Storm Signals

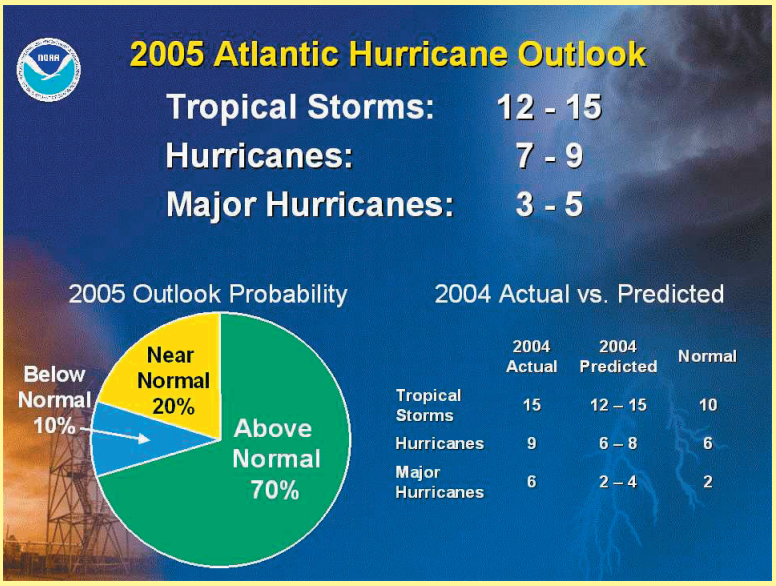
Houston/Galveston National Weather Service Office

Volume 70 Summer 2005

2005 Hurricane Season Outlook

Expected Activity

NOAA hurricane forecasters are predicting another above-normal hurricane season on the heels of last year's destructive and historic hurricane season. In May 2005, NOAA's forecast is calling for 12 to 15 tropical storms, with 7 to 9 becoming hurricanes, of which 3 to 5 could become major hurricanes (normals are 10, 6 and 3, respectively). NOAA's Atlantic hurricane outlook reflects a continuation of above-average activity that began in 1995. Since that time, all but two Atlantic hurricane seasons have been above-normal.



NOAA predicts that the vast majority of the tropical storms and hurricanes in 2005 will form during August-October. Many of these are likely to form over the tropical Atlantic and Caribbean Sea in the deep tropics region (between 9°N-21.5°N), which is typical for above-normal seasons. These systems generally track westward toward the Caribbean Sea and/or United States as they strengthen. Historically, similar seasons have averaged 2-3 landfalling hurricanes in the continental United States and 1-2 hurricanes in the region around the Caribbean Sea. However, it is currently not possible to confidently predict at these extended ranges the number or intensity of landfalling hurricanes, and whether or not a given locality will be impacted by a hurricane this season.

Expected Climate Conditions

Beginning with 1995, all of the Atlantic hurricane seasons have been above normal, with the exception of two El Niño years (1997 and 2002). This contrasts sharply with the generally below-normal activity observed during the previous 25-year period 1970-1994.

The regional atmospheric circulation features and oceanic conditions causing these very long-period fluctuations in hurricane activity are linked to something called the tropics-wide multi-decadal signal. This multi-decadal signal has been very conducive to above-normal hurricane seasons since 1995, and is again a main factor guiding the 2005 outlook.

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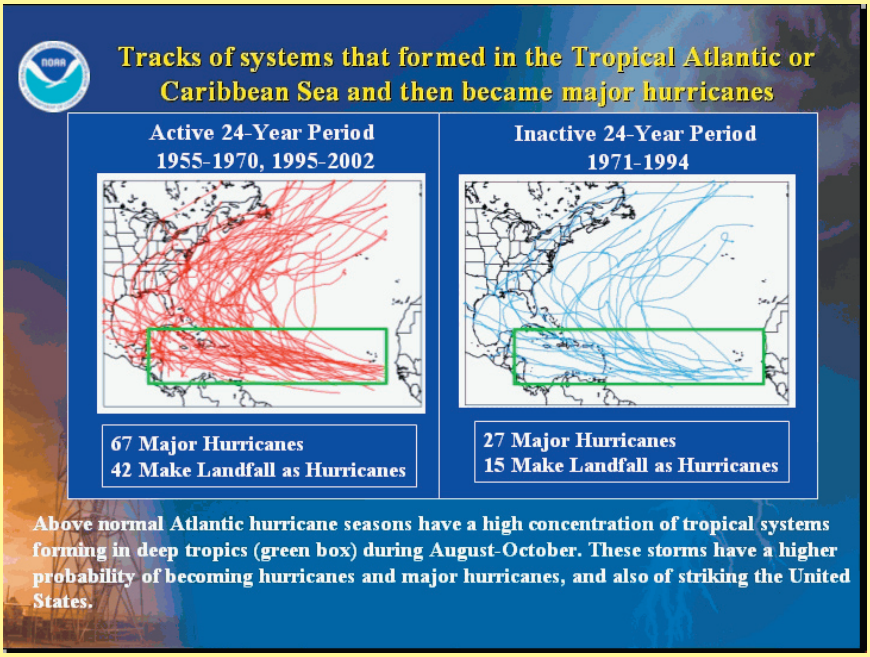
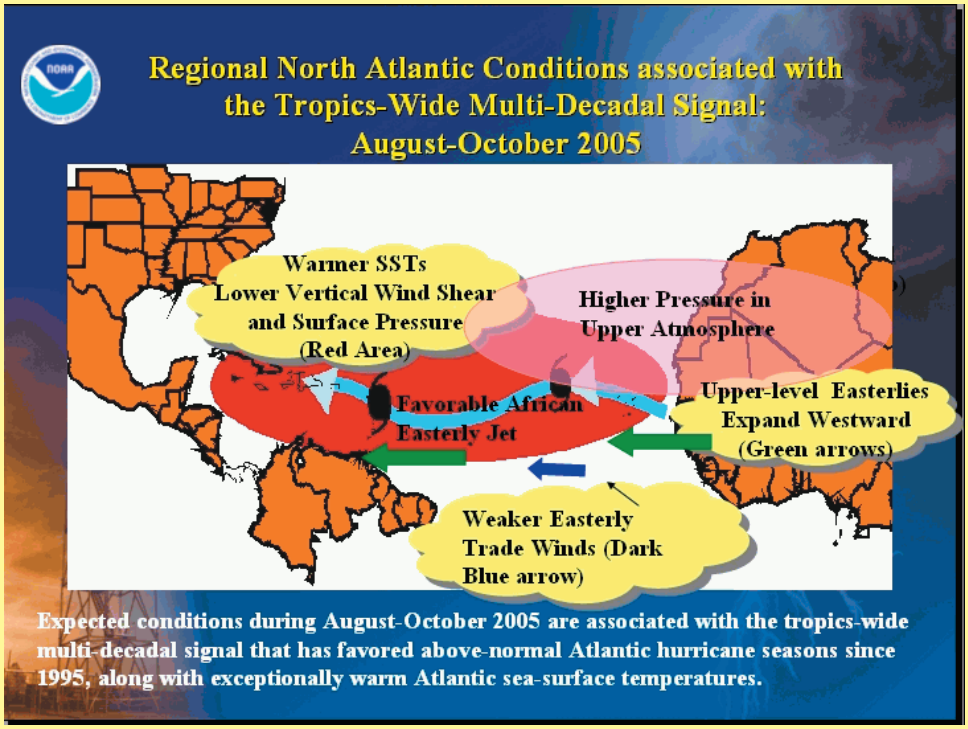


