

The HGX Files: Hurricane Harvey & Winter Weather in Southeast Texas



Texas Gulf Coast Maintenance & Operations Meeting

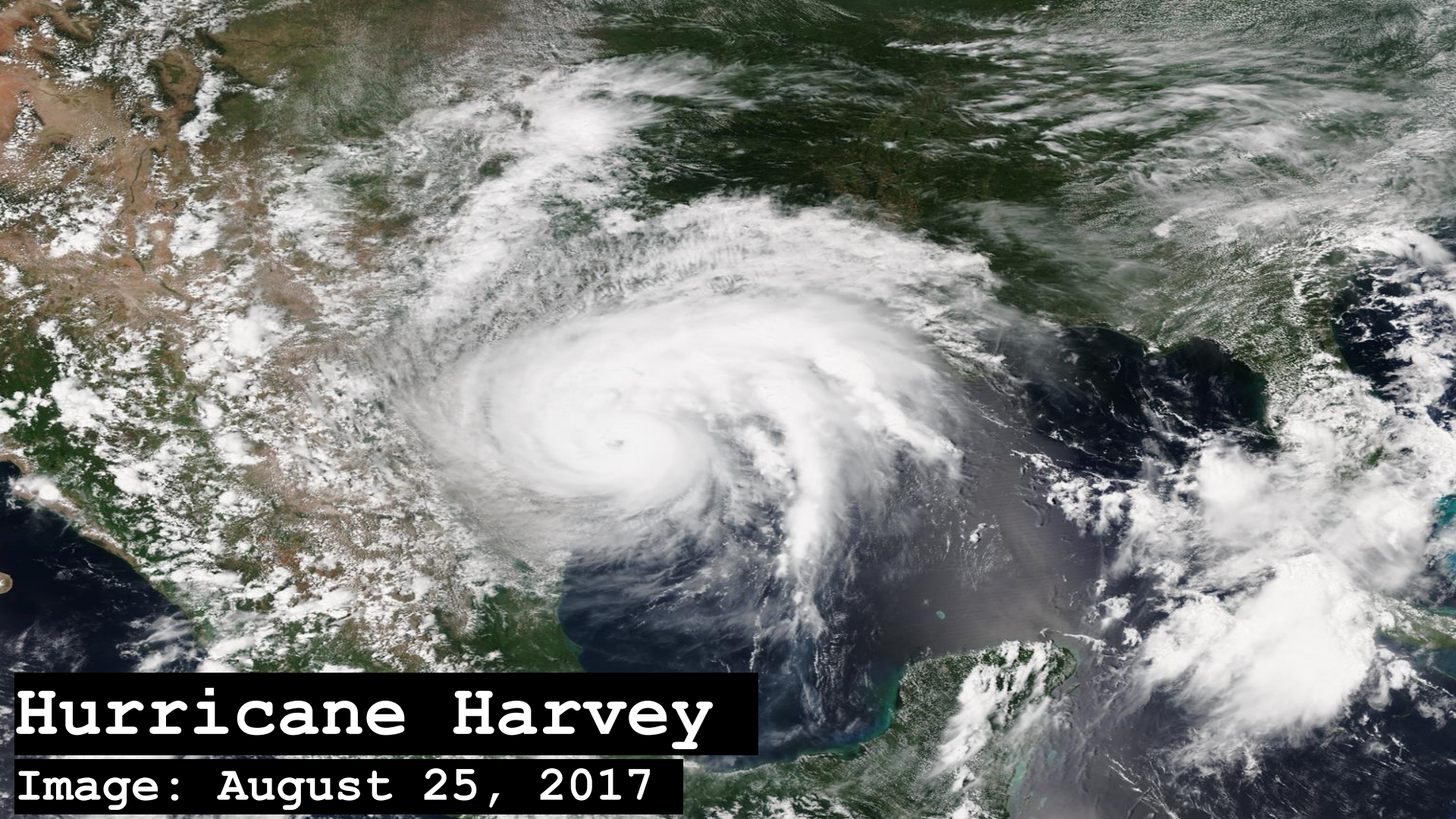
Melissa Huffman, Meteorologist

National Weather Service - Houston/Galveston, TX

November 9, 2017

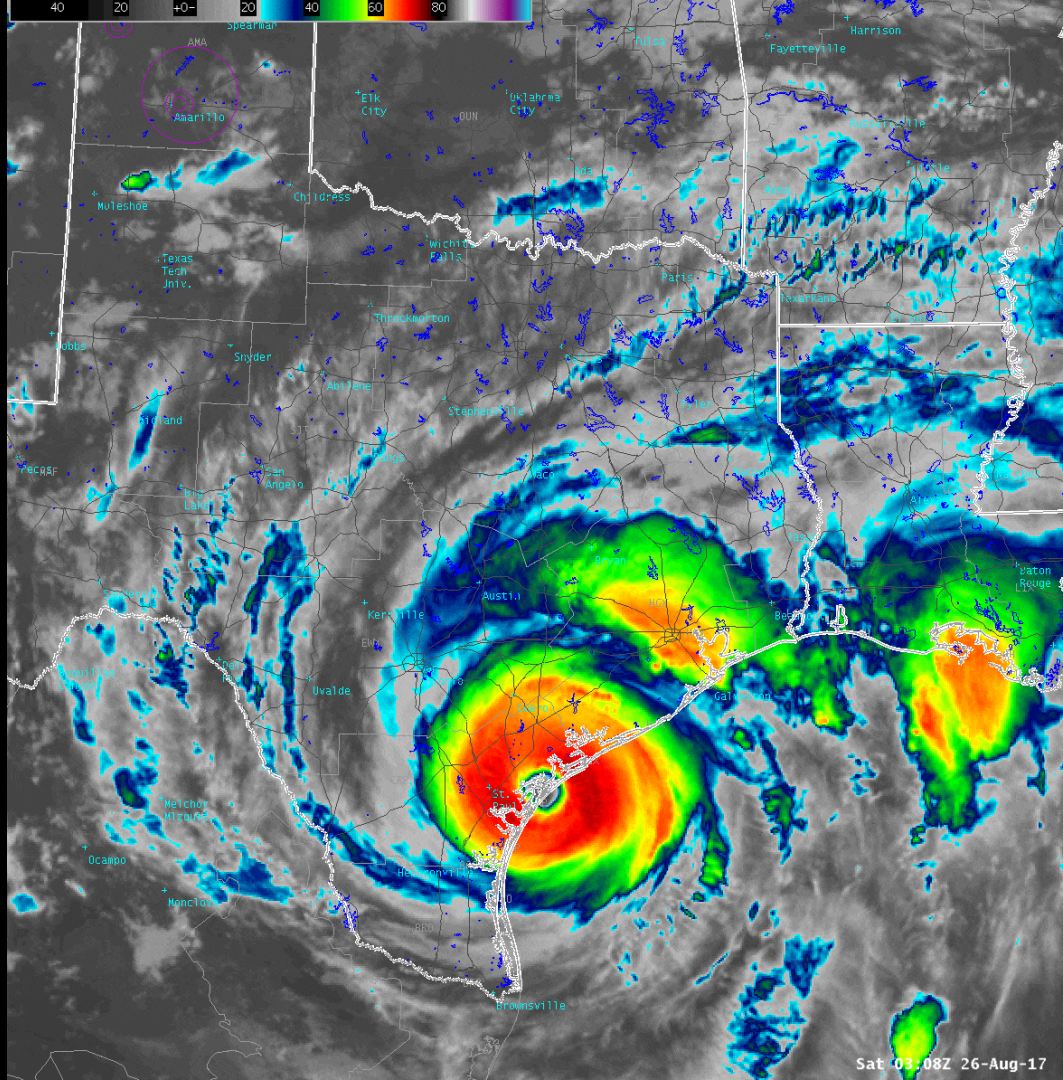
Who is the National Weather Service?





Hurricane Harvey

Image: August 25, 2017



Harvey by the Numbers

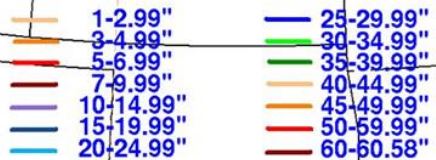
- **First** Category 4 hurricane to strike Texas since Carla (1961)
- **First** named storm on record to make 2 Gulf Coast landfalls more than 60 hours apart



