Storm Signals

Houston/Galveston National Weather Service Office

Volume 69 Winter 2004

2004 Christmas Eve and Christmas Morning Southeast Texas Snow

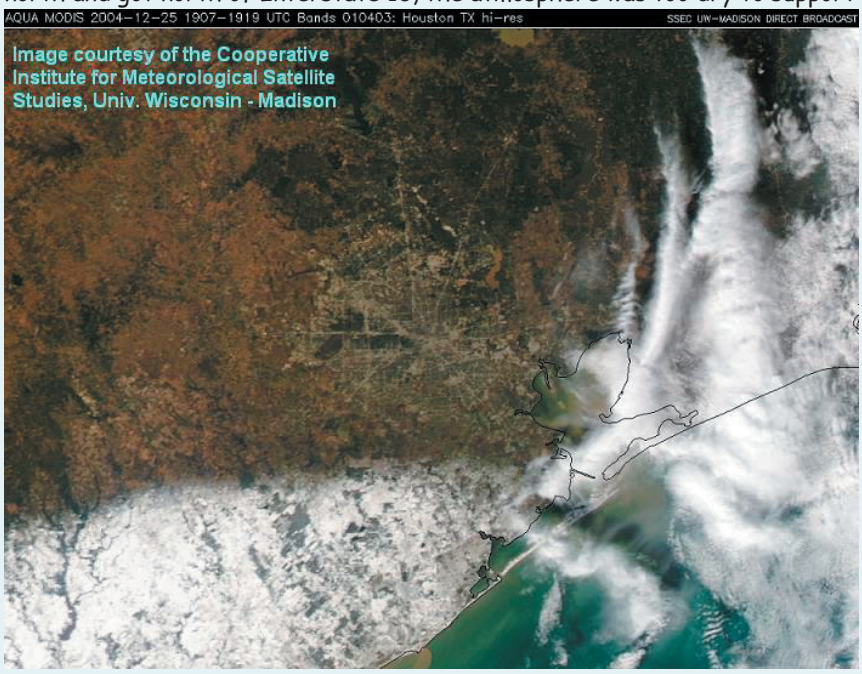
Houston/Galveston National Weather Service Office in Dickinson, TX on Saturday, December 25, 2004

A rare and record breaking snowfall occurred Christmas Eve into early Christmas morning 2004 across south and southeast Texas. For the first time ever, some areas experienced their first white Christmas. The snow line ran from Cotulla to Cuero to Sugar Land to Winnie. Snowfall totals ranged from 12 inches (in Brazoria) to about 1 inch (in Pasadena) across the region.

An arctic cold front had pushed across Southeast Texas on Wednesday (December 22nd) dropping temperatures below freezing, so plenty of cold air was in place Christmas Eve when the snow began. What made this event unusual was not just the cold air being in place, but the depth of the cold air that was in place over the area. Before the heavy snow began on the night of Christmas Eve, the entire depth of the atmosphere over Southeast Texas was below freezing. Normally when winter weather events occur in Southeast Texas, the depth of the cold air is much shallower, resulting in ice (freezing rain or sleet) being a lot more common in these parts than snow.

The morning of Christmas Eve, a strong upper level low was evident on satellite across northern Mexico. Ahead of this system, some snow began across Southeast Texas, but the dry atmosphere kept the snowfall light during the day, resulting in only trace amounts or a light dusting through late afternoon. Eventually, the atmosphere moistened up by late in the day as the upper level low approached from the west.

The upper low moved across South Texas during the nighttime hours Christmas Eve, resulting in a band of heavy snowfall just north of the track of the system. The band of heaviest snowfall, about 20 miles wide, was centered from Victoria to Edna to Bay City to Lake Jackson. In this area, approximately 9 to 12 inches of snow fell. All areas south of a line from around Garwood to Needville to Friendswood to Texas City saw at least 3 inches of snow, with 4 to 5 inches falling on Galveston Island, 6 inches reported in Angleton and 5 inches reported in Alvin. North of this area, the snowfall totals dropped off rapidly. Snowfall totals of around an inch occurred in Clear Lake and Missouri City, with accumulations in Houston generally ranging from a dusting to around an inch. The heavier snowfall occurred over the coastal counties south of Houston because this area had more moisture in the atmosphere (being closer to the Gulf), and was also closer to the track of the upper level low. As you headed north and got north of Interstate 10, the atmosphere was too dry to support much more than just a few flurries.



Visible satellite photo of Southeast Texas taken Saturday afternoon, December 25th. Snow can be seen on the ground south through southwest of the Houston area (Houston is in the center). Snow can also be seen on Galveston Island (high clouds are evident from across portions of Galveston Bay and to the east and northeast).

In this Issue

2004 - A Year In Review

By Charles Roeseler

Weather wise, 2004 was quite a year. The first half of the year was extremely wet with many locations receiving their normal annual rainfall in just the first six months. June was the wettest month of the year and in many locations, June was either the first or second wettest month in recorded history. A rare December snowstorm struck mainly the southern portions of Southeast Texas. Snow accumulations of up to a foot blanketed areas from Ganado to Louise. This was the same area that only a month earlier had been inundated with heavy rain and river flooding. Usually, there is at least one major severe weather outbreak in November and this year was no exception. Tornadoes, hail and high winds rocked the area on November 17th and again on the 23rd. A month by month narrative will be provided, highlighting some of the significant weather events across the area.

Rainfall for the year was well above normal. In fact, College Station had it's third wettest year in recorded history. Houston recorded it's sixth wettest year on record. Houston received 65.06 inches of rain for the year. This is 17.22 inches above normal. College Station received 56.27 inches of rain. This is 16.60 inches above normal. Rainfall along the coast was generally near normal and Galveston did not establish any rainfall records.

Average temperatures this year were again warmer than normal. Galveston's average temperature was 71.7 degrees and this is the 7th warmest year on record (tied with 1990 and 2000). Out of Galveston's top ten warmest years, six of them have occurred since 1994. Houston and College Station were also both warmer than normal.

January

Thunderstorms on the 17th produced hail from Burleson county to Motgomery county to Liberty county. The hail size was generally between 1 and 1 1/2 inches in diameter. Heavy rain developed on the 24th and minor flooding developed across portions of Harris, Polk and San Jacinto counties. Temperatures were 1 to 3 degrees warmer than normal and rainfall was well above normal.

February

Heavy rain redeveloped on the 10th and 11th. Due to the heavy rain, a flood watch was required. After the rain ended, colder air filtered into Southeast Texas and a winter weather advisory was required for the northern parts of the area. Around a half inch of snow fell from Caldwell to Crockett early on the 14th. A weak landspout developed on the evening of the 24th in Bryan. This weak short lived tornado produced damage near the A & M High School.

March

A cluster of thunderstorms marched across the area on the 16th. These storms produced high winds and isolated tornadoes. Most of the damage occurred in Brazos and Burleson counties. Nickel sized hail was reported just south of College Station on the 16th. Temperatures were well above normal during March, between 3 and 5 degrees warmer than normal. Rainfall was near to slightly below normal for the month.

April

April was again wetter than normal and temperatures were just slightly above normal. Hail producing thunderstorms moved across the region on the 6th and 7th. Some of the larger hail, up to the size of golf balls, affected Walker and Trinity counties. Across Polk and Houston counties, nickel to half dollar sized hail covered the ground for 30 minutes. More severe weather pummeled the area on the 10th. High winds toppled trees in Burleson county and softball sized hail hammered the Turtle Creek subdivision in Magnolia. Two inch diameter hail also affected the communities of Crockett, Pinhurst and Goodrich. The storms intensified as they approached Houston, spawning a tornado near Bellaire and Beltway 8. Numerous reports of wind damage were reported across Harris county. On Easter Sunday, more golf ball size hail fell from Morales to Beasley. On the 25th, a small but intense and nearly stationary area of thunderstorms developed from Fulshear to Sealy. This area of storms produced nearly ten inches of rain during the afternoon. Two dozen homes suffered flood damage in Fort Bend county and numerous roads were closed due to high water.

May

Just like the months preceding May, temperatures and rainfall were above normal. Thunderstorms on the 11th produced numerous funnel clouds. Tornadoes were reported in Conroe damaging a few homes and an auto dealership. Another tornado damaged homes and businesses in Bryan. This scenario repeated itself on the 13th with numerous funnel cloud reports. Another hail and high wind event occurred on the 17th and 31st, mainly north of a Brenham to Conroe to Livingston line.

June

June was active right from the start. During the first week of the month, high winds toppled trees and power lines from North Zulch to Grapeland. On the 4th, large hail fell across portions of Harris, Fort Bend and Austin counties. On the 8th, a tornado developed near the community of Wharton. Although damage was relatively minor, eight persons were injured from flying debris and broken glass. Heavy rain and flooding was the primary weather hazard for the second half of the month. Rain fell almost daily from the 22nd to the 30th. Many locations set rainfall records for the month. All this heavy rain occurred without the benefit of a tropical system. Houston's rainfall of 18.33 inches was the second wettest June in recorded history.

July

Rainfall began to drop off in July as a sub-tropical ridge of high pressure built westward forcing most of the precipitation west and north of Southeast Texas. Rainfall was less than normal near the coast and above normal well inland. Temperatures were inversely proportional, that is, above normal near the coast, below normal inland. Hazardous weather was less frequent with only a few high wind events early in the month. A strong thunderstorm complex from Montgomery to Galveston county on the 25th produced widespread wind damage.

