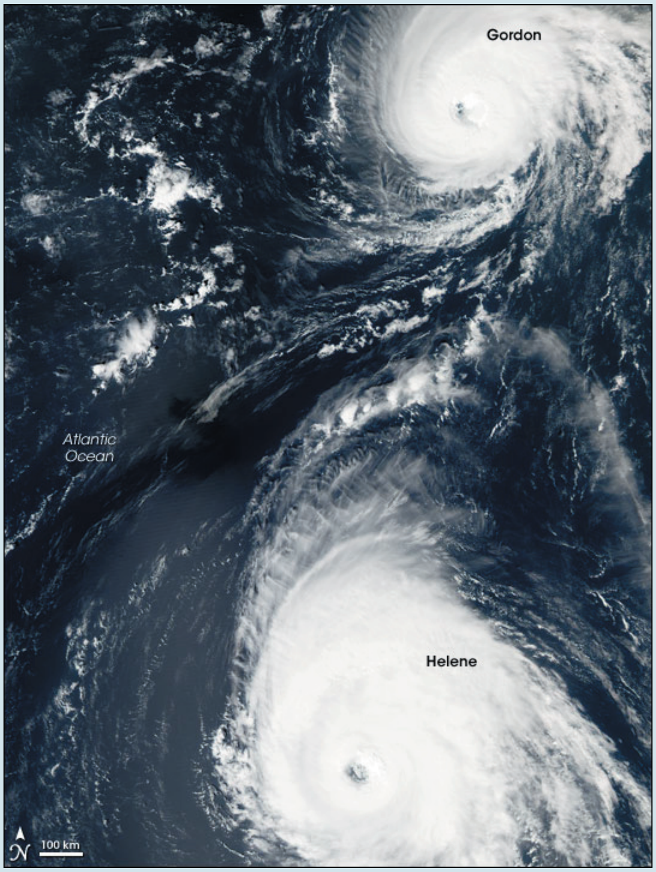


Figure 13. Hurricane Gordon and Hurricane Helene at 16:45 UTC on September 18, 2006, out in the Atlantic Ocean. This MODIS photo is from NASA's Earth Observatory.

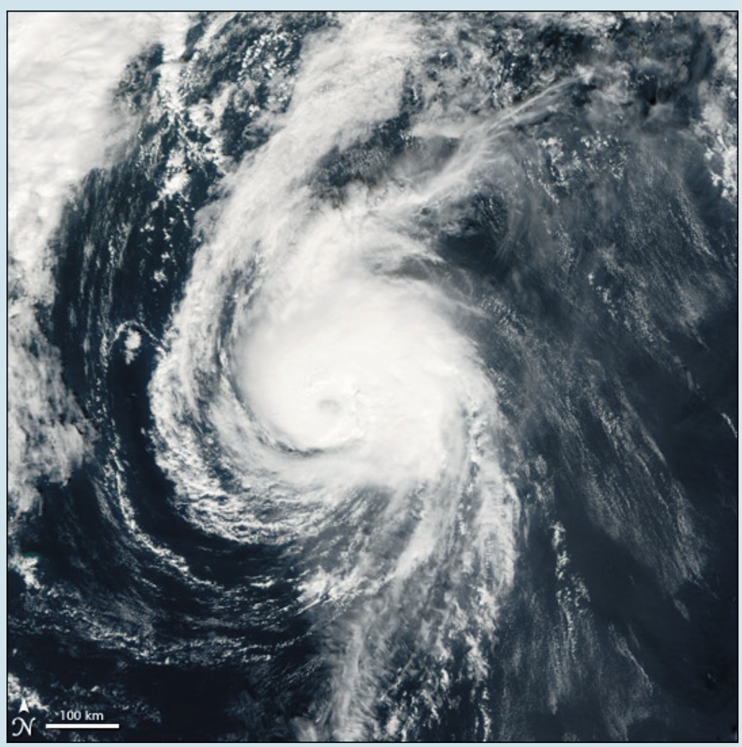


Figure 14. Hurricane Isaac at 14:35 UTC on October 1, 2006, out in the Atlantic Ocean. This MODIS photo is from NASA'a Earth Observatory.