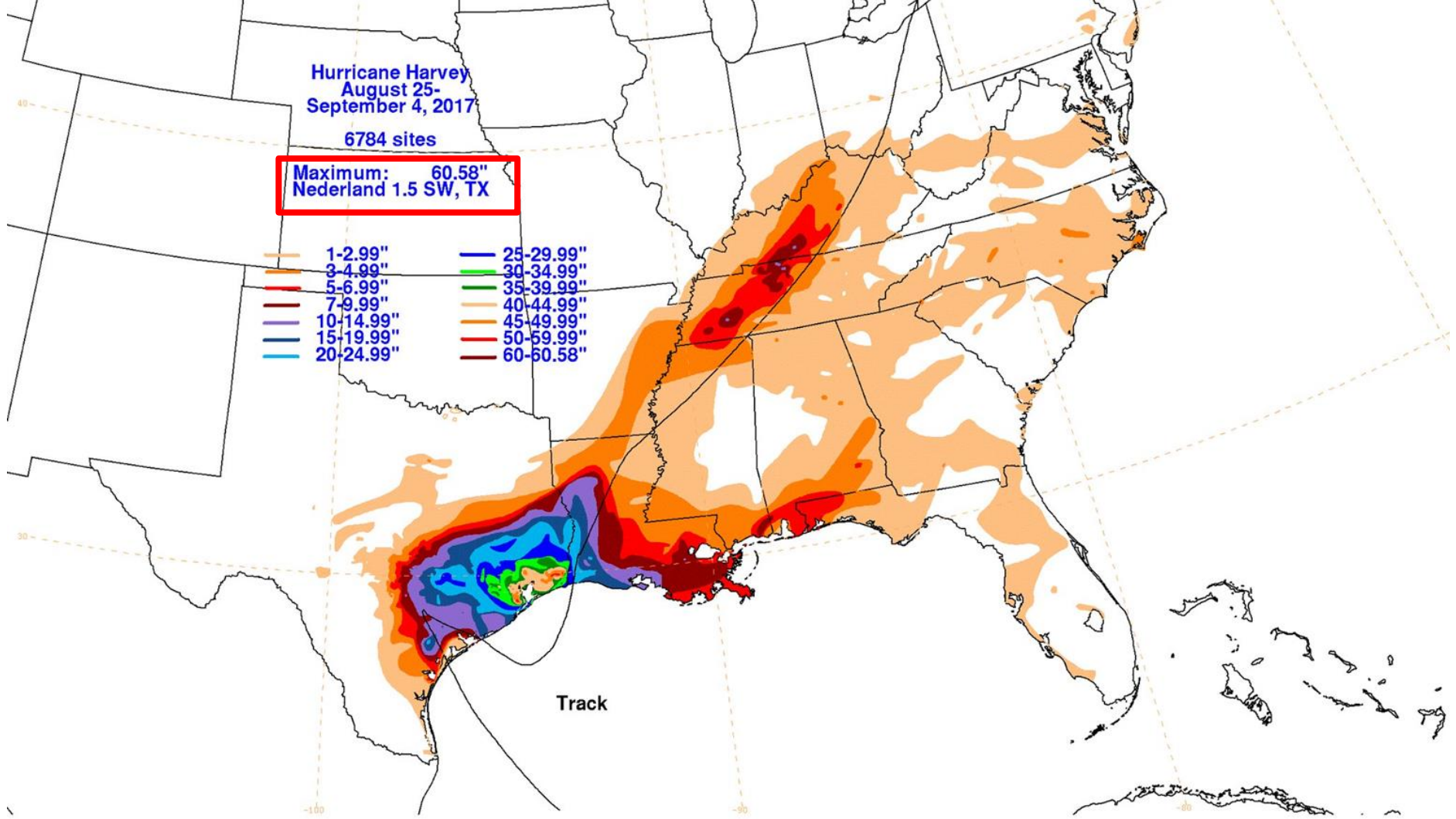
Hurricane Harvey
August 25-
September 4, 2017