Over the North Atlantic, key aspects of the multi-decadal signal expected during the 2005 hurricane season include: 1) lower surface air pressure, warmer sea surface temperatures (SSTs), and increased moisture across the central and eastern tropical Atlantic, 2) an amplified subtropical ridge at upper levels across the central and eastern North Atlantic, 3) reduced vertical wind shear in the deep tropics over the central North Atlantic, which results from an expanded area of easterly winds in the upper atmosphere (green arrows) and weaker easterly trade winds in the lower atmosphere (dark blue arrows), and 4) a configuration of the African easterly jet (wavy light blue arrow) that favors hurricane development from tropical disturbances moving westward from the African coast.



Also expected this season is a continuation of tropical Atlantic SSTs that are warmer than can be accounted for by the multi-decadal signal. This additional warmth is more conducive to hurricane formation than would be expected from the multi-decadal signal alone.

Another factor known to significantly impact the Atlantic hurricane seasons is ENSO (El Niño/Southern Oscillation), with El Niño favoring fewer hurricanes and La Niña favoring more hurricanes. Based on the most recent ENSO Outlook issued by NOAA's Climate Prediction Center, ENSO-neutral conditions are expected in the tropical Pacific through at least the first half of the hurricane season. Therefore, the ENSO phenomenon is not expected to impact this hurricane season.

Multi-decadal fluctuations in Atlantic hurricane activity

Atlantic hurricane seasons exhibit prolonged periods lasting decades of generally above-normal or below-normal activity. These multi-decadal fluctuations in hurricane activity result nearly entirely from differences in the number of hurricanes and major hurricanes forming from tropical storms first named in the tropical Atlantic and Caribbean Sea.

Hurricane seasons during 1995-2004 have averaged 13.6 tropical storms, 7.8 hurricanes and 3.8 major hurricanes. NOAA classifies all but two of these ten seasons (El Niño years of 1997 and 2002) as above normal. In contrast, during the preceding 1970-1994 period, hurricane seasons averaged 9 tropical storms, 5 hurricanes, and 1.5 major hurricanes. NOAA classifies twelve (almost one-half) of these 25 seasons as being below normal, and only three as being above normal (1980, 1988, 1989).

Uncertainties in the Outlook

The main uncertainty in NOAA's outlook is not whether the season will be above normal, but how much above normal it will be. There is the possibility of another extremely active season similar to that seen in 2003 and 2004. These very active seasons resulted partly from the combination of near-record warmth across the tropical Atlantic and an amplified upper-level ridge over the western subtropical North Atlantic and eastern United States.

A second uncertainty is that weak El Niño conditions may occur during August-October, as indicated by some ENSO forecasts. Although unlikely, El Niño conditions during this period could reduce the chance for an above-normal season.

NOAA scientists will closely monitor the evolving climate conditions. A more confident El Nino forecast will be available for NOAA's updated Atlantic hurricane outlook to be issued in early August, which is prior to the normal active portion of the Atlantic hurricane season.

