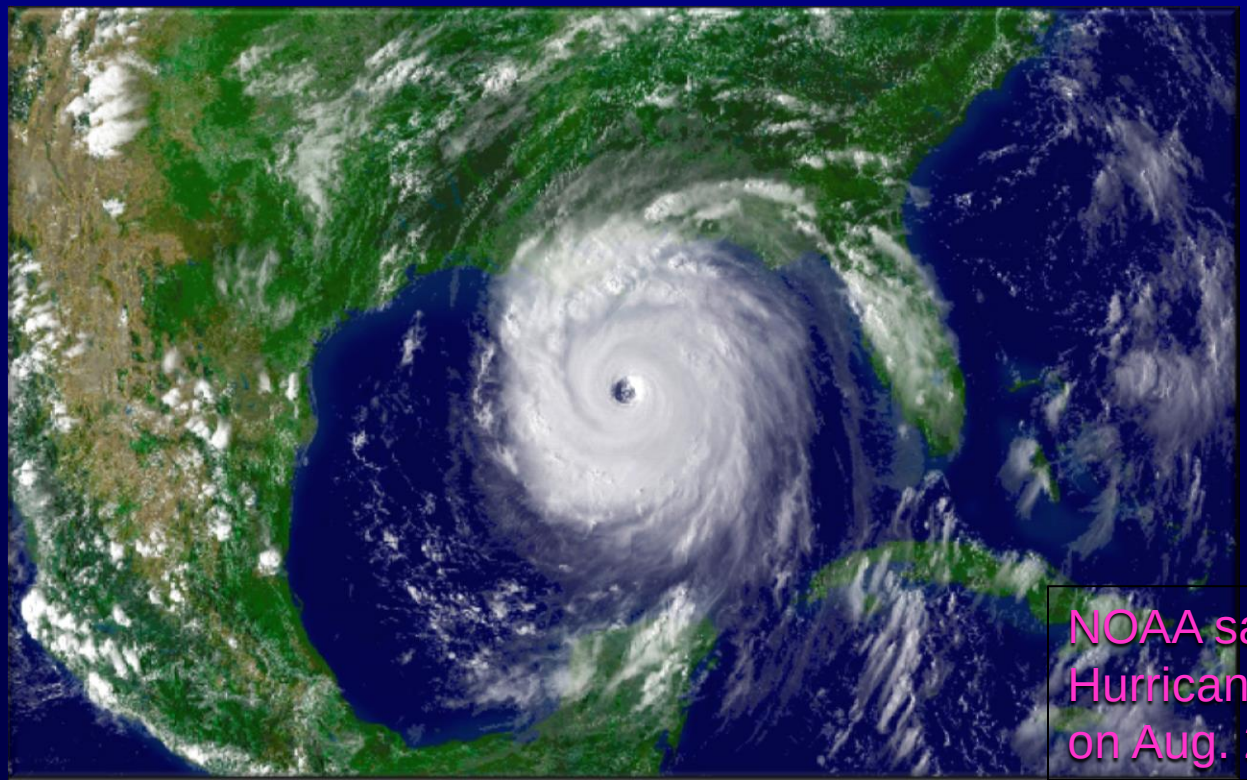
Hurricane Hazards and Outlook for 2013

CWSU
National Weather Service,
Houston, TX

Outline

- Hurricane hazards (storm surge, high winds, flooding rains, tornadoes)
- Past hurricane seasons (what is typical)
- 2013 Atlantic hurricane outlook

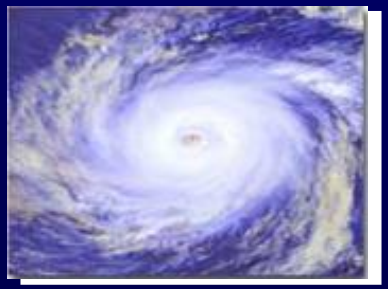


NOAA satellite image of Hurricane Katrina taken on Aug. 28, 2005.