August

On the 11th, thunderstorms produced widespread wind damage across parts of Brazos, Burleson, Austin, Wharton, Washington and Fort Bend counties. This was the only significant weather event of the month. Rainfall and temperatures were generally below normal for the month.

September

September was unusually quiet. Hazardous weather was at a minimum. September is normally the peak of the tropical season, but this year all the tropical systems stayed east of Texas (see Florida for more details). Temperatures were warmer than normal and rainfall was well below normal.

October

Temperatures in October were well above normal. In fact, Houston, College Station and Galveston all had their warmest Octobers in recorded history. Rainfall was above normal along the coast and slightly below normal inland. On the 4th, a severe thunderstorm erupted near Friendswood. This storm produced quarter sized hail and strong winds toppled trees and produced minor roof damage.

November

The mini-drought of August, September and October came to an abrupt end as heavy rains fell over the area on the 1st and 2nd. There was a brief gap in the rainfall for a few weeks, but the rains returned with a vengeance on the 17th. Widespread severe weather and heavy rain affected the area. Isolated tornadoes affected parts of Harris and Liberty counties. A flood watch was in effect for the entire area and roads were closed due to high water in Polk county. It was a year ago to the day that Southeast Texas endured another significant tornado outbreak. On November 17th 2003, 23 tornadoes were confirmed across Southeast Texas.

Heavy rain developed over parts of Jackson, Wharton, Colorado and Matagorda counties on the 20th. Although the heavy rain was localized, there were spots that received in excess of 12 inches of rain. Widespread flooding was reported in Ganado, Louise and El Campo. Many area rivers were swollen and out of banks.

There was more hazardous weather on the 22nd and 23rd. Tornadoes, large hail, straight line winds and flooding were reported across the 23 counties that comprise Southeast Texas. Some of the more significant damage occurred near Spanish Camp in Wharton county, near Hempstead in Waller county and near Brenham in Washington county. Additional storms erupted on the 27th, mainly over the eastern third of the region. These storms also produced wind damage and large hail.

December

Other than the biggest snowstorm in the last 109 years to affect parts of the region, the weather in December was relatively benign. A strong arctic cold front swept through the region on December 22nd. Colder air continued to filter into the state through Christmas. By December 24th, a weak coastal trough developed over the Gulf of Mexico while an upper level low over West Texas moved east. The interaction between these systems produced a wide swath of winter precipitation across much of South Texas. The axis of heaviest snow fell along a Beeville to Victoria to Wharton to Galveston line. Accumulating snow fell as far north as South Houston and as far south as Brownsville. It was the first white Christmas for many of these locations and the heaviest snowfall ever recorded for places like El Campo, Bay City and Matagorda. Even Galveston received 4 inches of snow. It was Galveston's heaviest snowfall since the 15 inch snowstorm in February 1895. Accumulating snow did not reach Intercontinental Airport, so officially Houston did not have a white Christmas.

2004 - A Year In Review

Here are the monthly statistics for Houston, Galveston and College Station:

Houston Intercontinental Airport 2004 Data

Month	Average High	Average Low	Average Daily	Departure	Rain	Departure	Snow
January	62.9	46.5	54.7	+2.9	6.01	+2.33	0.0
February	62.0	45.2	53.6	-1.8	5.58	+2.60	0.0
March	76.4	58.2	67.3	+5.0	2.23	-1.13	0.0
April	78.8	60.2	69.5	+1.0	5.56	+1.96	0.0
May	85.8	68.1	76.9	+1.1	7.33	+2.18	0.0
June	88.6	73.6	81.1	-0.2	18.33	+12.98	0.0
July	93.6	75.6	84.6	+1.0	0.79	-2.39	0.0
August	93.3	72.9	83.1	-0.2	2.49	-1.34	0.0
September	91.4	71.0	81.2	+2.3	1.01	-3.32	0.0
October	86.5	68.5	77.5	+7.1	2.05	-2.45	0.0
November	70.8	53.1	62.0	+1.1	11.73	+7.54	0.0
December	62.4	43.4	53.8	+0.1	1.95	-1.74	Trace
Totals	79.4	61.4	70.4	+1.6	65.06	+17.22	Trace

Galveston Scholes Field 2004 Data

Month	Average High	Average Low	Average Daily	Departure	Rain	Departure	Snow
January	61.5	50.4	55.9	+0.1	4.78	+0.70	0.0
February	60.6	49.0	54.8	-3.2	4.18	+1.57	0.0
March	72.4	61.0	66.7	+2.6	2.41	-0.35	0.0
April	76.3	64.8	70.6	+0.6	2.50	-0.06	0.0
May	80.9	71.6	76.3	-0.6	3.66	-0.04	0.0
June	86.5	77.2	81.8	-0.4	10.99	+6.95	0.0
July	89.5	79.4	84.5	+0.2	0.86	-2.59	0.0
August	90.0	78.4	84.2	-0.2	0.77	-3.45	0.0
September	89.0	76.9	82.9	+1.8	2.44	-3.32	0.0
October	84.0	73.8	78.9	+4.8	4.70	+1.21	0.0
November	72.8	60.7	66.7	+1.3	7.78	+4.14	0.0
December	63.6	50.5	57.0	-1.1	2.55	-0.98	4.0
Totals	77.3	66.1	71.7	+0.5	47.62	+3.78	4.0

College Station Easterwood Field 2004 Data

Month	Average High	Average Low	Average Daily	Departure	Rain	Departure	Snow
January	61.9	44.4	53.1	+2.9	4.53	+1.21	0.0
February	59.0	41.9	50.4	-4.1	5.92	+3.54	Trace
March	75.6	56.9	66.2	+4.6	2.78	-0.06	0.0
April	78.5	59.1	68.8	+0.9	4.23	+1.03	0.0
May	85.3	67.3	76.3	+1.0	7.83	+2.78	0.0
June	88.0	72.5	80.2	-1.3	11.75	+7.96	0.0
July	92.3	73.6	83.0	-1.6	2.33	+0.41	0.0
August	92.3	72.3	82.3	-2.4	2.54	-0.09	0.0
September	91.2	70.2	80.7	+1.0	0.26	-3.65	0.0
October	85.7	68.3	77.0	+6.5	3.80	-0.42	0.0
November	69.2	51.5	60.3	+0.3	9.23	+6.05	0.0
December	63.5	41.5	52.5	+0.3	1.07	-2.16	0.0
Totals	78.5	60.0	69.3	+0.7	56.27	+16.60	Trace

Galveston County Emergency Management Facility

Work is progressing on schedule for completion of the Galveston County Emergency Management Facility. We will be moving into the facility and sharing the second floor with Galveston County Office of Emergency Management. Other tenants include Galveston County Emergency Communications District and Galveston County. As of early February, we anticipate being operational in the new center in April, 2005.

The building has been designed to be there even if a category 4 or 5 hurricane strikes Galveston County. The operation centers for both OEM and NWS are on the second floor, which is above the highest elevation of water derived from the SLOSH model. The engineering of the building is designed to withstand sustained winds above 150 mph and instantaneous gusts to over 170 mph. Shatter resistant glass and hurricane protection adds to the wind security. Of course, we will have a generator for back up power, multiple paths for communication and kitchen and bunking facilities to permit continuous operations no matter how bad the disaster.

Both OEM and the NWS anticipate mission support benefits from our collocation. Working together during impending and occurring disasters should lead to improved understanding and communication of the threat to the public. This includes coordinated briefings to the media, local officials and other emergency managers during an event. Shared resources for emergency communications, training and media events will provide additional efficiencies in operation. Both of us have our workspaces designed for improved operations over our current facilities.

We are excited about the prospects of working in partnership with Galveston County and are looking forward to making the move this spring. Once in the building, we will be inviting you to visit and tour the new facility and learn more about our joint operation.

Skywarn 2005

Severe weather can and does occur every month of the year. However, the majority of the severe weather episodes in southeast Texas occur in the springtime months of March, April and May. October and November is the other peak time period for severe weather. One of the ways your community or county can be better prepared for the upcoming severe weather season is to host a Skywarn training session for your community.

What is Skywarn? Skywarn is a program sponsored by your local National Weather Service Office to train individuals in your community to be storm spotters. When there is a threat of severe weather, these trained spotters will watch the skies and report important weather information to their local Emergency Manager, law enforcement official or you local National Weather Service. This information can be used to warn local citizens and schools of possible severe weather. This information will also be used by the National Weather Service to enhance the warning program.

Who can be a Storm Spotter? Anyone who has an interest in helping out their community can be a spotter. People that make good spotters are law enforcement employees, volunteer firemen, amateur radio operators and interested citizens. Good communication is a key. It is important to can relay your reports as quickly as possible back to the local authorities.