UNNAMED

The National Hurricane Center re-classified a short-lived July weather system over the Atlantic south of Nova Scotia as an Unnamed Tropical Storm. The tropical cyclone originated along the tail end of a cold front that moved offshore of the northeastern United States late on July 13th and stalled over the western Atlantic Ocean. An extratropical low formed on July 16th along the decaying front when an upper trough approached from the west. The trough weakened, and the low moved slowly northeastward over warm waters. Buoy and satellite data suggest the front associated with the low dissipated late on July 16th. However, the low lacked organized convection until early the next day when a large burst of convection formed near the center. It is estimated that a tropical depression formed around 06Z on July 17th about 210 miles southeast of Nantucket Island, Massachusetts. Satellite intensity estimates indicate the low attained tropical storm strength six hours later while accelerating toward the northeast. A large curved band of convection formed in the northern portion of the storm, with other banding features becoming more prominent throughout the day (see Figure 15). The system reached a peak intensity of about 50 mph twelve hours after genesis. Shortly thereafter, the cyclone crossed the north wall of the Gulf Stream and encountered much lower sea-surface temperatures. Convection significantly diminished overnight and by 12Z on July 18th, the system became a non-convective remnant low. The system moved across Newfoundland later on July 18th, then turned toward the east-northeast and dissipated on July 19th over the open waters of the north Atlantic Ocean.