Tropical Cyclone Classifications

- Tropical Depression: Max Sustained Winds less than 39 mph

- Tropical Storm: Max Sustained Winds 39-73 mph



- Hurricane: Max Sustained Winds 74 mph or greater

Hurricane and Tropical Storm Names

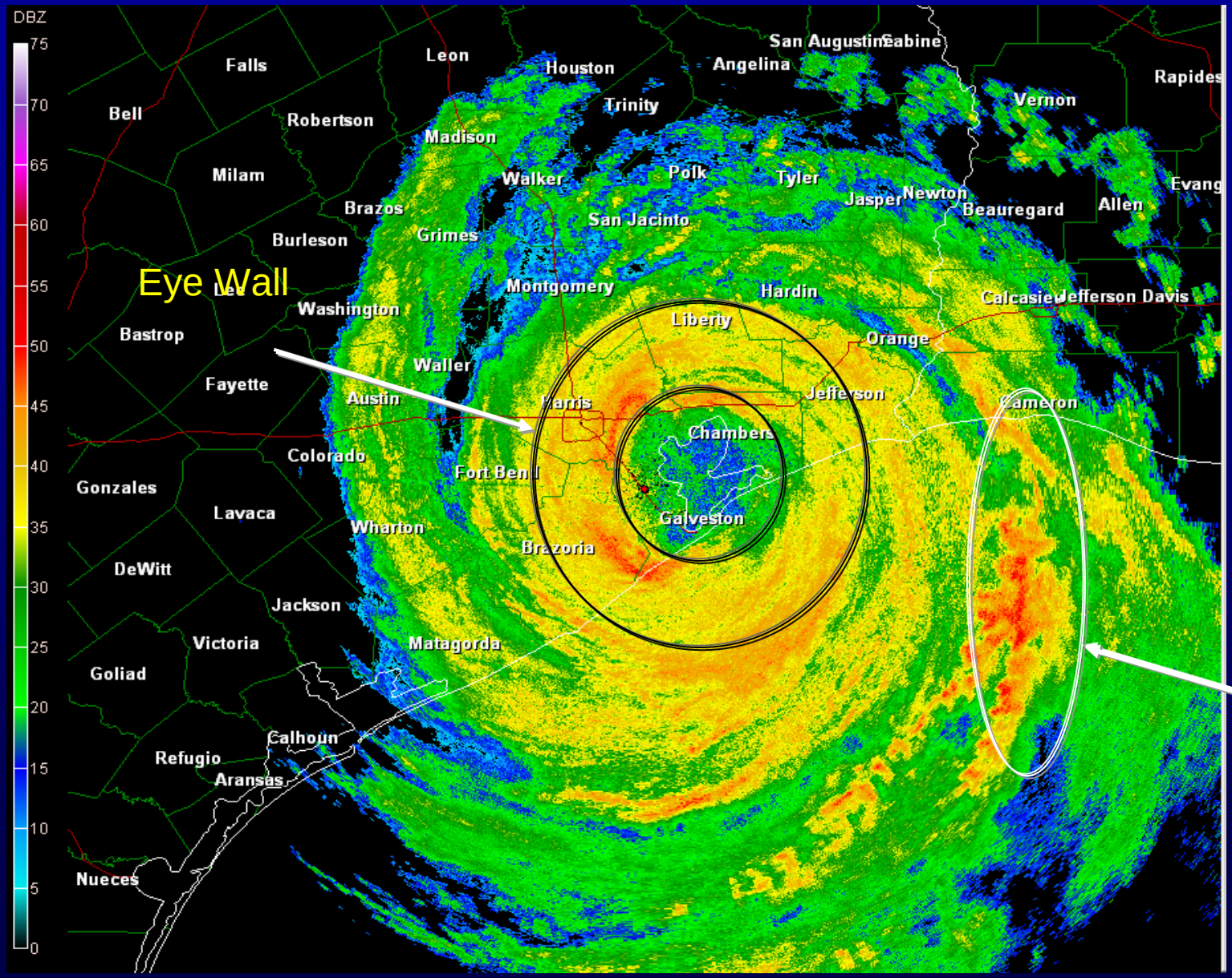
- Alternate Male/Female
- Repeat every 7 years unless the name is retired!