6784 sites

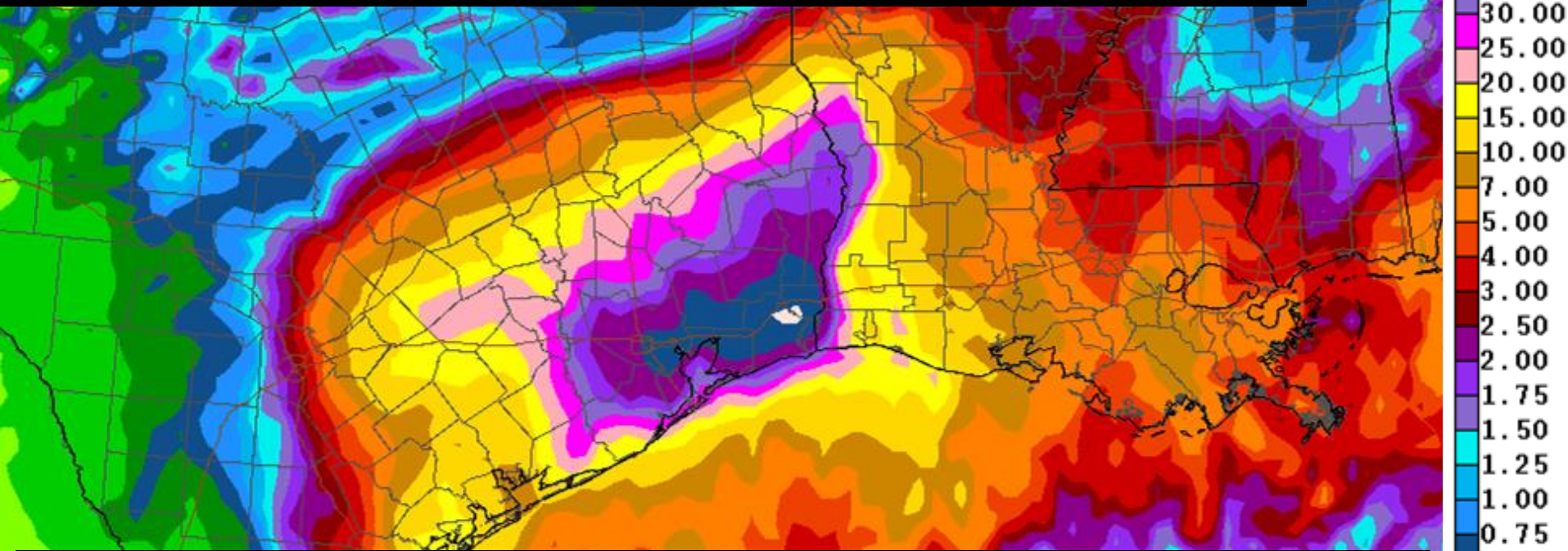
Maximum: 60.58"
Nederland 1.5 SW, TX



Track



7 Day Observed Rainfall (Inches) Ending Friday September 1, 2017 7 AM CDT



6.5 million people were impacted by 30 inches or more of rainfall over 6 day (Friday through Wednesday) time period

An aerial photograph showing a multi-lane highway interchange, likely I-45, that is severely flooded. The surrounding area, including trees and some buildings, is also inundated with murky water. A red line is drawn across the upper left portion of the highway, pointing towards the center of the interchange. The text '16" in 3 hours measured at Clear Creek and I-45' is overlaid in yellow on the lower half of the image.

**16" in 3 hours measured at
Clear Creek and I-45**

Source: Harris County Flood Control District

Harvey by the Numbers

- **1,000,000,000,000 gallons of water**
 - 3200 Astrodomes
 - 15 days
Niagara Falls
- **2 centimeters**
 - Estimate of how much Houston sank into Earth from weight of Harvey's water



Harvey's History

A satellite-style map of the Gulf of Mexico and surrounding landmasses. A path of colored dots and arrows traces the trajectory of Hurricane Harvey. The path starts in the western Gulf of Mexico, moves eastward, then turns northward through the Texas coast, and continues inland across the central United States. The path is marked with blue dots and arrows, transitioning to cyan and yellow dots in the Gulf region.

Previous Record:
Hurricane Fern (1971)
54 Hours

Harvey by the Numbers

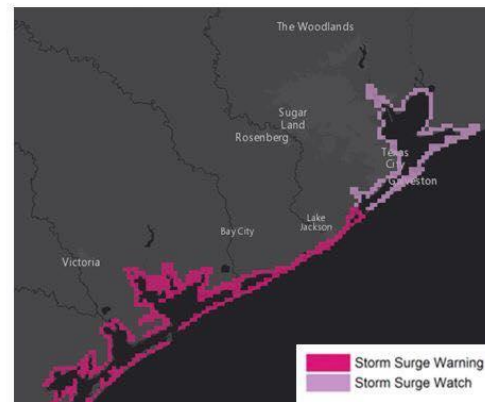
Southeast Texas
spent **162**
continuous hours
under a Tropical
Storm Watch or
Warning (6.75
straight days)



Watches and Warnings

National Weather Service Houston/Galveston

- **Hurricane Warning** in effect from Port Mansfield to Matagorda
- **Tropical Storm Warning** in effect from Matagorda to High Island
- **Storm Surge Warning** is in effect from Port Mansfield to San Luis Pass
- **Storm Surge Watch** is in effect from San Luis Pass to High Island



@NWSHouston
weather.gov/houston

Image 8/24/2017
Created 5:35 AM

Harvey by the Numbers

- **96 hours** under a continuous Tornado Watch
 - **157** Tornado Warnings
 - **29** confirmed tornadoes



Harvey by the Numbers

- **62** Flash Flood Warnings over 6 days
 - **4th** Flash Flood Emergency event in past 3 years



CIVIL EMERGENCY MESSAGE

National Weather Service Houston/Galveston

000
WOU544 KHGX 271110
CEMHGX
TXC039-167-201-271715-

BULLETIN - EAS ACTIVATION REQUESTED
CIVIL EMERGENCY MESSAGE
EMERGENCY MANAGEMENT IN CITY OF HOUSTON... GALVESTON COUNTY...
AND BRAZORIA COUNTY
RELAYED BY NATIONAL WEATHER SERVICE HOUSTON/GALVESTON TX
610 AM CDT SUN AUG 27 2017

THE FOLLOWING MESSAGE IS TRANSMITTED AT THE REQUEST OF THE
EMERGENCY MANAGEMENT IN THE CITY OF HOUSTON... GALVESTON
COUNTY... AND BRAZORIA COUNTY.

EMERGENCY MANAGEMENT OFFICIALS HAVE REQUESTED THAT PEOPLE ESCAPING
FLOOD WATERS AS A LAST RESORT DO NOT STAY IN THE ATTIC. IF HIGHEST
FLOOR OF YOUR HOME BECOMES DANGEROUS...GET ON THE ROOF. CALL 911
FOR HELP AND STAY ON THE LINE UNTIL ANSWERED.

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EMERGENCY MANAGEMENT OFFICIALS HAVE REQUESTED THAT PEOPLE ESCAPING FLOOD WATERS AS A LAST RESORT DO NOT STAY IN THE ATTIC. IF HIGHEST FLOOR OF YOUR HOME BECOMES DANGEROUS... GET ON THE ROOF. CALL 911 FOR HELP AND STAY ON THE LINE UNTIL ANSWERED.