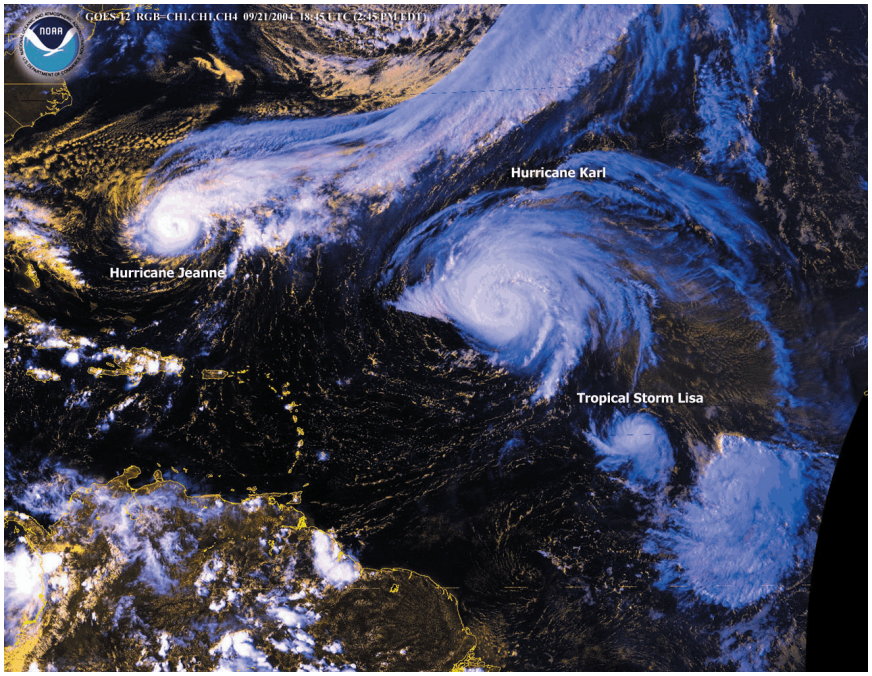
How do you become a trained spotter? Skywarn training classes take place throughout southeast Texas from late winter into early spring with most classes during the months of February and March. The training class lasts between two and three hours and is usually given during the evening or on Saturdays. Each participant at the end of the training will receive a certificate, a Skywarn sticker for your vehicle and additional reading material to further enhance your understanding of severe weather. Instructions on what information to report and how to report your information will be given during the training. If you are interested in helping the National Weather Service by becoming a Skywarn spotter, plan on attending a training session. You can check our web site on times and location of upcoming Skywarn training sessions.

If you are an emergency manager, sheriff, or other public official, and you are interested in scheduling a training class, please contact the Houston/Galveston National Weather Service Office at 281-337-5074. Please check our website: www.srh.noaa.gov/hgx/severe/skywarn/schedule05.htm for more information on training classes to be held in your area. Information will be posted and updated during the training season.

2004 Hurricane Season Highlights

The 2004 Atlantic hurricane season was one for the record books. Nine named storms affected the United States during the six-month hurricane season—three as tropical storms (Bonnie, Hermine and Matthew) and six as hurricanes (Alex, Charley, Frances, Gaston, Ivan and Jeanne). Three of the hurricanes (Charley, Ivan, and Jeanne) made landfall as major hurricanes. Nature's favorite target this season was the state of Florida, which was affected by four hurricanes and one tropical storm. Insurance companies estimated that one out of every five houses in Florida received damage from hurricanes Charley, Frances, Ivan and Jeanne.

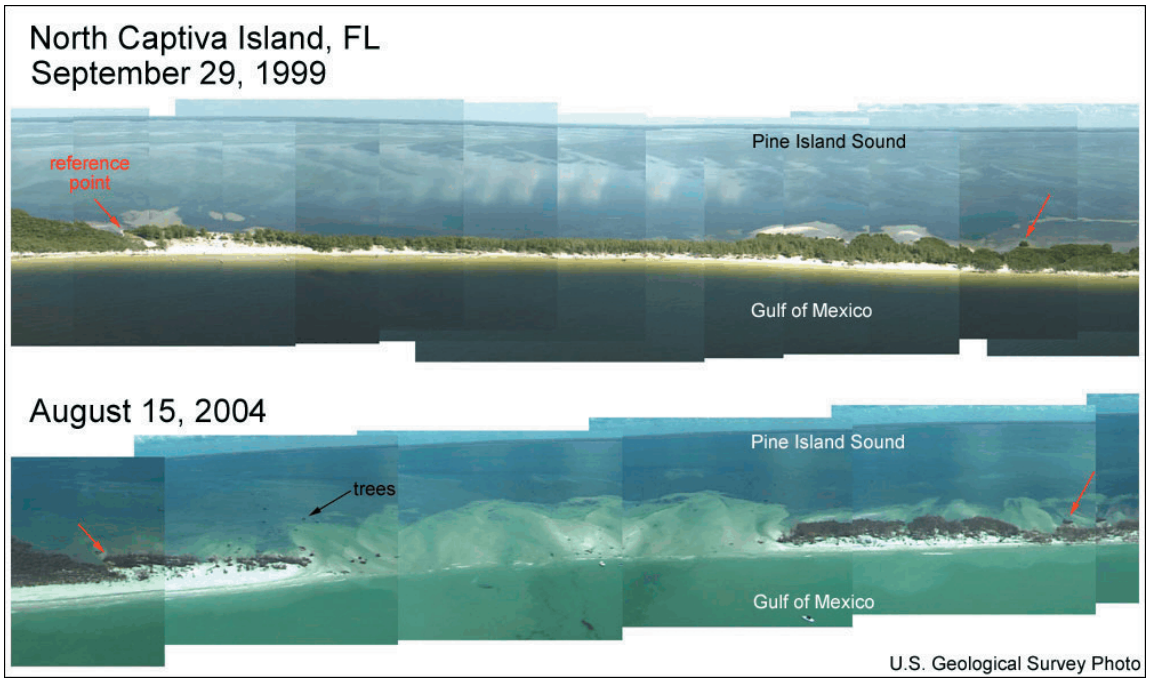
NOAA's seasonal hurricane outlook issued in May called for 12 to 15 named storms, six to eight hurricanes and two to four major hurricanes. The season actually produced 15 named storms, of which nine became hurricanes, and six became "major" (Category 3 or higher on the Saffir-Simpson Hurricane Scale). In the month of August alone, eight systems reached tropical storm strength, breaking the previous record of seven set in 1933 and 1995.



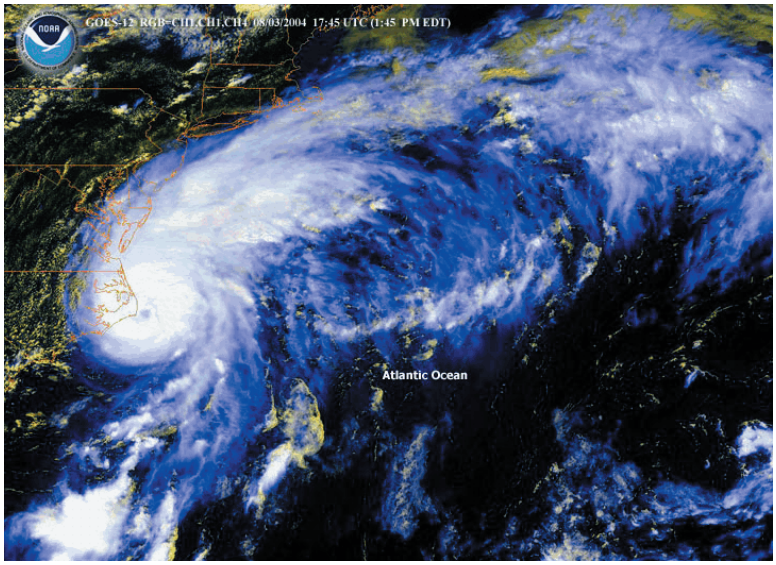
Satellite photo of Hurricane Jeanne, Hurricane Karl and Tropical Storm Lisa taken on September 21, 2004. The Dominican Republic, Haiti and Puerto Rico are south of Hurricane Jeanne.

On average, the U.S. experiences two to three landfalling hurricanes during above-normal hurricane seasons, well below the eight landfalls recorded this year (Alex is not officially counted as a landfall since the center of its eye remained offshore).

This is the first time since record-keeping began in 1851 that four hurricanes have impacted Florida in one year. The only other state to have experienced this level of activity was Texas in 1886. Hurricane Ivan was an encore performer with two landfalls during 2004, first as a Category 3 hurricane near Gulf Shores, AL, and second as a tropical storm over southwestern Louisiana.



Hurricane Charley before and after photo of North Captiva Island, FL showing the island severed into two parts resulting in a 450 meter wide breach.



Hurricane Alex visible satellite photo near Cape Hatteras on August 3, 2004

Human and economic impacts were considerable. Direct U.S. hurricane-related fatalities totaled 59. Jeanne was the deadliest of the year with more than 3000 fatalities in Haiti due to heavy rains. Florida bore the brunt of U.S. property damage, with estimates (adjusted to year 2000 dollars) at more than $42 billion which eclipses the $34.9-billion in damage caused by Hurricane Andrew in 1992. The Insurance Information Institute estimates that one in every five Florida homes was impacted by a hurricane to some degree this year. Some 9.4 million Florida residents were evacuated from their homes this season.

Scientists point to the multi-decadal fluctuations in seasonal activity as a primary factor leading to the high number of hurricanes during 2004. During 1995-2004, eight of ten Atlantic hurricane seasons were above normal (the exceptions being the El Niño years of 1997 and 2002), increasing the potential for more landfalling hurricanes. During 2004, the hurricane landfalls were also related to a strong region of high pressure over the western Atlantic in the middle levels of the atmosphere, which helped to steer hurricanes toward the United States rather than out to sea.