2013	2014	2015	2016	2017
Andrea	Arthur	Ana	Alex	Arlene
Barry	Bertha	Bill	Bonnie	Beryl
Chantal	Cristobal	Claudette	Colin	Cindy
Dorian	Dolly	Danny	Danielle	Don
Erin	Edouard	Erika	Earl	Emily
Fernand	Fay	Fred	Fiona	Franklin
Gabrielle	Gonzalo	Grace	Gaston	Gert
Humberto	Hanna	Henri	Hermine	Harvey
Ingrid	Isaias	Ida	Ian	Irma
Jerry	Josephine	Joaquin	Julia	Jose
Karen	Kyle	Kate	Karl	Katia
Lorenzo	Laura	Larry	Lisa	Lee
Melissa	Marco	Mindy	Matthew	Maria
Nestor	Nana	Nicholas	Nicole	Nate
Olga	Omar	Odette	Otto	Ophelia
Pablo	Paulette	Peter		Philippe
Rebekah	Rene	Rose	Richard	Rina
Sebastien	Sally	Sam	Shary	Sean
Tanya	Teddy	Teresa	Tobias	Tammy
Van	Vicky	Victor	Virginie	Vince
Wendy	Wilfred	Wanda	Walter	Whitney

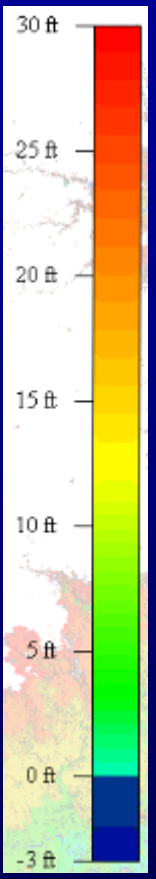
Hurricane Hazards

- Are any of these hazards not relevant to Montgomery County?
- Which Hazard is the Greatest Threat to Life in Montgomery County?