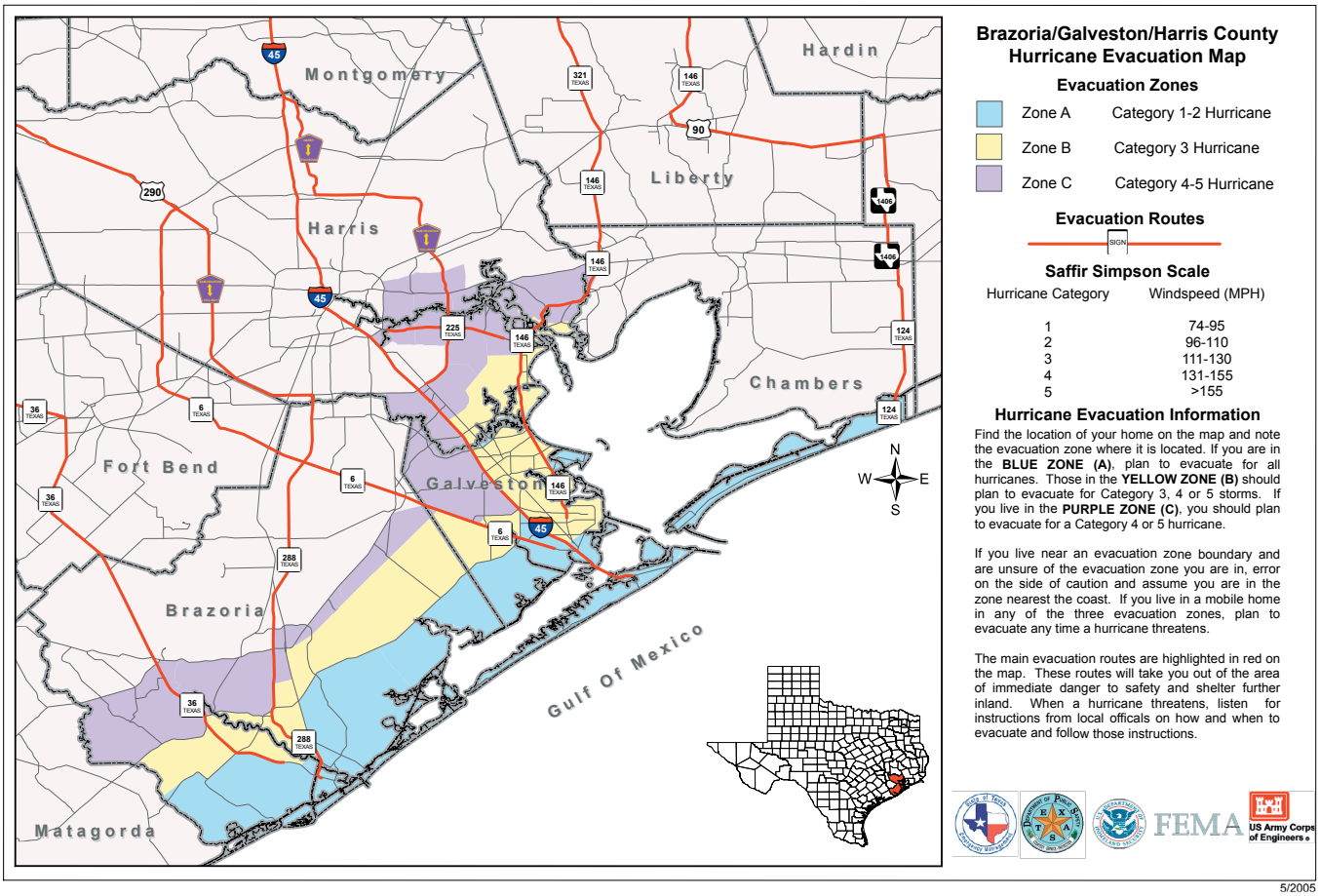
It must always be noted that far more damage can be done by one major hurricane hitting a heavily populated area than by several hurricanes hitting sparsely populated areas or, of course, not making landfall at all. Therefore, hurricane-spawned disasters can occur even in years with near-normal or below-normal levels of activity. Examples of years with near-normal activity that featured extensive hurricane damage and numerous fatalities include 1960 (Hurricane Donna), 1979 (Hurricanes David and Frederic), and 1985 (Hurricanes Elena, Gloria and Juan). Moreover, the nation's most damaging hurricane, Andrew in 1992, occurred during a season with otherwise below normal activity. And, of course, Hurricane Alicia, the last major hurricane for Southeast Texas, occurred in 1983 - a year that ended up with only four named storms.

Evacuation Plan for Harris, Galveston and Brazoria Counties

When a category 3, 4, or 5 hurricane threatens the upper Texas Coast, will you evacuate? If the answer is yes, and we do hope it is yes, do you know where you will go? If you leave early enough before local officials make any evacuation recommendations, you will be allowed to go in any direction, on any road you choose. When evacuating, we recommend you move away from the coast, away from the storm surge zone. Remember, "run from the water…protect from the wind". If you wait until local officials recommend evacuation for your area, your choice of evacuation routes will be limited.

The Department of Public Safety along with Emergency Management Officials from Harris, Galveston and Brazoria Counties have developed channeled evacuation corridors to expedite the movement of traffic north out of the storm surge zone. These evacuation corridors will have limited access as you travel further inland allowing the evacuation traffic to proceed north with very little interference from local traffic. Traffic signals will be set to blinking yellow along the corridors in favor of the evacuating traffic. Major intersections will be also be controlled by law enforcement to expedite the flow of traffic.

The evacuation corridors for Galveston County include Highway 146 to Lufkin, Interstate 45 to Huntsville and Highway 6 to College Station. The evacuation corridors for southeast Harris County include Highway 146 to Lufkin and Interstate 45 to Huntsville. The evacuation corridors for Brazoria County include Highway 36 to Brenham and Highway 288 to College Station via Beltway 8, Highway 290 and Highway 6. The communities that exist along these corridors will be required to use these roads once the evacuation decision has been made. For example: citizens that will be leaving Galveston Island will be required to stay on I-45. They will not be allowed to exit onto Highway 6 or Highway 146 but must remain on I-45. The evacuation map below shows the different evacuation routes in red. Please note: there are not any direct connections between the various evacuation routes in red.



The ultimate goal is to allow all citizens that want to evacuate inland from a major hurricane the opportunity to do so before the winds reach 40 mph. For a category 3, 4 or 5 hurricane the decision to evacuate will have to be made 30 to 36 hours before the expected onset of 40 mph winds. Due to the uncertainty in hurricane forecasts, there will be events when you may be asked to evacuate, that in hindsight were not necessary. The NWS and Emergency Management Officials would prefer you leave when you do not have to, rather than to stay when you should have left.

For further information, please contact your local emergency management official or the Houston/Galveston National Weather Service.

Hurricane Talks

The Houston/Galveston National Weather Service Office offers informative hurricane talks to schools, businesses and organizations. These talks include details on the dangers of tropical storms and hurricanes, the history of activity along the Southeast Texas coast and ways to protect your life and property during a tropical threat. Brochures on hurricanes can also be made available to all attendees.

If you are interested in having a meteorologist come to you to talk about hurricanes, please contact Gene Hafele (Gene.Hafele@noaa.gov) or Joshua Lichter (Joshua.Lichter@noaa.gov) at (281)337-5074. The more you know about tropical storms and hurricanes, the better you will be prepared to survive when the next one strikes.

Dedication of Our New Building

On Wednesday, May 25th, the Galveston County Emergency Management Facility was dedicated for service to the citizens of Galveston County. We were honored to be participants in the ceremony and Mr. X. William Proenza, NWS Southern Region Director, Dr. Ed Rappaport, Deputy Director of the National Hurricane Center, and Bill Read, Meteorologist In Charge, Houston/Galveston National Weather Service Office, were on the dias to say a few words to the 200 plus people in attendance. Other speakers included Texas Governors Division of Emergency Management Coordinator Jack Colley, Galveston County Communications District Board Chairman Tommy Anderson and County Judge, Jim Yarbrough. Prior to the ceremony, a lunch and tour for VIPs and media representatives was conducted. After the ceremony, the facility was open for visitors to come and see the new digs and meet with those of us who work here. Local elected officials, emergency management and responders, family members and even a few former employees were on hand for the festivities.