Some of the more impressive 2004 season highlights included:

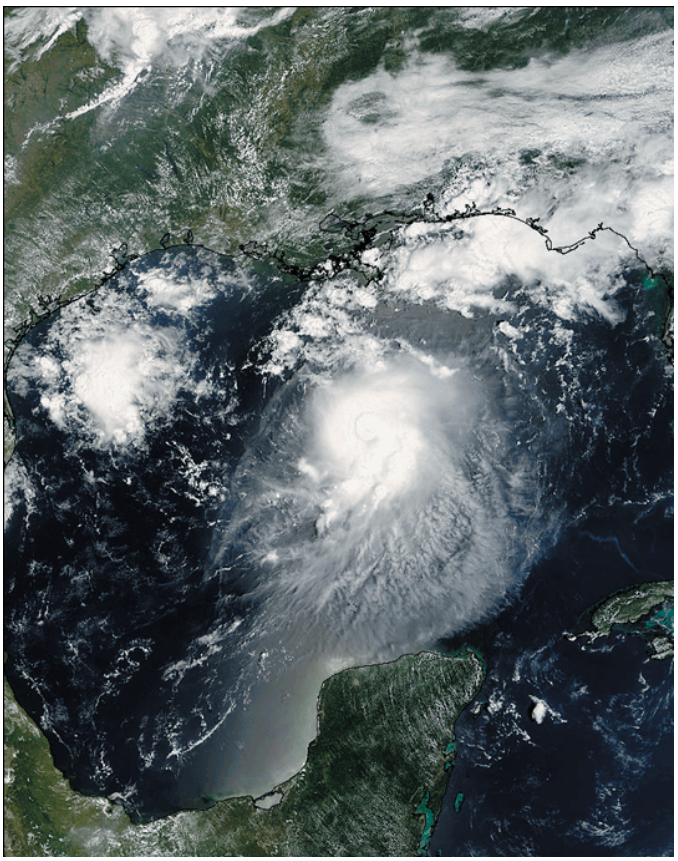
Alex became the strongest major hurricane on record (120 mph) to develop north of 38N latitude (Hurricane Ellen in 1973 at 115 mph is now in second place). Alex and Ellen are the only two hurricanes on record to reach major hurricane strength at such a high latitude. Rip currents associated with Alex resulted in one death off of Nags Head, North Carolina.

Bonnie spawned a tornado that killed three in Pender County, North Carolina. Bonnie had peak winds of 65 mph.

Charley's first landfall was at Playa del Cajio, Cuba with 120 mph winds (Category 3 intensity). Charley then crosses western Cuba and passed over the Dry Tortugas as a Category 2 hurricane. Charley had 150 mph winds (Category 4 intensity) when he made landfall on the southwest coast of Florida just north of Captiva. Charley traversed the central Florida peninsula resulting in a swath of destruction across the state. Charley was still a hurricane when the center re-emerged over water near Daytona Beach. Charley made a second landfall as a weaker hurricane (80 mph winds) near Cape Romain, South Carolina and made another landfall at North Myrtle Beach with 75 mph winds. Charley was directly responsible for 15 deaths (10 in the United States, 4 in Cuba and 1 in Jamaica. An additional 20 U.S. deaths, all in Florida, were indirectly caused by Charley. Total damage was around $14 billion which would make Charley the second costliest hurricane in U.S. history.

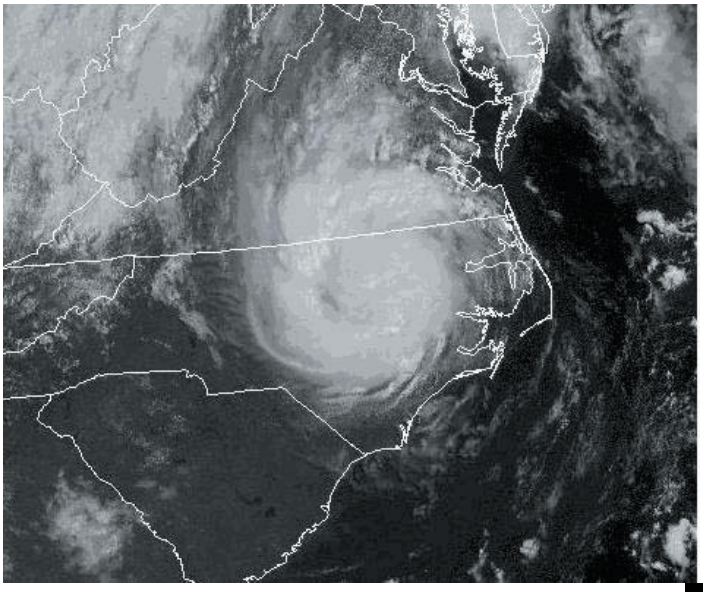
Danielle was the third hurricane of the season and had peak winds of 105 mph (strong Category 2). Danielle remained over the open waters of the eastern Atlantic Ocean during her lifetime.

Earl was a short-lived tropical storm that produced some heavy rains and winds as it crossed the Windward Islands.



Tropical Storm Bonnie satellite picture taken on August 11, 2004. The Yucatan Peninsula is south of Bonnie. The Florida Panhandle is toward the upper right of the photo.

Frances left a broad trail of damage through the Bahamas and Florida and into the southeastern United States. Peak intensity (145 mph – Category 4) occurred while located north of Puerto Rico and near the southeastern Bahamas. Frances weakened to a 105 mph (Category 2 intensity) hurricane by the time she made landfall on Florida's east coast near the southern end of Hutchinson Island (between West Palm Beach and Fort Pierce). Frances



August 30, 2004 Tropical Depression Gaston Satellite Picture

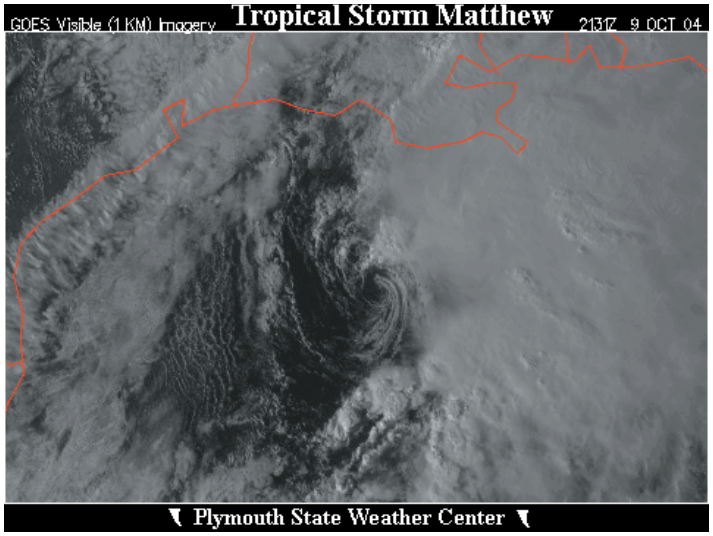
Hermine formed on a frontal zone south of Bermuda, moved northwestward then northward and reached its peak tropical storm intensity of 60 mph. Hermine then weakened and reached the southern coast of Massachusetts near New Bedford with 40 mph winds. Hermine became extratropical later that day.

Ivan was a classic long-lived Cape Verde hurricane that made two landfalls along the U.S. Coast and reached Category 5 strength three times. His first impact was felt across the southern Windward Islands where considerable damage and loss of life was inflicted. Grenada was particularly hard hit where 39 lives were lost and an estimated 90 percent of homes were damaged or destroyed. Ivan strengthened to Category 5 intensity, and then weakened to Category 4 status when passing south of Jamaica and the Cayman Islands. Nearly every building on Grand Cayman sustained some degree of roof damage. Ivan's small eye then passed through the Yucatan Channel and entered the Gulf of Mexico. For the next three days, Ivan moved northwestward then northward over the Gulf and slowly weakened until making landfall near Gulf Shores, Alabama at Category 3 intensity. Before landfall, offshore buoys in the Gulf of Mexico measured wave heights as high as 50 feet! Ivan inflicted significant wind and storm surge damage along the coastline of Mississippi, Alabama and the Florida panhandle. Extensive destruction occurred in Pensacola, FL and its suburbs. Ivan gradually weakened into an extratropical low over the next week while making a large clockwise loop. After completing its loop and emerging in the Gulf of Mexico once again, Ivan regained tropical storm strength and made his second U.S. landfall over extreme southwestern Louisiana and then dissipated over east Texas. Ivan produced 104 tornadoes on its track across the United States. Ivan is directly blamed for 95 deaths, including 26 in the United States. Damage in the United States is estimated at $13 billion.

Jeanne was the deadliest tropical cyclone of the year. At least 3000 lives were lost in the Dominican Republic and Haiti from inland flooding. There were five direct U.S. deaths - one occurred in Puerto Rico, two in Florida, one in South Carolina and one in Virginia. Jeanne directly struck Abacos and weakened to a tropical storm while crossing the central Florida peninsula, moved into the northeast Gulf of Mexico and made a final landfall as a tropical storm in the Florida Panhandle near the mouth of the Aucilla River. Frances killed 7 (6 in the U.S. and 1 in the Bahamas) and caused almost $9 billion in damage. Frances also spawned 117 tornadoes, topping Hurricane Beulah's 115 tornadoes in September 1967.

Gaston was a minimal hurricane (75 mph – Category 1) when he made landfall between Charleston and McClellanville, South Carolina on the morning of August 29. Gaston weakened to a tropical depression as he moved to the northeast, and then regained tropical storm strength as he moved back over water around the Delmarva Peninsula. Before Gaston raced out to see and became extratropical, widespread flooding was observed across South Carolina, North Carolina and Virginia. Rainfall totals exceeded 12 inches in the Richmond area where 8 people were killed by flash flooding. Total damage from Gaston was around $130 million.

Hurricane Frances before and after photo of an oceanfront house destroyed by waves and erosion on North Hutchinson Island, FL. Note how the vegetation/dune line is now more landward than before the storm, indicating erosion. Also note the remains of a protective seawall on the beach.



Tropical Storm Matthew visible satellite photo from October 9, 2004. The Louisiana Coast is north and Galveston Bay is northwest of the circulation center.