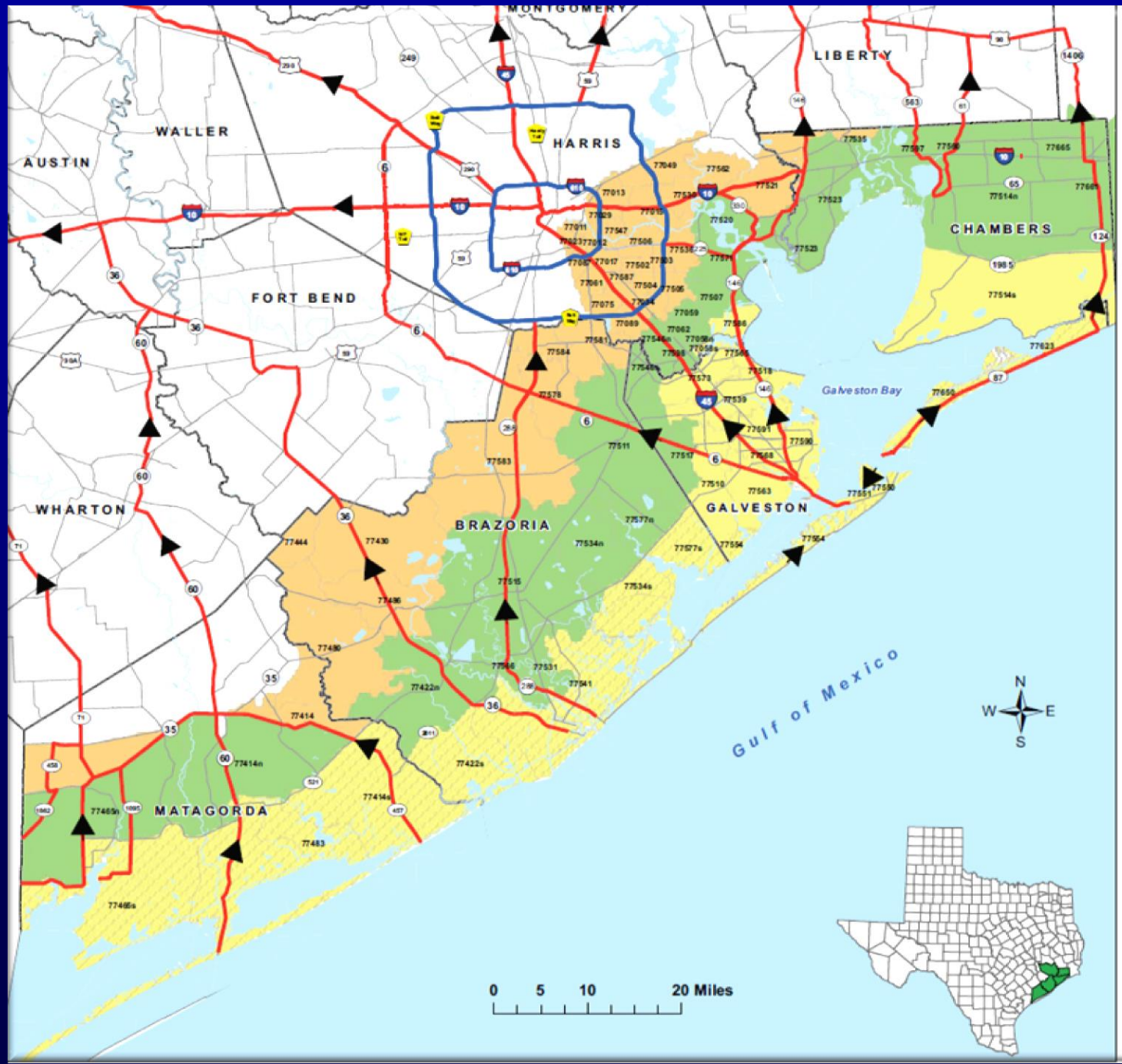
Hurricane Ike View from Radar



Know Your Elevation to Determine Risk for Surge



Elevation around Montgomery County 150 to 300 feet



Brazoria, Chambers, Galveston, Harris and Matagorda Hurricane Evacuation Zip-Zones Coastal, A, B, C