Photo: Houston Chronicle



Photo: CNN



Photo: Houston Chronicle

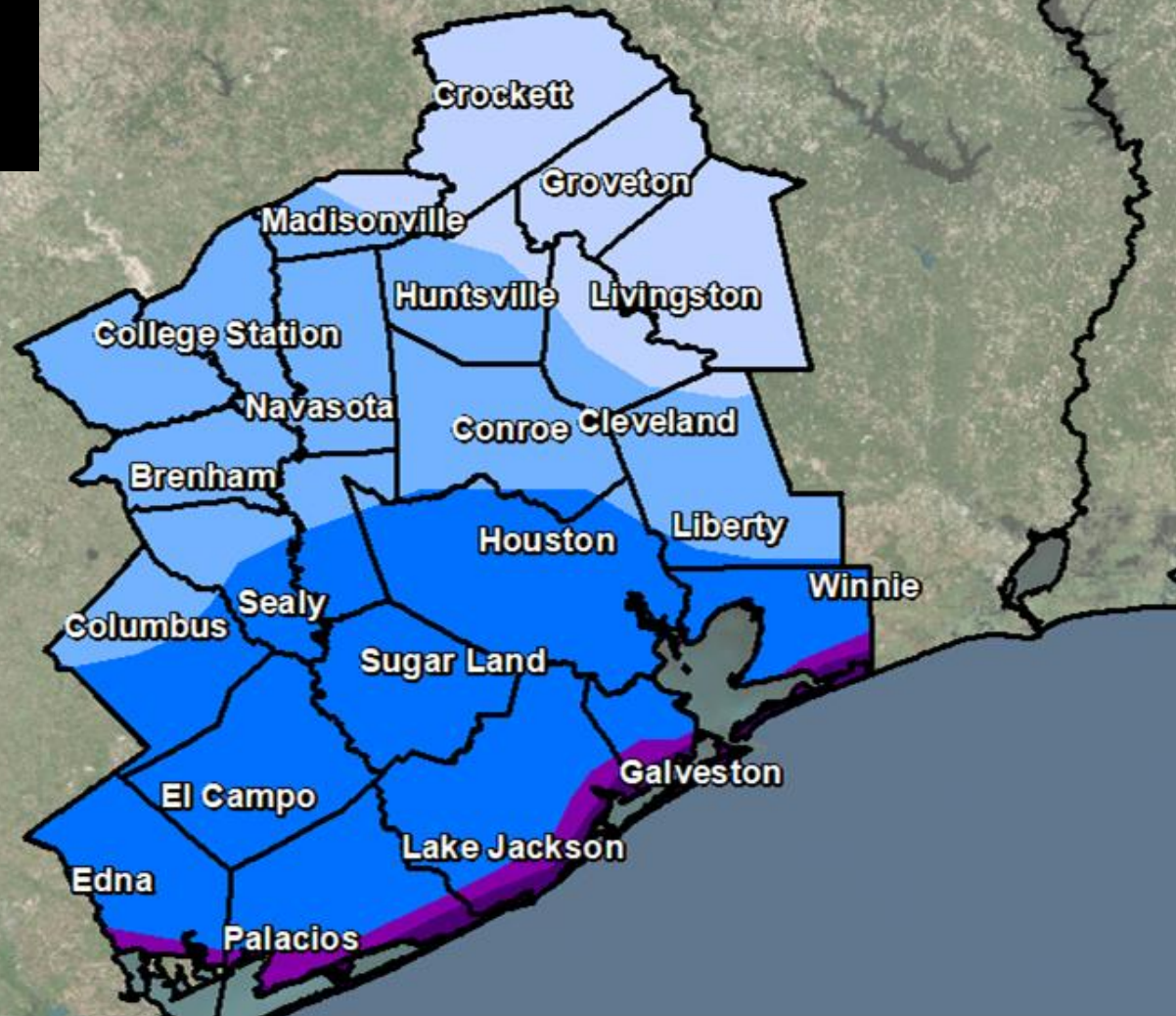
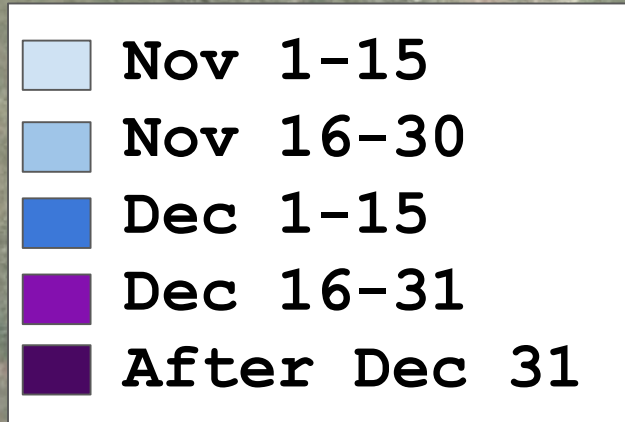
Questions?