Dr. Ed Rappaort speaking at the dedication ceremony.

Southeast Texas Drier than Normal through June
Temperatures Slightly Warmer than Normal

For lack of a better term, the weather across Southeast Texas could best be described as roller coaster like. Temperatures were warmer than normal in January and February (top of the hill), cooler than normal in March, April and May (bottom of the hill) and then warmer than normal in June (climbing toward the top of the hill). Rainfall data supports a similar curve with maximum values in January and February and minimum values March through June with the absolute minimum occurring in June.

2005 started out considerably warmer than normal with January temperatures averaging 2 to 4 degrees warmer than normal. Rainfall in January was generally 1 to 2 inches less than normal over the southern two-thirds of the region with near normal values over the northern one-third of the region. Other than periods of fog, no hazardous weather was reported.

February was also warmer than normal with temperatures averaging another 2 to 4 degrees warmer than normal. Rainfall was also above normal with some heavy rainfall noted over central parts of the region with lesser rainfall totals toward the coast. Pea sized to 1 inch diameter hail fell over parts of Montgomery county on the 13th.

During March, rainfall remained above normal areawide averaging around an inch greater than normal with the higher values along the coast. Several bouts of severe weather occurred during the month with 1 inch diameter hail falling near Beltway 8 and I-45 South on March 7th and 2 inch diameter hail falling in Burleson county on the 19th.

Rainfall was considerably less than normal in April with rainfall totals 1 to 2 inches below normal. Temperatures were slightly warmer than normal along the coast and cooler than normal inland. Thunderstorms on the 5th produced hail from Brazos county to Houston county.

There were several episodes of severe weather in May. On May 8th, large hail pummeled parts of Wharton, Fort Bend and Brazoria counties and high winds uprooted trees and toppled power lines in Fort Bend, Brazoria and Galveston counties. Golf ball sized hail pounded areas from Columbus to Coldspring on the 28th. Rainfall in May varied greatly with some locations 2 to 3 inches above normal and many locations 2 to 3 inches below normal.

Rainfall was well below normal during June. It was the driest June in recorded history for the city of Houston and the 8th driest June for Galveston. It was also the 3rd warmest June in Galveston and tied for the 10th warmest June for College Station. Despite the lack of organized thunderstorm activity, an isolated severe storm near Bellaire in Harris county still produced hail and toppled a few trees on June 14th.

Here is the temperature and rainfall data for several sites across Southeast Texas.

January 2005

Site	Avg High	Avg Low	Avg Daily	Departure	Rainfall	Departure
IAH	65.2	47.3	56.3	+4.5	3.41	-0.27
GLS	64.7	51.9	58.3	+2.5	2.16	-1.92
CLL	63.3	45.9	54.6	+4.4	3.92	+0.60
HOU	66.5	49.0	57.8	+3.5	0.96	-3.29
PSX	65.5	48.6	57.0	+4.1	1.42	-1.76
UTS	64.0	46.2	55.1	N/A	2.73	N/A
CXO	63.8	44.7	54.2	N/A	3.48	N/A
LVJ	65.9	48.8	57.3	N/A	2.11	N/A
SGR	66.5	48.6	57.6	N/A	1.91	N/A
DWH	64.2	46.6	55.4	N/A	3.69	N/A
HGX	65.6	47.7	56.7	N/A	1.83	N/A

February 2005

Site	Avg High	Avg Low	Avg Daily	Departure	Rainfall	Departure
IAH	66.2	51.3	58.8	+3.4	6.10	+3.12
GLS	64.7	54.4	59.5	+1.5	2.76	+0.15
CLL	64.6	49.6	57.1	+2.6	5.07	+2.69
HOU	66.5	52.9	59.7	+2.0	4.22	+1.21
PSX	66.4	53.2	59.8	+4.0	2.89	+0.44
UTS	65.5	49.1	57.3	N/A	4.74	N/A
CXO	64.8	47.9	56.3	N/A	5.54	N/A
LVJ	66.2	52.8	59.5	N/A	4.16	N/A
SGR	67.4	52.8	60.1	N/A	6.02	N/A
DWH	65.9	50.1	58.0	N/A	5.25	N/A
HGX	65.4	51.1	58.2	N/A	3.54	N/A

March 2005						
Site	Avg High	Avg Low	Avg Daily	Departure	Rainfall	Departure
IAH	72.5	53.3	62.9	-1.3	3.62	+0.43
GLS	70.2	57.2	63.7	-0.4	3.92	+1.16
CLL	71.1	49.6	60.4	-1.2	3.81	+0.97
HOU	72.5	53.3	62.9	-1.3	3.62	+0.43
PSX	72.6	54.8	63.7	+1.6	6.06	+3.36
UTS	71.5	50.1	60.8	N/A	2.84	N/A
CXO	71.4	47.3	59.3	N/A	2.83	N/A
LVJ	72.3	52.7	62.5	N/A	3.34	N/A
SGR	73.2	51.9	62.6	N/A	2.82	N/A
DWH	72.0	49.9	61.0	N/A	3.18	N/A
HGX	71.4	50.5	60.9	N/A	4.63	N/A

April 2005						
Site	Avg High	Avg Low	Avg Daily	Departure	Rainfall	Departure
IAH	78.3	57.1	67.7	-0.8	1.28	-2.32
GLS	77.0	64.7	70.8	+0.8	1.85	-0.71
CLL	78.1	55.9	67.0	-0.9	1.26	-1.94
HOU	78.6	59.1	68.8	-1.2	0.88	-2.58
PSX	79.1	60.1	69.6	+1.1	1.04	-1.76
UTS	71.5	50.1	60.8	N/A	2.84	N/A
CXO	78.0	52.1	65.1	N/A	1.91	N/A
LVJ	78.2	57.8	62.5	N/A	1.48	N/A
SGR	79.7	57.5	68.6	N/A	1.13	N/A
DWH	78.2	55.5	66.8	N/A	1.73	N/A
HGX	76.1	56.1	66.1	N/A	1.82	N/A