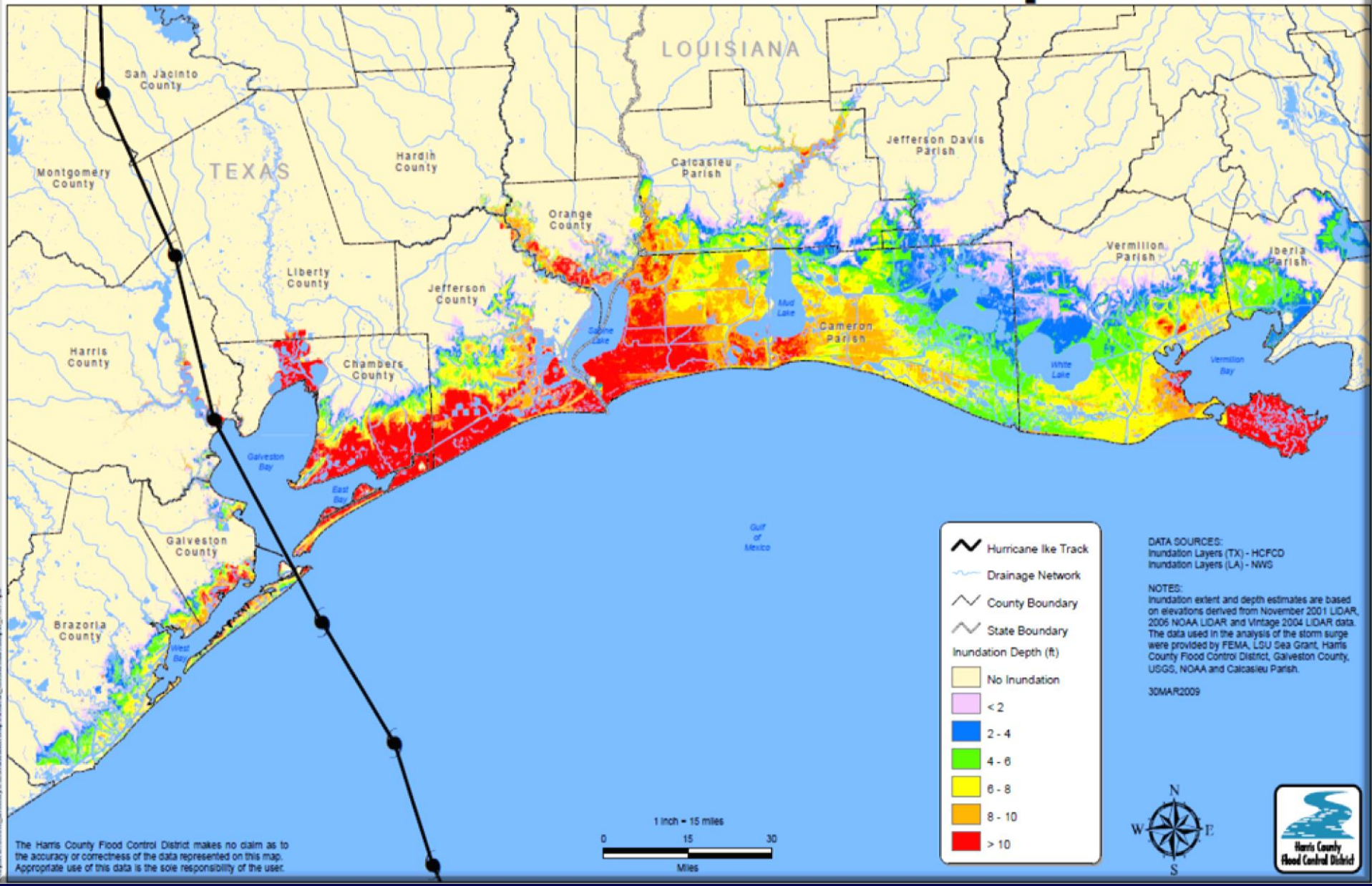
Zip-Zone Coastal				
77414s	77483	77550	77577s	77650
77422s	77534s	77551	77617	
77465s	77541	77554	77623	
Zip-Zone A				
77510	77539	77568	77590	
77514s	77563	77573	77591	
77518	77565	77586		
Zip-Zone B				
77058	77507	77522	77560	77661
77059	77511	77523	77566	77665
77062	77514n	77531	77571	
77414n	77515	77534n	77577n	
77422n	77517	77546n	77597	
77465n	77520	77546s	77598	
Zip-Zone C				
77011	77034	77444	77505	77562
77012	77049	77463	77506	77578
77013	77061	77480	77521	77581
77015	77075	77486	77530	77583
77017	77087	77502	77535	77584
77023	77089	77503	77536	77587
77029	77430	77504	77547	