Grand Bahama Islands while strengthening to major hurricane (Category 3) intensity and made landfall on the east coast of Florida near Stuart. It is notable than Hurricane Frances made landfall near the same location just three weeks earlier and also moved over the same northwestern Bahamian Islands. Jeanne produced 16 tornadoes and had a U.S. damage estimate of $6.5 billion.

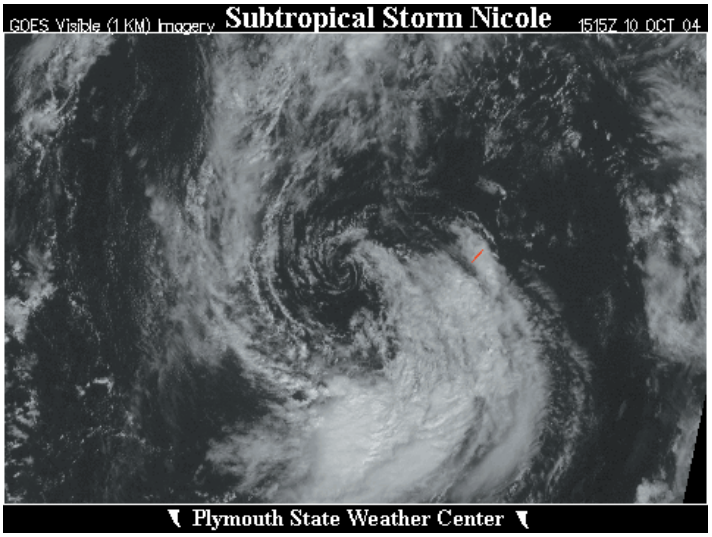
Karl was the last of the six major hurricanes of the season with 145 mph winds. Karl remained in the far eastern Atlantic Ocean during his lifetime.

Lisa had a similar track to Karl and remaining in the far eastern Atlantic Ocean during her lifetime. Lisa was much weaker than Karl and peaked at minimal hurricane strength (75 mph winds – Category 1 intensity).

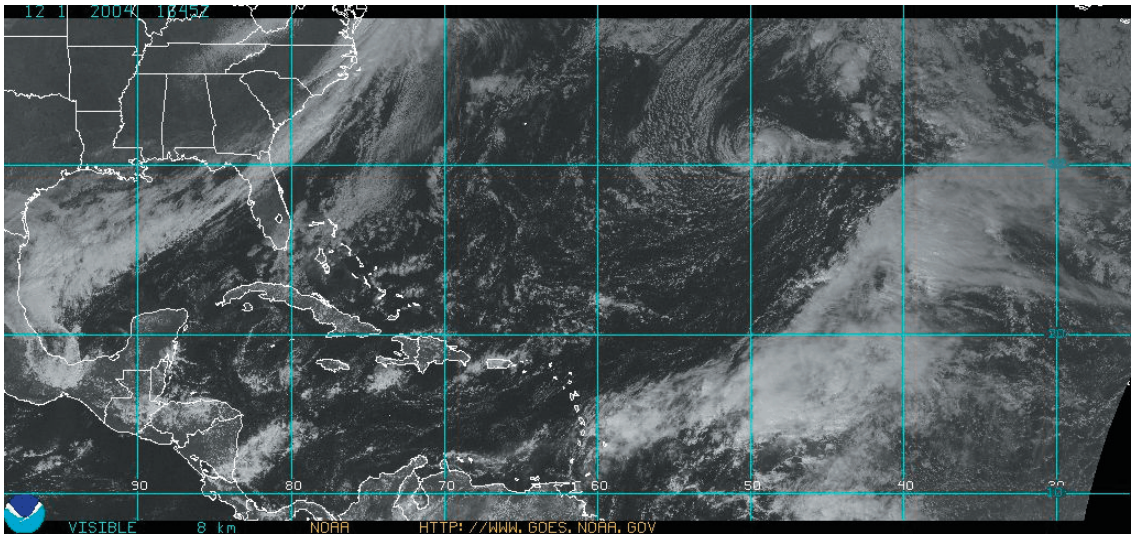
Matthew was a Gulf of Mexico system that reached a peak intensity of 45 mph. He made landfall just west of Cocodrie, Louisiana as a minimal tropical storm (40 mph winds). In Terrebone Parish, about twenty homes were flooded by the combination of rain and storm surge.

Nicole was a short-lived subtropical cyclone that developed from an extratropical low pressure system with gale force winds. The low meandered near Bermuda for a couple of days before acquiring enough thunderstorm activity to be declared a subtropical storm. Peak winds with Nicole were 50 mph. Nicole passed just west and northwest of Bermuda before being absorbed by a large extratropical low.

Otto formed from a non-tropical area of low pressure on the last day of the nominal hurricane season east of Bermuda. Otto lasted less than two days and reached a peak intensity of 50 mph.

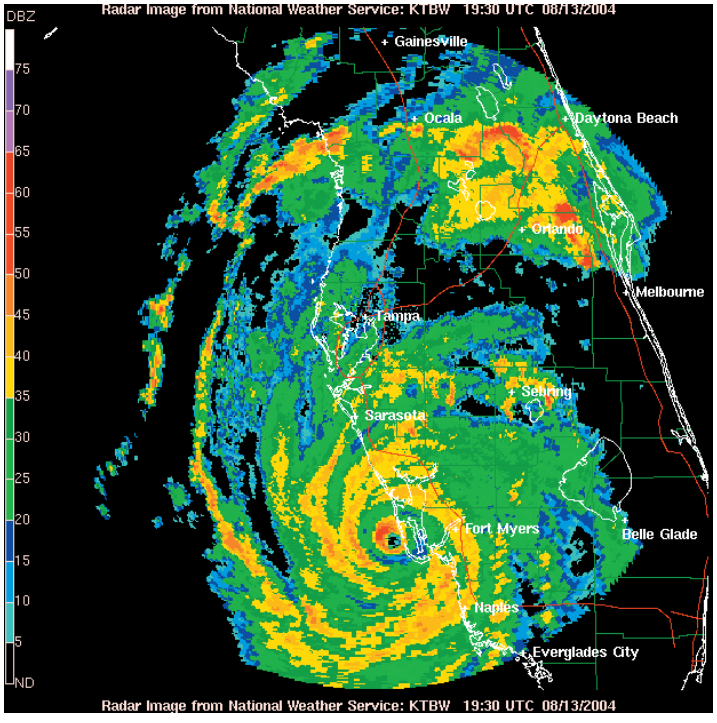


Visible satellite photo of Subtropical Storm Nicole from October 10, 2004.

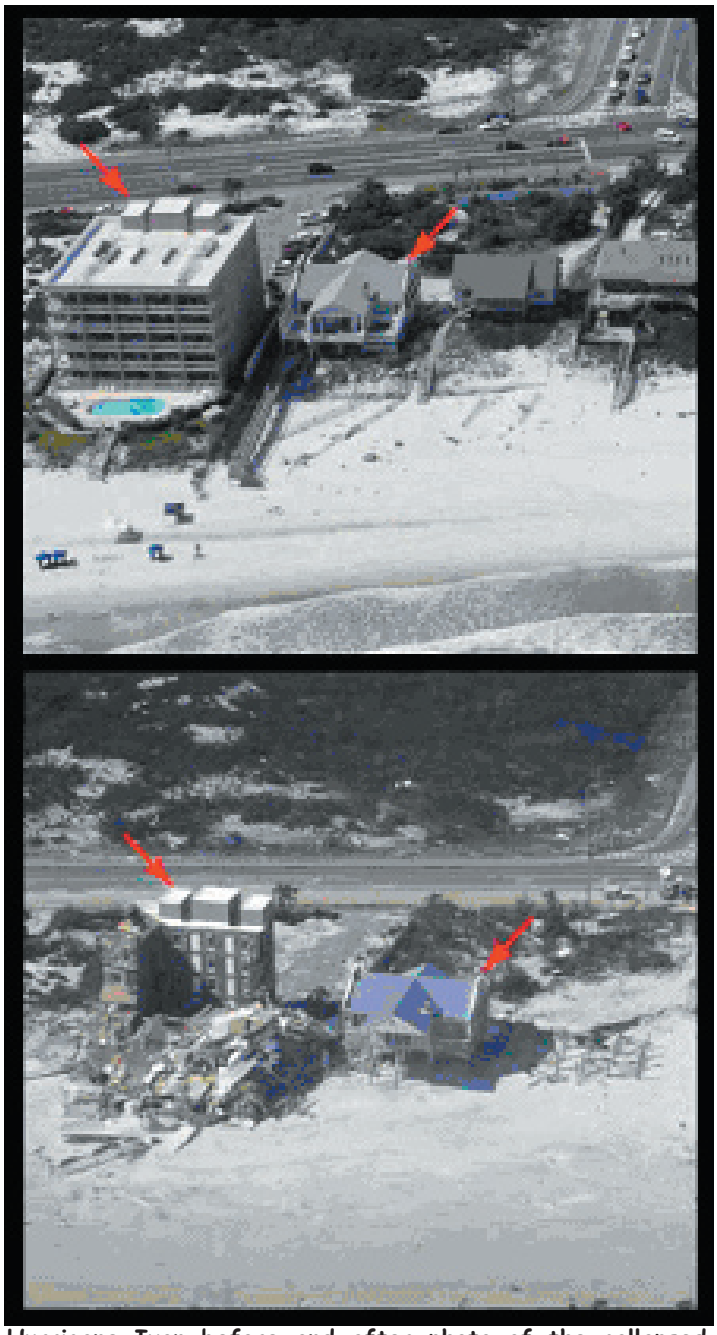


Visible satellite photo of Tropical Storm Otto taken December 1, 2004. Otto is out in the Atlantic Ocean east of Jacksonville, FL.