Winter Weather

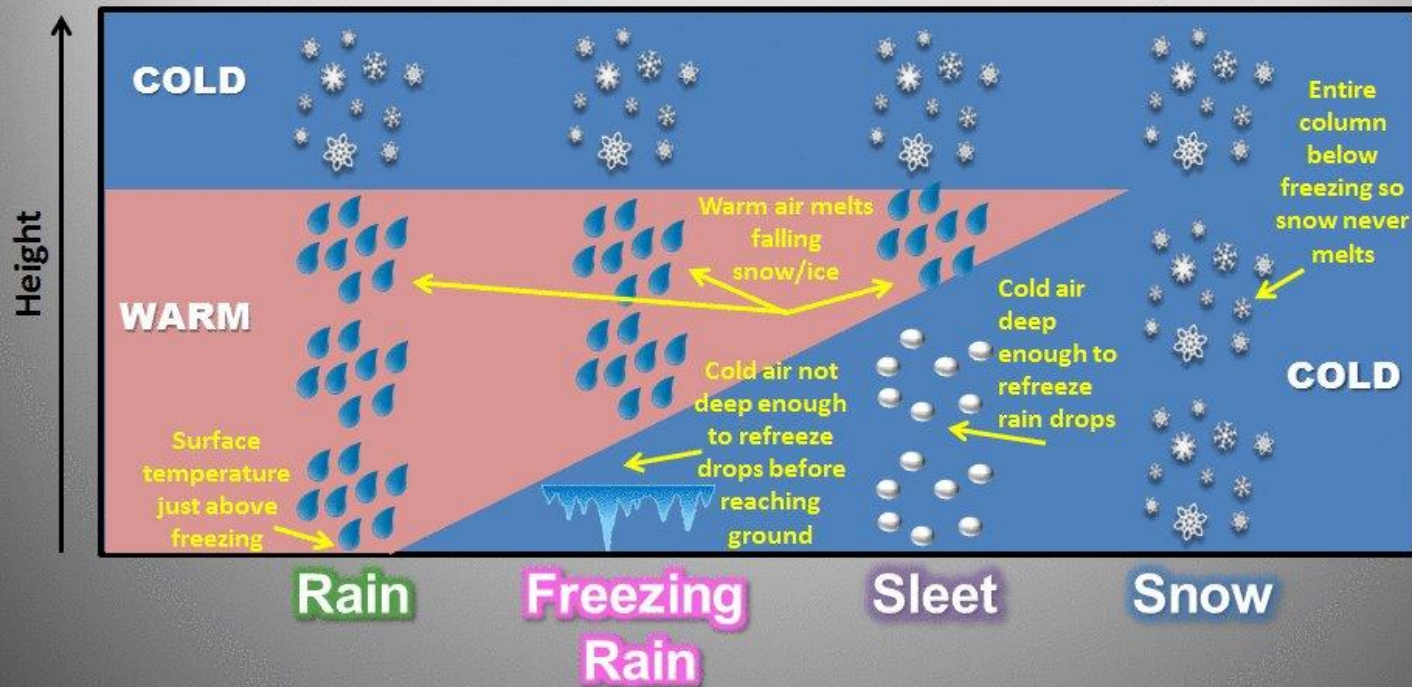
Image: March 4, 2014 (Katy, TX)

Southeast Texas Freeze Climatology





Forecasting Winter Weather Precipitation Types



A temperature difference of 1 or 2 degrees 1000s of feet above the ground can have drastic effects on precipitation type!



Freezing Rain: March 2014 (Katy, TX)



Sleet



Snow: December 2009 (Pearland, TX)