Route Designation

- Evacuation Corridors
- Evacuation Connections
- Other Roads
- County Boundary

Expiration Date December 2012
Map Created by:
Houston-Galveston Area Council

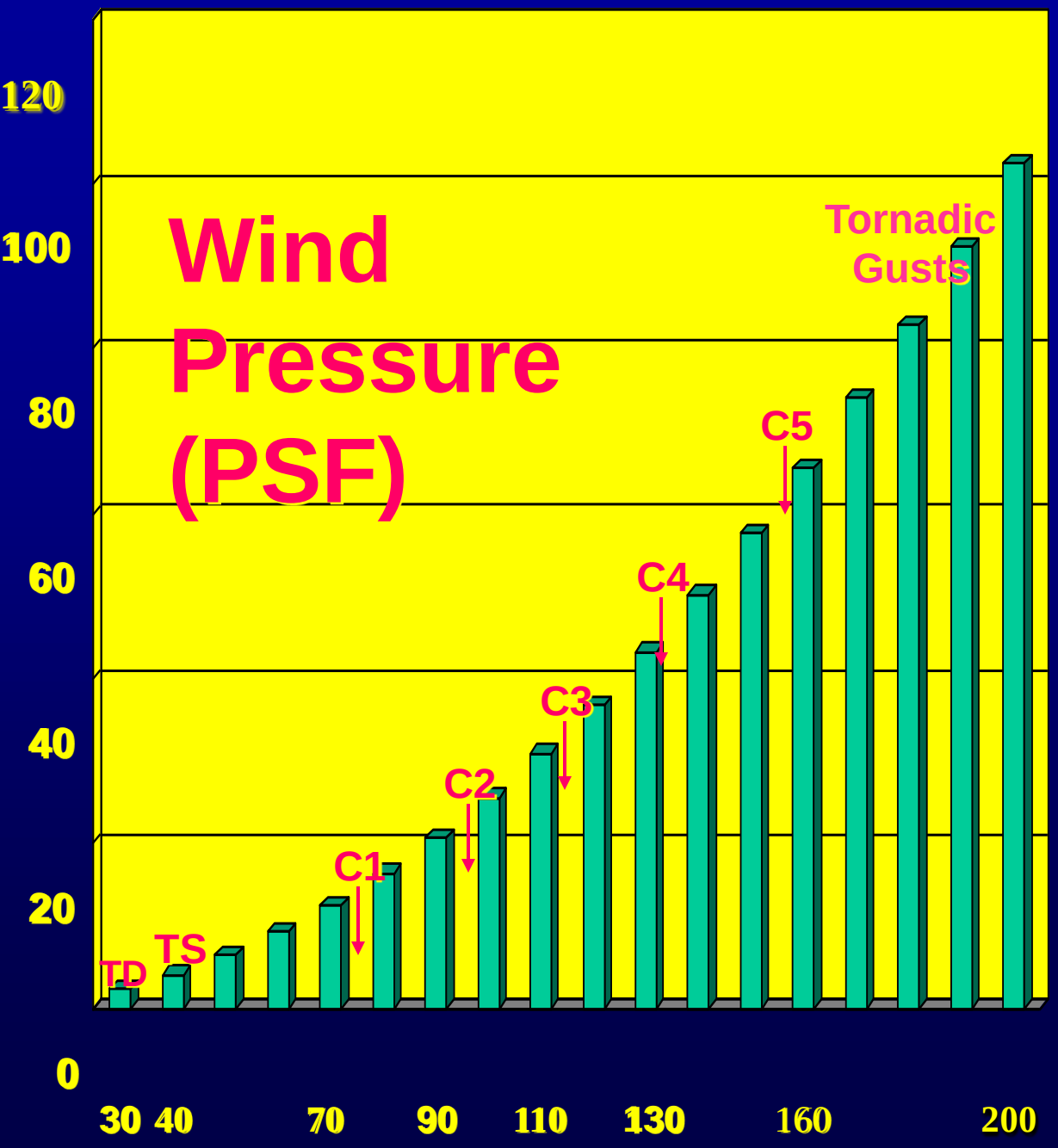
Hurricane Ike Inundation Depth



HURRICANE WINDS

Saffir-Simpson Hurricane Wind Scale

Category	*1-min. Sustained Winds (mph)*	*Storm Examples*	*Wind Impacts*
Tropical Depression	Less than 39 mph		Relatively minor
Tropical Storm	Between 39 and 73	Allison	Can be significant
1	74 - 95	Jerry 1989 Claudette 2003 Humberto 2007	Very dangerous; will produce some damage
2	96 - 110	Georges 1998 Ike 2008	Extremely dangerous; will produce extensive damage
3	111 - 129	Alicia 1983 Katrina 2005 Rita 2005	Devastating damage
4	130 - 156	1900 - Galveston Carla 1961	Catastrophic damage
5	157 or greater	Andrew 1992 Camille 1969	Catastrophic damage