2004 Summary Table				
Name	Dates	Max Wind (MPH)	Deaths U.S.	Damage ($Millions)
H Alex	31 Jul - 6 Aug	120	1	5
TS Bonnie	3-12 Aug	65		
H Charley	9-14 Aug	150	15	14,000
H Danielle	13-21 Aug	105		
TS Earl	13-15 Aug	50		
H Frances	25 Aug - 8 Sep	145	7	8,860
H Gaston	27 Aug - 1 Sep	75	8	130
TS Hermine	29-31 Aug	40		
H Ivan	2 -24 Sep	165	95	13,000
TD Ten	7 - 9 Sep	35		
H Jeanne	13-29Sep	120	3000+	6,500
H Karl	16-24 Sep	145		
H Lisa	19 Sep - 3 Oct	75		
TS Matthew	8-10 Oct	45	N/A	
STS Nicole	10-11 Oct	50		



Hurricane Charley radar picture on August 13, 2004. Charley is centered near North Captiva Island, FL.



Hurricane Ivan before and after photo of the collapsed front of a multistory building on Orange Beach, AL. This multistory building was perched on top of a dune that was eroded during Hurricane Ivan. The Gulf-front portion of the building collapsed. Compare the pilings in the pre and post-photos of the house adjacent to the multi-story structure to determine the scale of vertical erosion of the dune. In the post-storm photo, the lower, unpainted portions of the pilings were below sand level prior to Hurricane Ivan.

Dune erosion and seawall failure, Melbourne Shores, FL: The upper photo is post-Frances and the bottom photo is post-Jeanne. The seawall on the right survived Hurricane Frances, but failed during Jeanne. Note the extreme dune erosion where the front face of the dune retreated landward to the pool.

2005 National Weather Service Hurricane Workshop

The 2005 National Weather Service Hurricane Workshop, presented by CenterPoint Energy, will take place on May 26 from 4:30-9:00 p.m. at the Pasadena Convention Center in Pasadena, Texas. The theme of the 2005 Workshop will be "Florida 2004: What if it happened in Texas?"

The 2005 Workshop will focus on the 2004 Hurricane Season, in particular the impact on Florida. We will also try to imagine what the impact four hurricanes in one season would have on Texas. The workshop will consist of a main session with several keynote speakers along with several breakout sessions covering hurricane related topics. A vendor area will also be available for companies involved in hurricane preparedness and hurricane protection.

The Houston/Galveston National Weather Service is proud to announce that CenterPoint Energy will be the presenting sponsor for the 2005 Hurricane Workshop. CenterPoint Energy, the company that maintains the electrical lines throughout the Greater Houston area, is very involved in preparing for and recovering from a major hurricane.

CenterPoint Energy had hundreds of employees in Florida this past hurricane season helping in restoring power to the local communities. CenterPoint Energy Regional Manager Ed Russell, who led the crews in restoring power in Florida, will talk about the Florida recovery process and will share how it would apply in Texas if we experience a major hurricane.

The City of Pasadena continues to be a sponsor of the workshop by furnishing the use of the Pasadena Convention Center for the 12th year in a row.

The National Hurricane Preparedness Week will take place from May 15 – 21 2005. The Texas State Hurricane Conference will take place from May 17-19 in Beaumont, Texas. Additional information can be found at:
www.srh.noaa.gov/hgx/tropical/meetings05.htm

National Severe Weather Workshop 2005

Fostering Effective Severe Weather Partnerships

www.norman.noaa.gov/nsww2005/

The 2005 National Severe Weather Workshop will be held on March 3-5 in Norman, OK. This annual workshop will feature the nation's premier severe weather experts discussing their latest research and forecasting techniques. Speakers will include forecasters and researchers from the NOAA Weather Partners in Norman: Storm Prediction Center, National Severe Storms Laboratory, Warning Decision Training Branch, Radar Operations Center and National Weather Service Norman Forecast Office.

Designed for emergency managers, storm spotters and other weather enthusiasts, the workshop offers a unique opportunity to learn about the National Weather Service's outlook, watch and warning process, severe weather preparedness and safety, StormReady, EMWIN, severe storm risks, lightning effects, wind damage effects and new ways to get radar data. Spotter training will be offered in conjunction with the workshop.

Turn Around Don't Drown

By Patrick G. Blood *

Each year, more deaths occur due to flooding than from any other thunderstorm-related hazard. Why? The main reason is people underestimate the force and power of water. Many deaths occur in automobiles as they are swept downstream. Of these drownings, many are preventable, but too many people continue to drive around the barriers that warn of flooded roadways.

Whether you are driving or walking, if you come to a flooded road, **Turn Around, Don't Drown.** You will not know the depth of the water nor will you know the condition of the road underneath the water.

Except for heat-related fatalities, more deaths occur from flooding than any other hazard. Most people fail to realize the absolute power of flowing water. For example, six inches of fast moving flood water can knock you off your feet! While the number of fatalities can dramatically vary with weather conditions from year to year, the national 30-year average for flood deaths is 127. This is significant when you compare that to the 30-year average of 73 deaths for lightning, 65 for tornadoes and 16 for hurricanes. You can easily see why you should be aware of the dangers of flooding, especially while driving.

National Weather Service data also shows:

- Nearly half of all flash flood fatalities are vehicle-related.
- The majority of victims are males.
- Flood deaths affect all age groups.

This is a definite No-No! Never drive into water of unknown depth!

Mother Nature follows no law (but her own) during floods!

Most flash floods are caused by slow moving thunderstorms; thunderstorms that move repeatedly over the same area or heavy rain produced by tropical cyclones. This type of flooding can develop within minutes or hours depending on the intensity and duration of the rain, the topography, soil conditions, and ground cover. Flash floods can roll boulders, tear out trees, destroy buildings and bridges, and scour out new channels. Rapidly rising water can reach heights of 30 feet or more! Occasionally, floating debris can accumulate at a natural or man-made obstruction and restrict the flow of water. Water held back by a debris dam can cause flooding upstream. Subsequent flash flooding can occur downstream if the obstruction should suddenly release.

Turn Around Don't Drown continued

Please follow these safety rules in the event of flooding:

- Monitor the NOAA Weather Radio, or your favorite news source, for vital weather related information.
- If flooding occurs, get to higher ground. Get out of areas subject to flooding. This includes dips, low spots, canyons, washes, etc.
- Avoid areas already flooded, especially if the water is flowing fast. Do not attempt to cross flowing streams. **Turn Around Don't Drown!**
- Road beds may be washed out under flood waters. NEVER drive through flooded roadways. **Turn Around Don't Drown!** If your vehicle is suddenly caught in rising water, leave it immediately and seek higher ground.
- Do not camp or park your vehicle along streams and washes, particularly during threatening conditions.
- Be especially cautious at night when it is harder to recognize flood dangers.

*Much of this information was taken off the SRH **T.A.D.D.** web site at: http://www.srh.noaa.gov/tadd/

Gene Hafele and Chris Fakes at NWS booth during the 2005 Boat

2005 Houston International Boat Show and Other Marine News

The 2005 Houston International Boat Show was held at the Reliant Center from January 7th through January 16th. Similar to the past several years, NWS Houston/Galveston hosted a booth to hand out weather safety brochures, tide tables, cloud charts, etc. This was a great opportunity for the Houston/Galveston NWS staff to meet with the marine community as they passed by and we enjoyed your comments and suggestions. Our booth had an internet connection which allowed us to show off the latest and greatest links off our homepage (www.srh.noaa.gov/hgx) and show folks where to obtain various weather information they were interested in. As of this writing the attendance total was not available, but the show has averaged around 140,000 people for the past several years.

In other news:
(1) Forrest Oil, and their contractor, the ESSI Corporation, have installed an environmental monitoring station in the Gulf of Mexico that features an animated web cam. Courtesy of a high speed Internet connection, they provide 10 frame loops of photos taken every second. New loops are sent about every five minutes. Measurements of wind direction, speed, gust, air temperature, dew point, salinity, sea surface temperature, and surface current measurements are sent every 15 minutes. The station is near the Flower Garden Banks, about 115 miles south of the Texas-Louisiana border. The specific web page address is: http://www.ndbc.noaa.gov/station_page.php?station=fgbl1 A big thank you goes out to Forrest Oil for sharing their data with the NWS.

(2) We would like to talk to regular users of the Upper Texas Coast Tide Forecast that we produce. (www.srh.noaa.gov/hgx/productview.php?pil=HGXTIDHGX&version=0)
Wind direction usually plays as big of a part, if not more, than astronomical conditions in determining how high/low the water levels get along the upper Texas Coast. This affects not only boaters, but those with property on the coast suspect to coastal flooding. We are thinking about changing the format of the product in the next couple months to make it more user-friendly and easier to understand. In order for more people to understand the product and use it on a regular basis, we would like to hear some of your suggestions on how to improve the tide forecast. Please send comments/suggestions to: Brian.Kyle@noaa.gov **Please type in the subject bar "Tide Forecast".** Help us help you!