May 2005						
Site	Avg High	Avg Low	Avg Daily	Departure	Rainfall	Departure
IAH	85.9	64.7	75.3	-0.5	6.06	+0.91
GLS	82.3	70.9	76.6	-0.3	2.63	-1.07
CLL	85.0	64.7	74.9	-0.4	2.48	-2.57
HOU	85.8	66.7	76.2	-0.8	2.18	-2.93
PSX	83.4	67.7	75.5	-0.2	7.93	+3.38
UTS	86.5	64.3	75.4	N/A	1.59	N/A
CXO	85.4	60.9	73.2	N/A	1.30	N/A
LVJ	85.3	65.5	75.4	N/A	3.50	N/A
SGR	86.5	65.5	76.0	N/A	4.70	N/A
DWH	85.4	64.0	74.7	N/A	2.58	N/A
HGX	83.7	64.6	74.1	N/A	3.74	N/A

June 2005						
Site	Avg High	Avg Low	Avg Daily	Departure	Rainfall	Departure
IAH	93.5	73.0	83.3	+2.0	0.08	-5.27
GLS	89.7	79.8	84.7	+2.5	0.24	-3.80
CLL	94.4	73.3	83.9	+2.3	0.45	-3.34
HOU	92.6	74.7	83.6	+1.3	0.29	-6.55
PSX	89.9	75.2	82.5	+1.4	0.80	-3.51
UTS	96.3	73.1	84.7	N/A	0.11	N/A
CXO	94.3	69.0	81.7	N/A	1.50	N/A
LVJ	92.3	74.0	83.2	N/A	0.41	N/A
SGR	93.7	72.7	83.2	N/A	0.79	N/A
DWH	93.6	71.5	82.6	N/A	0.53	N/A
HGX	90.7	72.6	81.6	N/A	1.39	N/A

Here is some of the rainfall data for cooperative volunteer sites across southeast Texas (annual through June 30th):

City	Jan	Feb	Mar	Apr	May	Jun	Annual
Baytown	1.77	6.59	3.15	0.78	4.57	0.46	17.32
Bellville	3.43	3.57	1.98	0.84	2.29	0.61	12.72
Brenham	4.43	4.45	2.33	0.69	4.89	2.45	19.24
Caldwell	4.35	3.31	3.60	1.59	4.23	0.28	17.36
Cleveland	2.83	6.73	1.88	1.43	4.93	0.21	18.01
Clodine	2.16	9.20	3.26	1.13	4.69	2.54	22.98
Columbus	5.27	2.97	3.12	1.00	6.70	0.00	19.06
Corrigan	3.63	7.92	4.96	2.69	4.22	0.82	24.24
Crockett	4.53	4.66	3.72	0.36	3.16	0.30	16.73
Dacus	3.86	6.72	4.53	2.53	2.25	0.11	20.00
Danevang	1.88	6.44	3.30	1.35	5.19	1.18	19.34
Edna	4.10	5.48	3.07	0.97	6.77	1.80	22.19
El Campo	3.06	2.37	3.87	1.27	6.55	0.16	17.28
Freeport	3.39	2.99	3.99	1.81	1.87	0.19	14.24
Houston Heights	1.53	7.23	3.17	1.31	6.90	0.07	20.21
Houston Westbury	2.02	6.77	3.34	1.08	3.97	2.47	19.65
Jamaica Beach	2.62	3.67	6.64	1.30	3.32	0.66	18.21
Katy	1.15	6.25	2.81	0.67	3.96	0.82	15.66
Liberty	2.07	6.04	2.16	1.01	9.75	1.74	22.77
Madisonville	4.02	6.33	4.14	1.21	3.09	0.88	19.67
Matagorda	0.11	4.15	4.85	1.25	3.89	1.05	15.30
New Caney	1.84	7.66	2.51	1.80	3.36	0.06	17.23
Richards	3.00	3.50	1.79	3.26	2.66	0.80	15.01
Somerville Dam	3.41	4.93	2.83	0.61	3.03	0.33	15.14
Thompsons	1.47	6.12	3.34	1.09	5.04	0.24	17.30
Washington	3.08	3.62	2.98	1.33	2.75	0.20	13.96
West Columbia	1.74	3.37	3.57	1.27	4.72	0.28	14.95
Wharton	2.25	4.90	4.34	1.68	4.56	0.28	18.01

Tsunami Warning System for the U.S. Gulf Coast

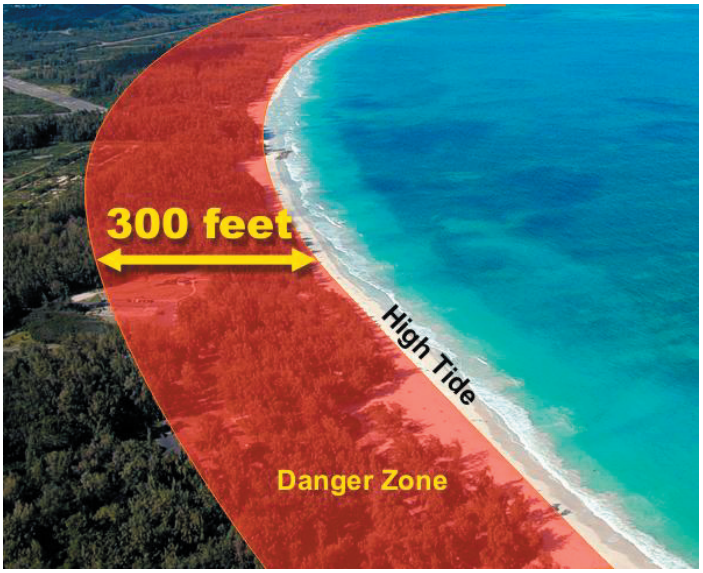
On December 26, 2004, a powerful (magnitude 9.3) earthquake in the Indian Ocean near Sumatra triggered a devastating tsunami which took the lives of over 300,000 people in nearly a dozen neighboring countries. Though not nearly as favorable for tsunami generation as the Pacific basin, tsunamis may also be initiated in the Atlantic and Caribbean basins near subduction zones.

Recognizing the tsunami threat for the entire Atlantic region, the NWS Southern Region, in partnership with the Alaska, Eastern, and Pacific Regions, has developed and implemented an interim Tsunami Warning System for the U.S. Gulf and East Coasts.