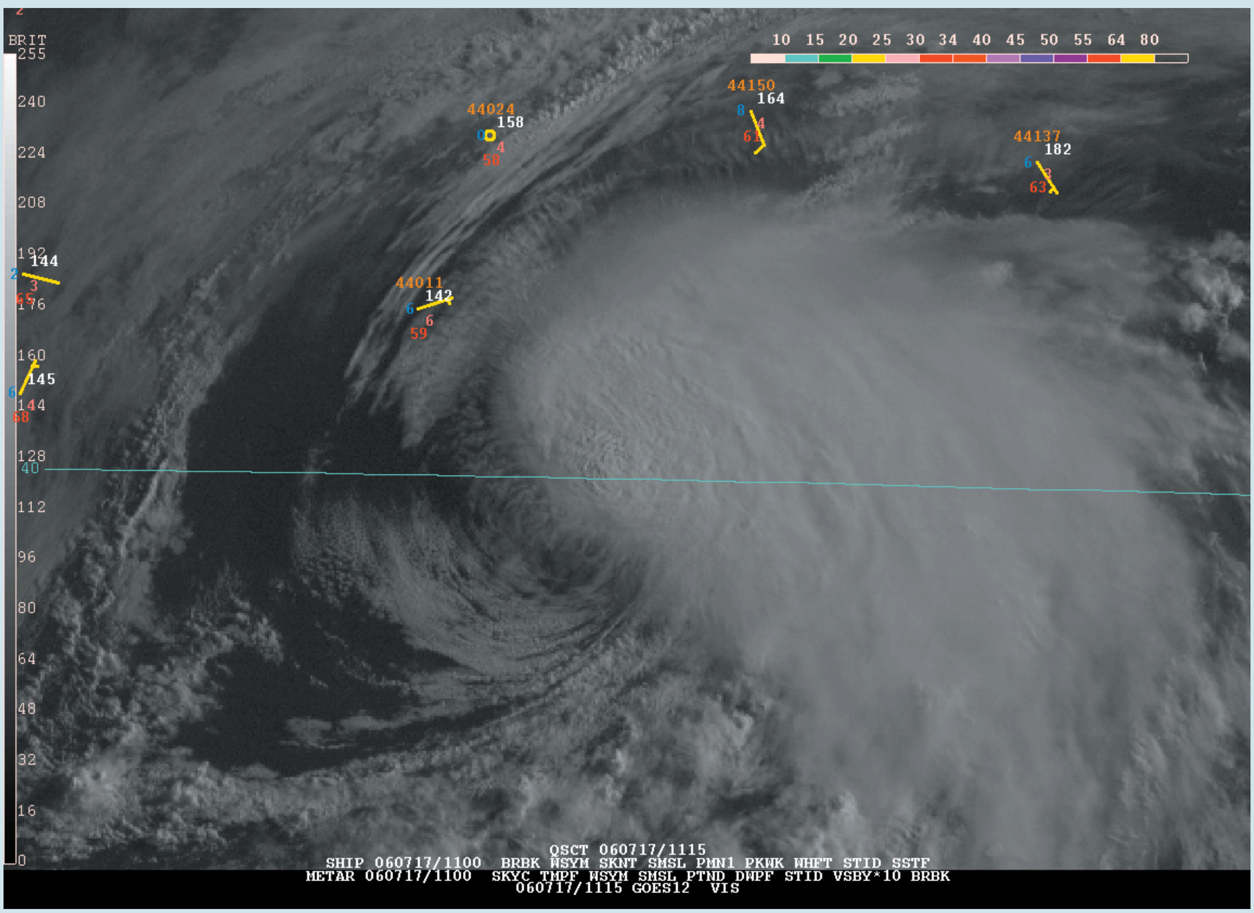


Figure 15. Visible satellite picture at 18Z July 17th 2006 of Unnamed Tropical Storm.

New Taiton Weather Radio Dedicated

On Wednesday, November 15th, 2006, officials from the Houston/Galveston National Weather Service (NWS), Lower Colorado River Authority (LCRA), Texas Colorado River Floodplain Coalition and Emergency Management Officials from Wharton and Colorado Counties gathered for the dedication of the New Taiton All Hazards Weather Radio. The New Taiton All Hazards Weather Radio is located about 20 miles north of El Campo on Highway 71. The weather radio was purchased and installed by the LCRA to increase the weather radio coverage over portions of southern Colorado County and northern portions of Wharton County. The new broadcast will serve Wharton, Colorado, Matagorda, Jackson, Lavaca, Austin and Fort Bend counties.

The new All Hazards Weather Radio now operating in New Taiton, Texas is one of six All Hazards Weather Radios operated from the Houston/Galveston NWS. Other transmitters are located in College Station, Onalaska, Houston, Galveston and Bay City. The All Hazard Weather Radio is more than just a weather radio. The All Hazard Weather Radio can now be used by the emergency management officials to warn about Non-Weather Emergency Messages (NWEM) such as Amber alerts, chemical spills, evacuation orders, terrorist attacks and other NWEM that require citizens to take some action to protect themselves and/or their property.

An All Hazards Weather Radio is one of the primary ingredients for your disaster supply kit. A good All Hazards Weather Radio will have several features that make it unique and an asset. It must have battery backup just in case your primary power to your home, business or school is knocked out. The radio must have the ability to tune to seven different frequencies that we broadcast on. This will enable you to use your radio when you move to a different part of the country or while you are traveling. The most important feature your weather radio should contain is what is called Specific Area Message Encoder (SAME). An All Hazards Weather Radio with SAME capability will allow you to program your weather radio for one particular county to eliminate receiving warnings from counties away from your area of interest. This allows you to only receive warnings for the county you live in.

To obtain additional information about the New Taiton All Hazards Weather Radio or the other All Hazards Weather Radios in southeast Texas, you can go to http://www.srh.noaa.gov/hgx/radio.htm on the internet.

Photo of officials from the Houston/Galveston National Weather Service (NWS), Lower Colorado River Authority (LCRA), Texas Colorado River Floodplain Coalition and Emergency Management Officials from Wharton and Colorado Counties gathered for the dedication of the New Taiton All Hazards Weather Radio.

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

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

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?

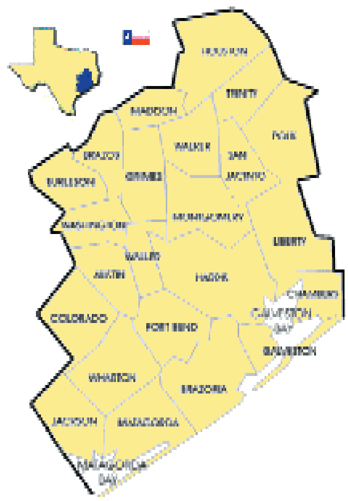
Yes. The only effect wind chill has on inanimate objects, such as car radiators and water pipes, is to more quickly cool the object to cool to the current air temperature. Objects will NOT cool below the actual air temperature. For example, if the temperature outside is -5 degrees F and the wind chill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



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Bill Read - Meteorologist In Charge
Gene Hafele - Warning Coordination Meteorologist
Josh Lichter / Kim Mikesell - Editors

Phone: 281-337-5074
Fax: 281-337-3798
www.srh.noaa.gov/hgx