Houston's Local Chapter of the American Meteorological Society

The Houston Chapter of the American Meteorological Society was founded in 1965 and continues to thrive on the large meteorological community across southeast Texas. From private sector and consulting meteorology businesses to areas of government including NASA and the NOAA/National Weather Service, the Houston Chapter has a diversified membership. The chapter is also represented by emergency managers from industry and governmental agencies, various media outlets, educational associations including the University of Houston and Texas A&M University, and weather enthusiasts from all walks of life. The Houston Chapter holds monthly meetings at various locations across the area to ensure a wide variety of meeting sites, tours, topics, and speakers. Some examples of where the Chapter has met and toured over this past year include visiting Houston's state-of-the-art Emergency Center, Hobby Airport's 1940 Air Terminal Museum, and NASA's Spaceflight Meteorology Group.

The Houston Chapter has provided a forum for members of the scientific community and academia to present seminars of interest to the membership. A topic last winter was on the current status and future of the Texas Mesonet. Involvement remains high with Texas A&M University and their Student Chapter of the American Meteorological Society (TAMSCAMS). Chapter involvement in the upcoming Texas A&M field project, "The Houston Environmental Aerosol Thunderstorm (HEAT) Project" is in the works. Each spring, the Chapter has a joint meeting with the TAMSCAMS and participates in the Texas A&M student career fair. Hurricane Awareness Week kicked off here in Houston with the P-3 (NOAA Hurricane Research Aircraft) Tour, thus we were fortunate enough to have Mr. Stacy Stewart, a Hurricane Specialist from the National Hurricane Center, speak to our group following that tour. His presentation, "The Effects of Hurricane Claudette on Texas," included forecasting situations that occurred during Claudette's life along with video clips. Obviously, hurricane topics are always of great interest to the Houston Chapter and its members that call the Gulf coast 'home'. This season kicked off with that same theme. The night Hurricane Ivan was making landfall across Florida's western Emerald Coast, Dr. Courtney Schumacher of Texas A&M University gave a presentation on the predictability, along with the nature of convective intensity, of tropical cyclones. Careers in private sector meteorology are also a hot topic. This fall, for example, a panel discussion featuring meteorologists from four of Houston's top energy firms spoke on the varying aspects of their respective careers in today's ever-fluctuating energy trading market.

While our monthly meetings are a priority, education and community outreach is also a critical component of the Houston local chapter. Chapter members annually participate in the collection and initial screening for the AMS/Industry Minority Scholarship applications. The minority scholarship is intended to help support college education for minority students traditionally underrepresented in the sciences. Furthermore, each spring the Houston local chapter supplies judges and provides awards to students at the Science and Engineering Fair of Houston. Members are also active in giving local school district talks. Please visit our web page at www.amshouston.org and, if you are interested in joining, feel free in contacting one of the officers. This website includes information on upcoming monthly chapter meetings and current events.

Liz Murphy - President / Patrick Blood - Secretary

The Spring Storm Season

Often in Southeast Texas, the most active season for severe weather is the collection of the spring months of March, April, and May.

With warm, moist air returning from the Gulf of Mexico and active frontal systems from the north and west, the Upper Texas Coast and Southeast Texas often experience numerous showers and thunderstorms.

There are mainly two big weather phenomena during the spring-thunderstorms and tornadoes. Tornadoes are associated with thunderstorms, but not every thunderstorm is capable of producing a tornado. However, thunderstorms can still produce significant damage without the presence of tornadoes. By definition, a thunderstorm produces lightning which is the number two weather related killer in the United States. The number one killer is flash floods which are also associated with thunderstorms. Despite the popularity or notoriety of hurricanes and tornadoes, the two main weather related killers can occur on a frequent basis. There are ways to help reduce the chances of suffering injury or damage during thunderstorms.

The best defense for spring thunderstorms is preparation. Try to keep updated to forecasts that might suggest severe weather. There are several signs that suggest a thunderstorm approaching. Thunder is often the best warning signal. Temperature changes and breezy winds also offer a clue to approaching weather. If you can hear thunder or feel cool breezes, you are close enough to the thunderstorm to be affected. If at all possible, take shelter in a sturdy building away from windows. Use phones only in case of an emergency. If a shelter is not available, find a hard top automobile and keep the windows up. A common myth about automobiles is that the rubber tires insulate the car. This is false as lightning can still strike the vehicle. But the vehicle will provide significantly more protection than the open ground. Stay away from towers, hills, and tall trees as objects protruding into the air are the ones most likely to be struck. The only time to move to higher ground is if flood waters have been seen or reported in your area. If at the lake or on the coast, get off and away from water. If caught in the open ground, find a low spot in the terrain away from trees and fences. Squat low to the ground and lean on the balls of your feet. As lightning strikes the ground, it often spreads in several directions and can strike any object in the vicinity. By eliminating the area of ground that your are in contact with, you minimize your chance of being struck. If at all possible, stay informed by listening to advisories from commercial radio and television or to the National Weather Service's weather radio. With proper information and preparation, you can reduce the damage of severe thunderstorms to you, your family, and your property.

Tornadoes offer different problems, but many safety rules from thunderstorms apply. The best defense is again preparation. Practice tornado drills so that all members of the family or employees of businesses know the appropriate locations of tornado shelters. Don't panic. Move to an interior room away from windows. If at all possible cover yourself with blankets, pillows, or other soft objects. If driving, find a suitable low spot on the ground as quick as possible and abandon your vehicle. Do not try to outrun a tornado. If you reside in a mobile home, leave and find appropriate shelter as mobile homes offer little, if any, protection from tornadoes. Stay informed with the changing weather conditions.

By following these basic rules, one can minimize the risk, and thus the damage, posed by the variety of spring severe weather over Southeast Texas.

DEFINITIONS:

Tornado Watch - Conditions are favorable for the development of tornadoes (tornadoes are possible in the area).

Severe Thunderstorm Watch - Conditions are favorable for the development of severe thunderstorms (severe thunderstorms are possible in the area).

Tornado Warning - Tornadoes are imminent or are occurring in the area.

Severe Thunderstorm Warning - Severe thunderstorms are imminent or are occurring in the area.

El Niño Pattern will persist going into 2005: What does that mean for us?

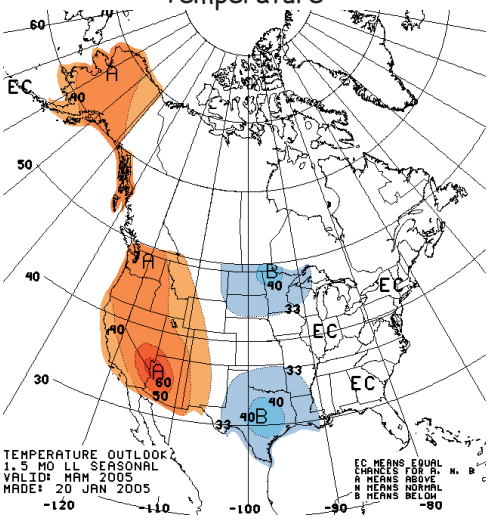
By Patrick Blood

The phenomenon known as El Niño has been observed as early as the 1600's off the coast of Peru. At varying intervals, anomalously warm waters off the Peruvian coast appeared around Christmas and were dubbed El Niño, for the Christ Child, by local fishermen. The development of El Niño has its origins in the western Pacific Ocean. Easterly trade winds relax while westerly winds become more prevalent. These westerlies induce eastward propagating surges of warmer water (Kelvin waves) along the equator towards South America. These waves deepen the ocean's (near) surface layer, the warmer 'mixed layer'. Thus, as a result, there is an overall net warming of the eastern and central equatorial Pacific Ocean. El Niño events occur irregularly at intervals of 2 to 7 years, although the average is about once every 3 to 4 years. They typically last 12 to 18 months, and are accompanied by swings in the Southern Oscillation (SO), the seesaw in tropical sea level atmospheric pressure between the eastern and western hemispheres. Hence, the scientific community refers to this phenomena as the **ENSO** pattern; **E**l **N**iño **S**outhern **O**scillation pattern.

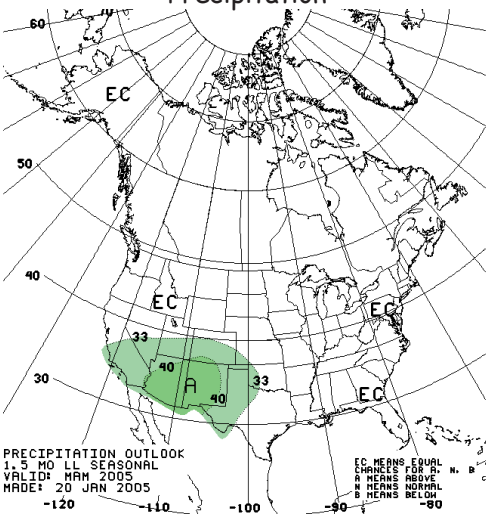
U.S Seasonal Outlook

March 2005 - May 2005

Temperature

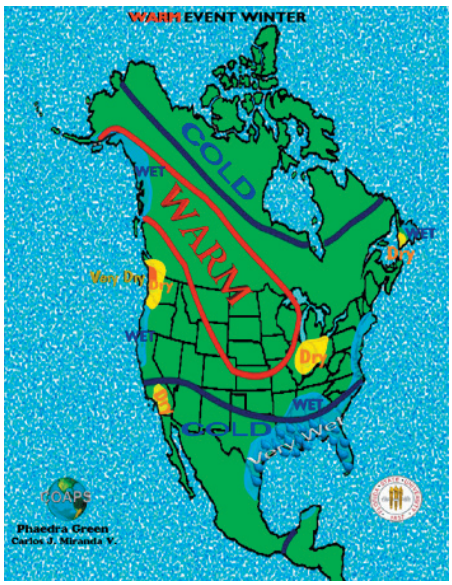


Precipitation



"The Numbers": Southeast Texas will have about a 30 to 40 % chance of experiencing colder-than-normal average temperatures. Seasonal rainfall is expected to be normal through May.