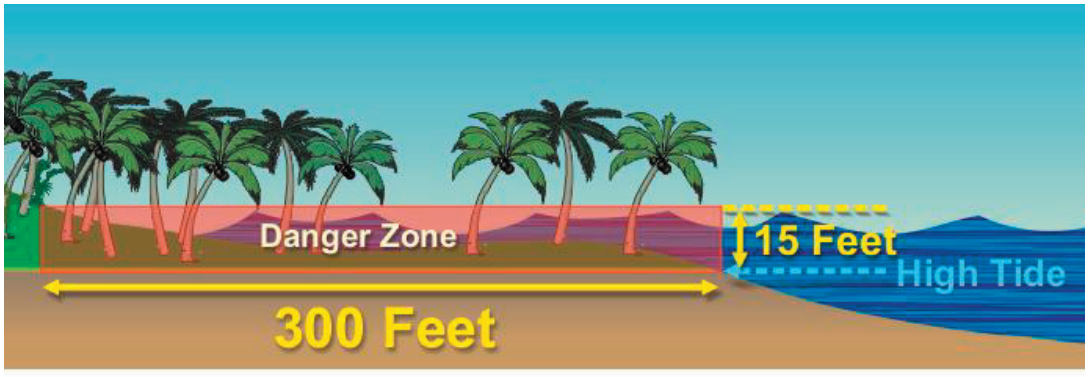
The West Coast/Atlantic Tsunami Warning Center headquartered in Palmer, Alaska will now be monitoring the Atlantic & Gulf Coasts for earthquakes that may subsequently produce a tsunami. If the Center deems a tsunami warning necessary for portions of the coastline, it will usually send the message within ten minutes of the earthquake to the local National Weather Service office, who will in turn relay the warning to the public and media via NOAA Weather Radio and EAS ACTIVATED warnings.

Seventy-five percent of tsunamis are initiated by earthquakes. Vertical plate movement quakes (convergent up and down) are the type of quakes that generate tsunamis. These are typically near subduction zones, which can be found in the Caribbean and around the Puerto Rico area. Horizontal plate movement (side to side motion) rarely initiates a tsunami no matter how strong it is. The other twenty-five percent of tsunamis are generated by other means such as slumping, which is similar to an underwater landslide. These types of tsunamis are harder to detect with significant warning leadtime compared to those associated with earthquakes. Computer modeling of Gulf of Mexico tsunamis is currently in progress.

The National Weather Service has defined the minimum criteria of an evacuation zone for the Gulf and East Coasts as areas within 300 feet of the shore that are less than 15 feet above sea level at high tide.



In the unfortunate event a tsunami warning would ever be required for populated portions of the upper Texas coast, vertical evacuation (evacuating up a high rise building or hotel) is stressed since warning lead time would be no where close to that of a hurricane.



Lightning Safety

Lightning ranks second only to flooding as the deadliest weather-related hazard in the United States. Lightning strikes an average of 400 people a year in this country, of which 67 are killed: this is more than the number of people killed by hurricanes and tornadoes combined. NOAA has proclaimed June 19th through 25th Lightning Safety Awareness Week. Given that summer is the peak season for lightning occurrence, now is a good time to review the safety precautions that you and your family should take.

Outdoors is the most dangerous place to be during a thunderstorm. During the summer months, more people are outside doing work or recreational activities putting more people at risk for injury by lightning strike. All thunderstorms produce lightning and are dangerous. Even if the sky appears blue overhead, a threat of lightning from nearby thunderstorms may still exist: lightning can strike up to 10 miles away from areas of rainfall. As soon as you hear thunder, it is time to take action.

When caught outdoors and lightning is a threat, heed the following safety rules:

1. Postpone activities as soon as you hear thunder. Don't wait for rain to occur!
2. Be the lowest point in the area. Crouch down if you are in an exposed area. Lightning will hit the tallest object in the area.
3. Instruct everyone to go inside a sturdy building or car for shelter if possible. Avoid the small wooden, vinyl, or metal sheds often found on athletic fields, golf courses, parks, roadside picnic areas, schoolyards and elsewhere. These shelters offer little or no protection from lightning and should be avoided during thunderstorms. A shelter that does not contain plumbing or wiring throughout, or some other mechanism for grounding from the roof to ground is not safe.
4. Stay away from trees! If there is no shelter, stay in the open and crouch near the ground. Underneath trees is not a safe place to seek shelter from a thunderstorm.
5. Avoid leaning against vehicles and contact with other metal objects.
6. Get out of the water immediately. Water is a great conductor of electricity. Stay away from the pool, the beach, and out of small boats and canoes. If caught out in a boat, crouch down in the center of the boat away from metal hardware. Swimming, wading, snorkeling, and scuba diving are not safe during lightning.
7. Move away from a group of people. Do not huddle in a group of people during a thunderstorm.

If someone in your group is struck by lightning, get medical attention by calling 9-1-1 or your local ambulance service immediately for help. If the person has stopped breathing, begin rescue breathing. A trained person should administer CPR. Check for burns on the victim in two places. The injured person has received an electric shock and may be burned. Being struck by lightning can also cause nervous system damage, broken bones, and loss of hearing or eyesight. People struck by lightning carry no electrical charge that can shock other people. You can examine them without risk.

The charge from lightning can still be a threat indoors, particularly in rural areas, so there are a few precautions you should take while indoors during a thunderstorm:

1. Avoid contact with corded phones.
2. Avoid contact with electrical equipment or cords. If you plan to unplug any equipment, do so well before the storm arrives.
3. Avoid contact with plumbing. If possible, avoid taking a shower or doing laundry during a thunderstorm.
4. Stay away from windows and doors and stay off porches and decks.
5. Do not lie on concrete floors and do not lean against concrete walls.
6. Bring pets inside before a storm hits.

Lightning causes significant damage to indoor electronics each year. While direct strikes cause much of the damage, lightning strikes generate electrical surges that can cause damage some distance from the actual strike. Most surge protectors will not protect electronic equipment from damage to a lightning strike. If possible, unplug any appliances or electronic equipment well before a thunderstorm threatens. If you plan to be away from your home for an extended period when thunderstorms may threaten, unplug any electrical equipment before you leave.