Freeze Warnings



Freeze Warning

- Issued for the 1st freeze of the year
 - Low temperatures 32°F or below

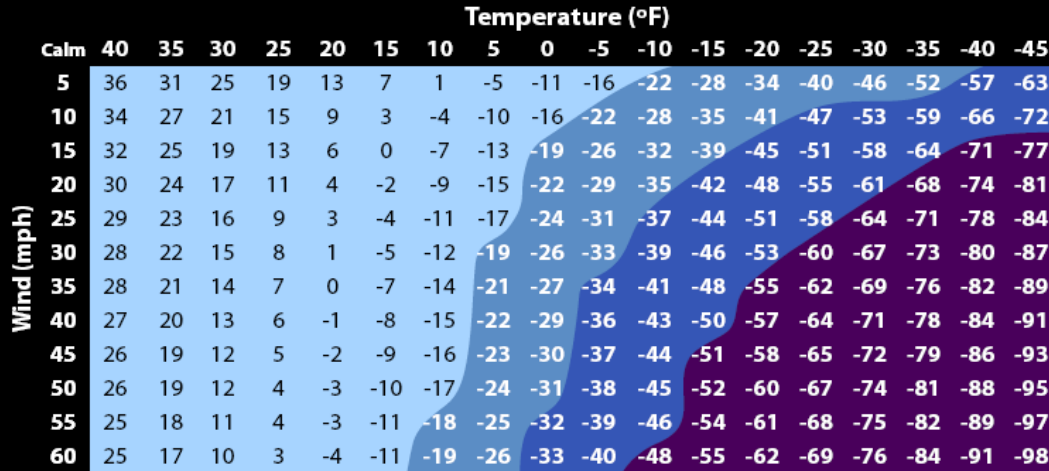
Hard Freeze Warning

- Issued when hard freeze conditions are forecast or expected to occur
 - Locally defined as low temperatures of 24°F or below

Wind Chill

Question: What is a "wind chill"?

Answer: The perceived decrease in air temperature felt by the body on exposed skin due to the flow of air



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

Wind Chill Advisory

A **Wind Chill Advisory** is issued when wind chill temperatures are forecast to fall below 13°F.

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

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Effective 11/01/01

Wind Chill Warning

A **Wind Chill Warning** is issued when wind chill temperatures are forecast to fall below 0°F.

		Temperature (°F)																		
		Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
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	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	
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	30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87	
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	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	
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Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Winter Storm Watch

- Potential for:
 - 2+ inches of snow and/or
 - ½ inch sleet and/or
 - ⅛ inch of ice accretion due to freezing rain
- Usually issued with a 24 hour to 48 hour lead time



Winter Weather Advisory

- Conditions expected or occurring:
 - Less than 2 inches of snow and/or
 - Less than $\frac{1}{2}$ inch sleet and/or
 - Less than $\frac{1}{8}$ inch of ice accretion due to freezing rain
- Threat to life and property may exist