U.S. El Niño Winter Pattern



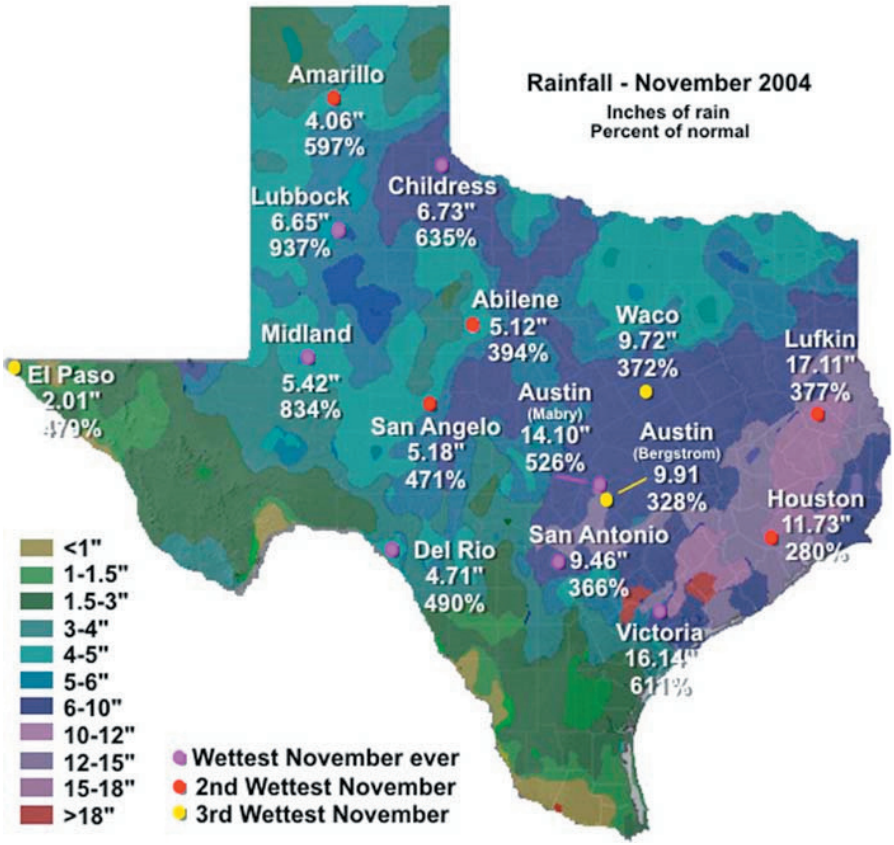
U.S. El Niño Spring Pattern

During El Niño, unusually high atmospheric pressures develop in the western tropical Pacific and Indian Ocean regions, and unusually low pressures develop in the southeastern tropical Pacific. Atmospheric and oceanic links have been made between tropical Pacific Ocean behavior and higher-latitude weather patterns, especially in the shift of mid-latitude weather patterns that affect you and I. El Niño is a disruption of the ocean-atmosphere system in the tropical Pacific having important consequences for weather around the globe. In normal (non- El Niño) years, the winds tend to blow from east to west across the waters of the tropical Pacific. These easterly winds push the surface waters westward across the ocean. In turn, this causes deeper, colder waters to rise to the surface. This "upwelling" of deep ocean waters brings with it the nutrients that otherwise would remain near the bottom. The fish populations living in the upper waters are dependent upon these nutrients for survival; hence the Peruvian anchovy business thrives. During El Niño years, the winds weaken, causing the upwelling of deep water to cease, ultimately causing the Peruvian fishing industry to suffer. The consequent warming of the ocean surface further weakens the winds and strengthens El Niño. As the ocean warms, the warmer water shifts eastward and so do the clouds and thunderstorms that produce heavy rainfall along the equator. This results in altered courses of jet streams (winds aloft), which lead to wetter and cooler conditions for us here in Southeast Texas. These wetter, cooler months usually occur from September through May. Typically, in an El Niño event, the southern branch of the polar jet stream travels across the Southern U.S. The enhanced rainfall brought on by this southern-shifting jet stream also tends to produce a cooling effect upon our daily afternoon temperatures. This is because of increased cloud cover and the evaporative cooling effects of precipitation. There is also the threat for a higher frequency of tornadoes and stronger storms as regions under the influence of the jet steam are more susceptible to severe weather.

Was soggy November 2004 a sign of what to expect from this on-going El Niño pattern?

November's Rainfall Data		
Location	**Average Rainfall**	**% of Normal**
Intercontinental AP	**11.73"**	**+ 280 %**
Galveston	**7.78"**	**+ 214 %**
College Station	**9.23"**	**+ 290 %**

November 2004 was the wettest November ever in Texas since comprehensive record-keeping began in 1895. An average 6.08 inches fell statewide, surpassing the previous record of 5.71 inches over a hundred years ago in 1902.



Recent Moderate to Strong El Niño Events at Intercontinental Airport (Oct. – Mar.):

Year	Average Low	Departure	Average High	Departure	Precipitation	Departure
1982-1983	47.7	+0.7	67.8	-1.6	30.28	+9.60
1986-1987	48.6	+1.6	67.7	-1.7	26.76	+6.08
1991-1992	49.8	+2.8	70.2	+0.8	36.91	+16.23
1994-1995	52.1	+5.1	71.4	+2.0	29.80	+9.12
1997-1998	47.6	+0.6	68.2	-1.2	28.43	+7.75
2002-2003	49.5	+2.5	67.1	-2.3	32.71	+12.03

In learning more about El Niño and its effects on us, please follow these links:

Climate Prediction Center's El Niño Home Page:
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/

Seasonal Cold and Warm Episodes:
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ensoyears.html

Lake Charles' Forecast Office study on precipitation anomalies over the Northwestern Gulf Coast during strong El Niño episodes:
http://www.srh.noaa.gov/lch/research/bptlch.htm

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 Fahrenheit and the wind is blowing at 15 mph, the wind chill is -19 degrees Fahrenheit. 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 Fahrenheit and the wind chill temperature is -31 degrees Fahrenheit, then your car's radiator will not drop lower than -5 degrees Fahrenheit.

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 Fahrenheit. 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 Fahrenheit, 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.

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. We will look into adding a Celcius version to the web page calculator. In the mean time, you can 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 National Weather Service issue a Wind Chill Advisory or Warning?

Criteria for issuing Wind Chill Warnings and Advisories are set locally. For the Rochester, NY area, Wind Chill Warnings are issued when the Wind Chill Temperature is expected to fall at or below -25 F. Wind Chill Advisories are issued when the wind chill temperature is expected to fall between -15F and -24F.

12. Does windchill 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. Object will NOT cool below the actual air temperature. For example, if the temperature outside is -5 degrees Fahrenheit and the wind chill temperature is -31 degrees Fahrenheit, then your car's radiator will not drop lower than -5 degrees F.

13. Does humidity or being near a large water body affect on 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.

Wind Chill Chart

Wind (mph) \ Temperature (°F)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Calm																		
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

Staff Spotlight:
NWS Forecast Office Houston/Galveston

Name: NWS Forecast Office Houston/Galveston
Position: Building
Favorite Movie: I don't like movies, but I love that Bob the Builder.

Personal Information
Hometown: League City, TX
Status: Single and soon to be alone.

NWS Background

1990	I was built!
2005	I will be abandoned.

Favorite Color: Off white, the color of my tiles.
Favorite Ice Cream Flavor: I don't like any of them; the forecasters, however, love it but they always spill it on my carpet.

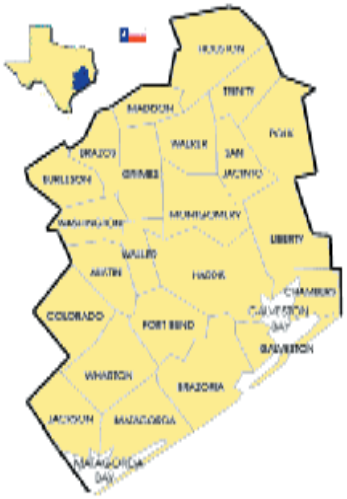
Career Highlights / Achievements / Duties / Other Tidbits
- I am one of the first "modern era" WFO offices to be built in the US (one of five).
- I was changed from a satellite office (with San Antonio being the parent office) to an independent forecast office in 1993.
- I was one of the first NWS offices to get Doppler radar in 1992 (one of ten).
- The Galveston office's duties were incorporated into this office in 1994.

Most memorable employee? Oh, there are far too many to mention, trust me.

Most memorable weather events?
- November 21, 1992 tornado outbreak. That was the first major weather event here.
- October 1994 floods.
- Tropical Storm Allison (2001).
- The Great Christmas Eve snow storm of 2004.

What is the greatest difference you have seen during the fifteen years of your existence?
The advances in technology! When I was first built, the main weather tool was AFOS (Automation of Field Operations and Services), which was an upgrade from teletype, as a tool for dissemination. That system consisted of a graphics monitor and a text monitor and you could only look at one graphic at a time (no overlays!). To look at satellite or radar, you had to look at a completely different computer. Now with AWIPS (Advanced Weather Interactive Processing System), all of that has combined into one system, making things easier on our wonderful forecasters. As far as the forecasters are concerned, there's just more of them to love nowadays!

Houston/Galveston
National Weather Service
1620 Gill Road
Dickinson, TX 77539



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

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