Lightning strike victims can be left with serious and life-long debilitating injuries to the nervous system. When the brain is affected, the person often has difficulty with short-term memory, coding new information and accessing old information, multitasking, distractibility, irritability and personality change. Early on, survivors may complain of intense headaches, ringing in the ears, dizziness, nausea, vomiting and other post-concussion types of symptoms. Survivors may also experience difficulty sleeping, sometimes sleeping excessively at first and then only two or three hours at a time. A few may develop seizure-like activity several weeks to months after the injury. Other more extreme effects from lightning injury include self-isolation, depression, thoughts of suicide, and extreme pain.

Now that the summer season is upon us and many will be spending more time outdoors, it is a good time to review the safety precautions to take when lightning threatens. Follow these few simple rules and protect yourself from one of Mother Nature's most deadly and dangerous forces.

For more information on lightning and lightning safety, please visit: http://www.lightningsafety.noaa.gov

Heat Waves

Know What These Terms Mean...

* **Heat wave:** Prolonged period of excessive heat and humidity. The National Weather Service steps up its procedures to alert the public during these periods of excessive heat and humidity.
* **Heat index:** A number in degrees Fahrenheit (F) that tells how hot it really feels when relative humidity is added to the actual air temperature. Exposure to full sunshine can increase the heat index by 15 degrees F.
* **Heat cramps:** Heat cramps are muscular pains and spasms due to heavy exertion. Although heat cramps are the least severe, they are an early signal that the body is having trouble with the heat.
* **Heat exhaustion:** Heat exhaustion typically occurs when people exercise heavily or work in a hot, humid place where body fluids are lost through heavy sweating. Blood flow to the skin increases, causing blood flow to decrease to the vital organs. This results in a form of mild shock. If not treated, the victim may suffer heat stroke.
* **Heat stroke:** Heat stroke is life-threatening. The victim's temperature control system, which produces sweating to cool the body, stops working. The body temperature can rise so high that brain damage and death may result if the body is not cooled quickly.
* **Sunstroke:** Another term for heat stroke.

If a Heat Wave Is Predicted or Happening...

* Slow down. Avoid strenuous activity. If you must do strenuous activity, do it during the coolest part of the day, which is usually in the morning between 4:00 a.m. and 7:00 a.m.
* Stay indoors as much as possible. If air conditioning is not available, stay on the lowest floor, out of the sunshine. Try to go to a public building with air conditioning each day for several hours. Remember, electric fans do not cool the air, but they do help sweat evaporate, which cools your body.
* Wear lightweight, light-colored clothing. Light colors will reflect away some of the sun's energy.
* Drink plenty of water regularly and often. Your body needs water to keep cool.
* Drink plenty of fluids even if you do not feel thirsty.
* Water is the safest liquid to drink during heat emergencies. Avoid drinks with alcohol or caffeine in them. They can make you feel good briefly, but make the heat's effects on your body worse. This is especially true about beer, which dehydrates the body.
* Eat small meals and eat more often. Avoid foods that are high in protein, which increase metabolic heat.
* Avoid using salt tablets unless directed to do so by a physician.

Signals of Heat Emergencies...

* Heat exhaustion: Cool, moist, pale, or flushed skin; heavy sweating; headache; nausea or vomiting; dizziness; and exhaustion. Body temperature will be near normal.
* Heat stroke: Hot, red skin; changes in consciousness; rapid, weak pulse; and rapid, shallow breathing. Body temperature can be very high-- as high as 105 degrees F. If the person was sweating from heavy work or exercise, skin may be wet; otherwise, it will feel dry.

Treatment of Heat Emergencies...

* Heat cramps: Get the person to a cooler place and have him or her rest in a comfortable position. Lightly stretch the affected muscle and replenish fluids. Give a half glass of cool water every 15 minutes. Do not give liquids with alcohol or caffeine in them, as they can make conditions worse.
* Heat exhaustion: Get the person out of the heat and into a cooler place. Remove or loosen tight clothing and apply cool, wet cloths, such as towels or sheets. If the person is conscious, give cool water to drink. Make sure the person drinks slowly. Give a half glass of cool water every 15 minutes. Do not give liquids that contain alcohol or caffeine. Let the victim rest in a comfortable position, and watch carefully for changes in his or her condition.
* Heat stroke: Heat stroke is a life-threatening situation. Help is needed fast. Call 9-1-1 or your local emergency number. Move the person to a cooler place. Quickly cool the body. Immerse victim in a cool bath, or wrap wet sheets around the body and fan it. Watch for signals of breathing problems. Keep the person lying down and continue to cool the body any way you can. If the victim refuses water or is vomiting or there are changes in the level of consciousness, do not give anything to eat or drink.

Building Facts:
Square Feet: 23,500
Designed to: Withstand CAT 5 Hurricane 155+ mph Winds
Tenants: Galveston County Office of Emergency Management
NWS Houston/Galveston
Galveston County 9-1-1 District
Texas Department of Emergency Management

Heat Index °F (°C)

Relative Humidity (%)

Temperature	40	45	50	55	60	65	70	75	80	85	90	95	100
110 (47)	136 (58)												
108 (43)	130 (54)	137 (58)											
106 (41)	124 (51)	130 (54)	137 (58)										
104 (40)	119 (48)	124 (51)	131 (55)	137 (58)									
102 (39)	114 (46)	119 (48)	124 (51)	130 (54)	137 (58)								
100 (38)	109 (43)	114 (46)	118 (48)	124 (51)	129 (54)	136 (58)							
98 (37)	105 (41)	109 (43)	113 (45)	117 (47)	123 (51)	128 (53)	134 (57)						
96 (36)	101 (38)	104 (40)	108 (42)	112 (44)	116 (47)	121 (49)	126 (52)	132 (56)					
94 (34)	97 (36)	100 (38)	103 (39)	106 (41)	110 (43)	114 (46)	119 (48)	124 (51)	129 (54)	135 (57)			
92 (33)	94 (34)	96 (36)	99 (37)	101 (38)	105 (41)	108 (42)	112 (44)	116 (47)	121 (49)	126 (52)	131 (55)		
90 (32)	91 (33)	93 (34)	95 (35)	97 (36)	100 (38)	103 (39)	106 (41)	109 (43)	113 (45)	117 (47)	122 (50)	127 (53)	132 (56)
88 (31)	88 (31)	89 (32)	91 (33)	93 (34)	95 (35)	98 (37)	100 (38)	103 (39)	106 (41)	110 (43)	113 (45)	117 (47)	121 (49)
86 (30)	85 (29)	87 (31)	88 (31)	89 (32)	91 (33)	93 (34)	95 (35)	97 (36)	100 (38)	102 (39)	105 (41)	108 (42)	112 (44)
84 (29)	83 (28)	84 (29)	85 (29)	86 (30)	88 (31)	89 (32)	90 (32)	92 (33)	94 (34)	96 (36)	98 (37)	100 (38)	103 (39)
82 (28)	81 (27)	82 (28)	83 (28)	84 (29)	84 (29)	85 (29)	86 (30)	88 (31)	89 (32)	90 (32)	91 (33)	93 (34)	95 (35)
80 (27)	80 (27)	80 (27)	81 (27)	81 (27)	82 (28)	82 (28)	83 (28)	84 (29)	84 (29)	85 (29)	86 (30)	86 (30)	87 (31)