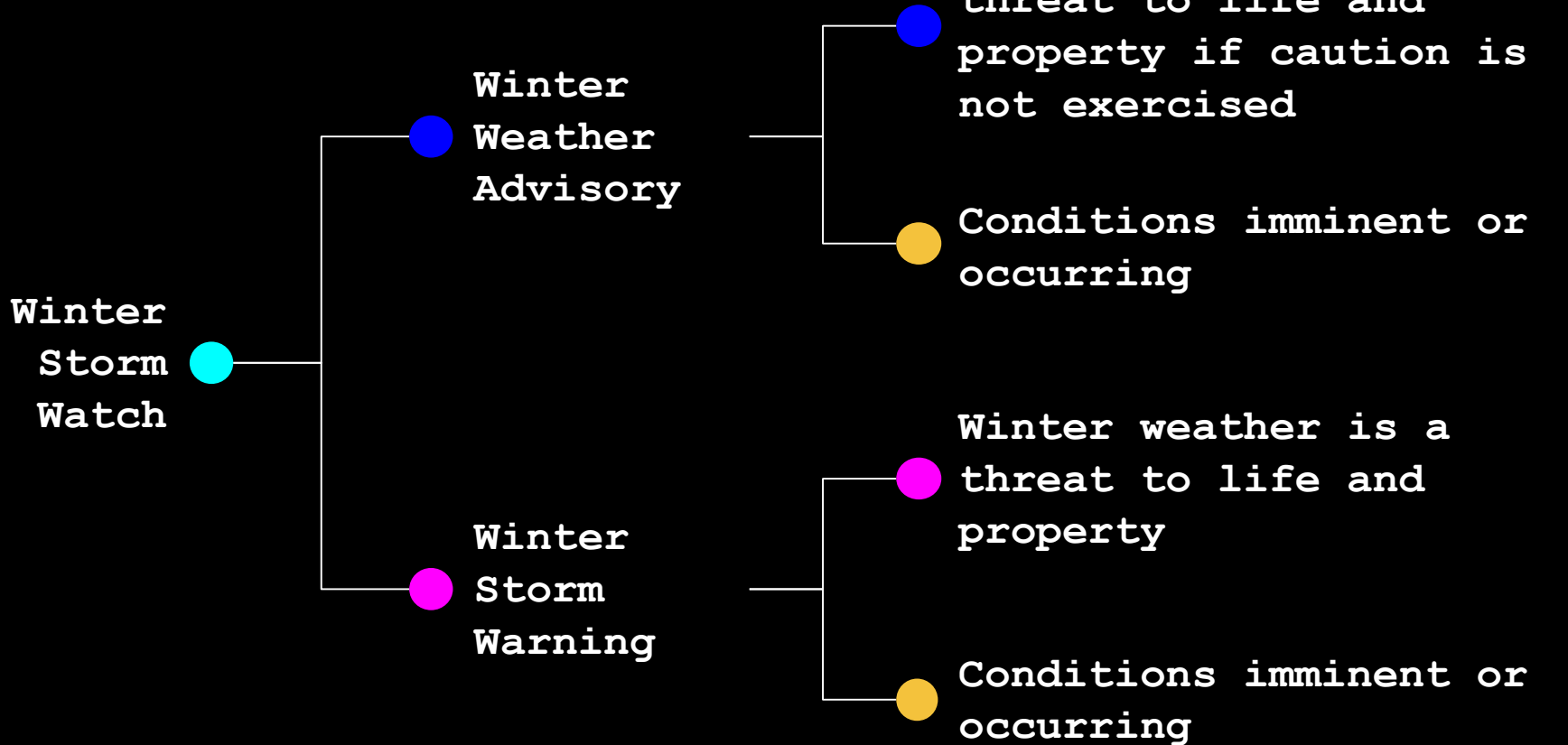
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- Conditions expected or occurring:
 - 2+ inches of snow and/or
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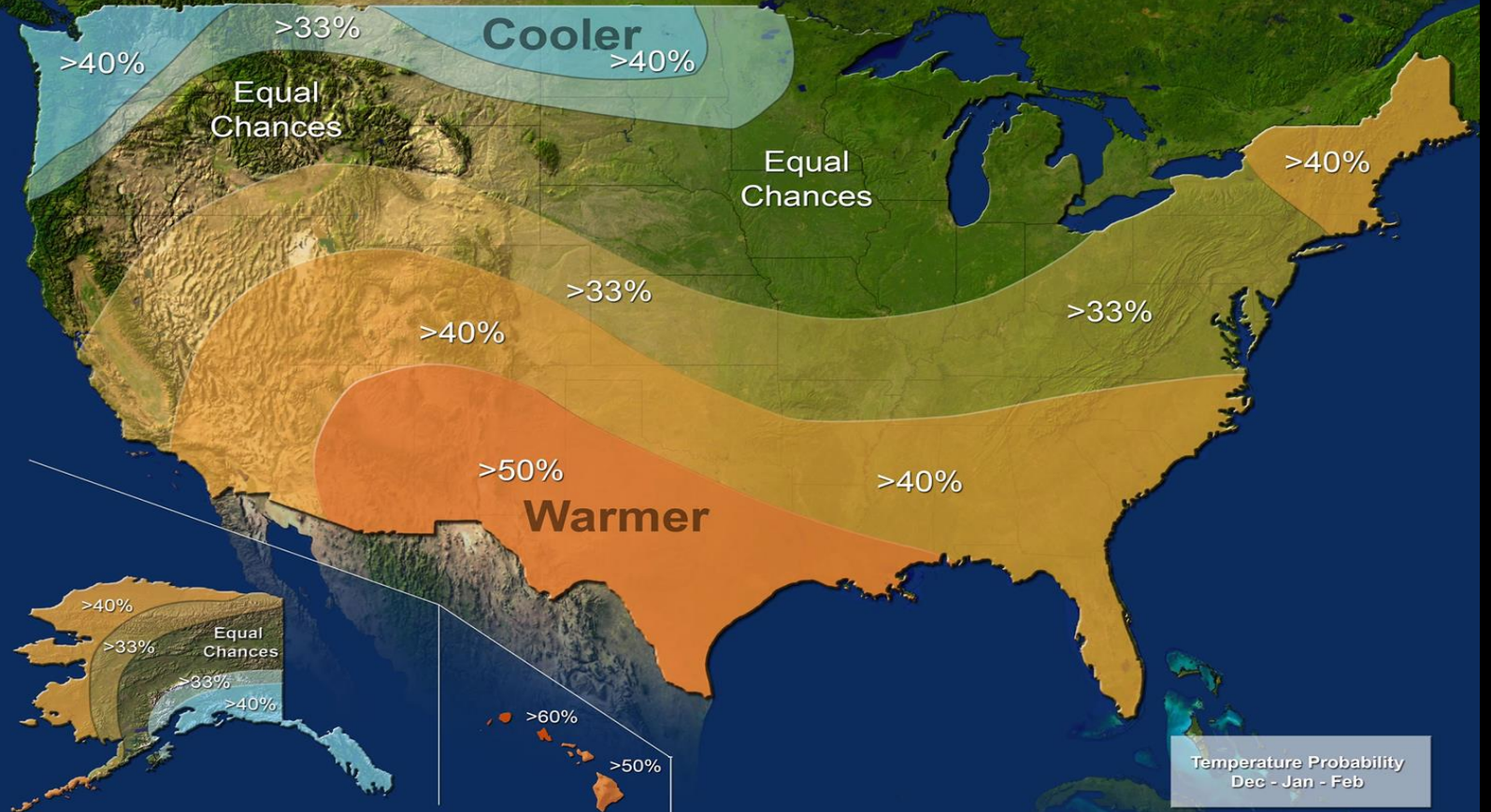
Winter Storm: December 2004 (Angleton, TX)

Putting It All Together



U.S. Winter Outlook

Temperature



Questions?

**The HGX Files:
Hurricane Harvey &
Winter Weather in Southeast Texas**



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