Category	Heat Index	Possible heat disorders for people in high risk groups
Extreme Danger	130°F or higher (54°C or higher)	Heat stroke or sunstroke likely.
Danger	105 - 129°F (41 - 54°C)	Sunstroke, muscle cramps, and/or heat exhaustion likely. Heatstroke possible with prolonged exposure and/or physical activity.
Extreme Caution	90 - 105°F (32 - 41°C)	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.
Caution	80 - 90°F (27 - 32°C)	Fatigue possible with prolonged exposure and/or physical activity.

Precautions To Take Against Excessive Heat

Increase your intake of non-alcoholic, non-carbonated, caffeine free beverages such as water and juice.
Wear clothing that is light in color and loose fitting.
Avoid the outdoors during extreme heat. Stay out of the sun.
Stay in an air-conditioned environment if possible. Shopping malls offer relief if your home is not air-conditioned.
Check on the elderly. They are especially susceptible to heat related illness.
Eliminate strenuous activity such as running, biking and lawn care work when it heats up.

Heat Related Illnesses And Their Symptoms

SUNBURN - Redness and pain in the skin. In severe cases there is also swelling, blisters, fever, and headaches.
HEAT CRAMPS - Heavy sweating and painful spasms usually in the leg or abdomen muscles.
HEAT EXHAUSTION - The person becomes weak and is sweating heavily. The skin is cold, pale and clammy. Fainting and vomiting accompanies heat exhaustion.
HEATSTROKE/SUNSTROKE - High body temperature (106 degrees or higher) along with hot dry skin and a rapid and strong pulse. Unconsciousness is possible.

Staff Spotlight: Mark Keehn

Name: Mark Keehn
Position: Information Technology Officer (ITO)
Favorite Movie: "Titanic"…fascinated by ships' history…not DiCaprio
Favorite Book: "Ghosts of the Titanic" by Charles Pellegrino
Favorite Character from "Star Wars": Jar Jar Binks
Favorite Meal: Lasagna
Favorite Band from the '80s: (tie) Boston & U2

Personal Information
Hometown: Arlington, VA
Status: Married, 1 kid, 3 dogs, no cats, 2 fish

NWS Background

1990-1994	Meteorological Intern; NWSO Brownsville, Texas
1994-2002	Techniques Development Meteorologist; Space Flight Meteorology Group (SMG), Johnson Space Center, Houston, TX
2002- Present	Information Technology Officer, NWSFO Houston/Galveston, TX

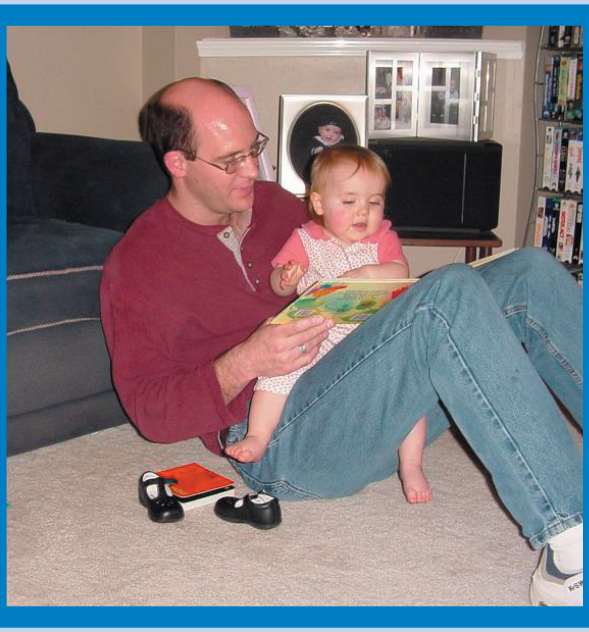
Career Highlights / Achievments / Duties / Other Tidbits

- Graduate of University of North Carolina at Asheville, 1989
- Most memorable weather event worked was 1992 flood that innundated Harlingen,TX
- Provided weather support for 29 shuttle missions at SMG
- Also provided weather support for experimental X-38 and Arian V missions
- Current Duties: Maintaining operational weather computer systems; installing and testing new applications/software updates; development of local software

What is the main difference or challenge as an ITO versus an operational meteorologist?
Constant need to stay on top of all the technology and software being fielded.

Earliest weather memory?
Saw a large tree get struck by lightning and fall on a neighbor's house when I was three years old…thought it was totally cool.

Last year's Halloween Costume?
Originally a Blue Man from the Blue Man group, but it was too hot for the makeup so went as Ghandi instead.



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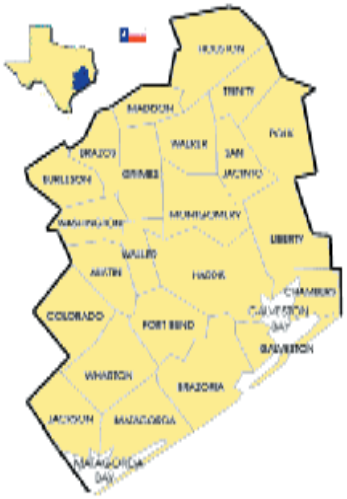

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