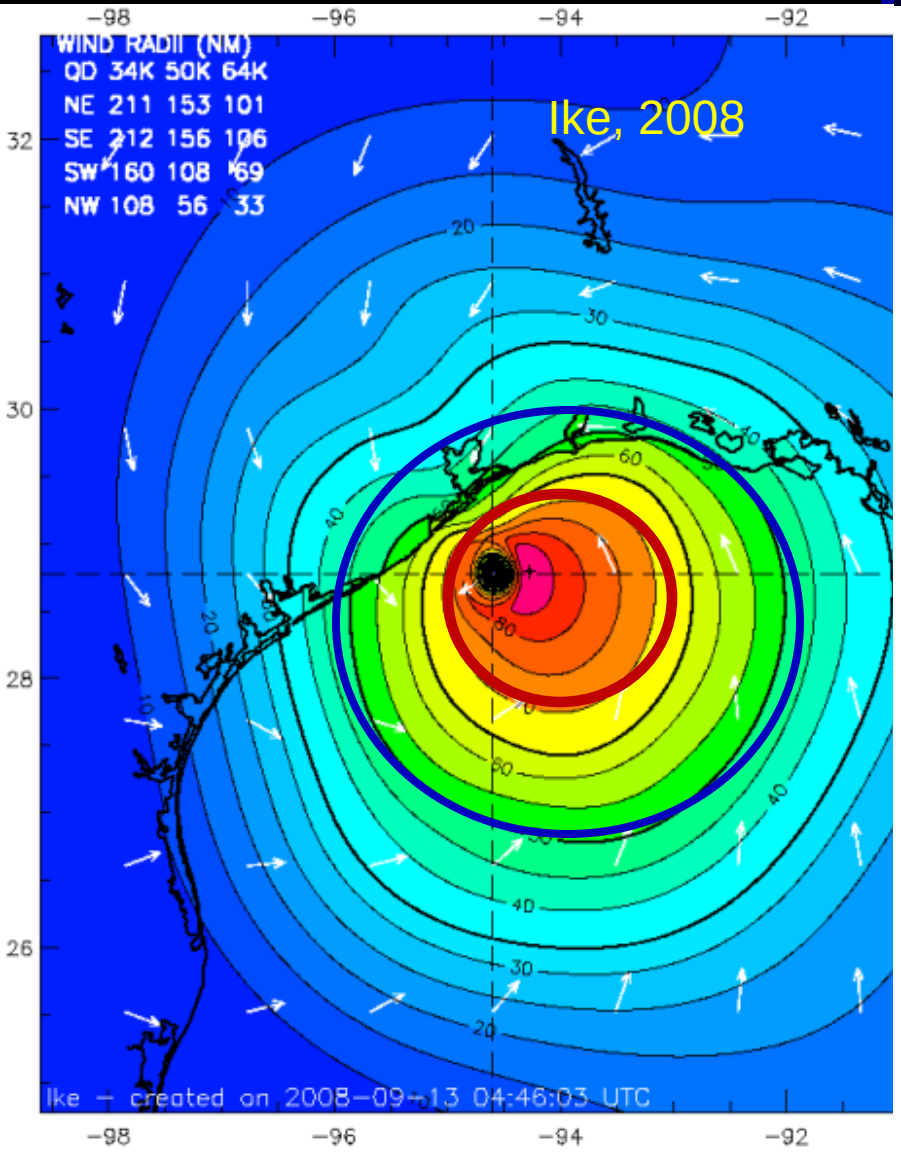


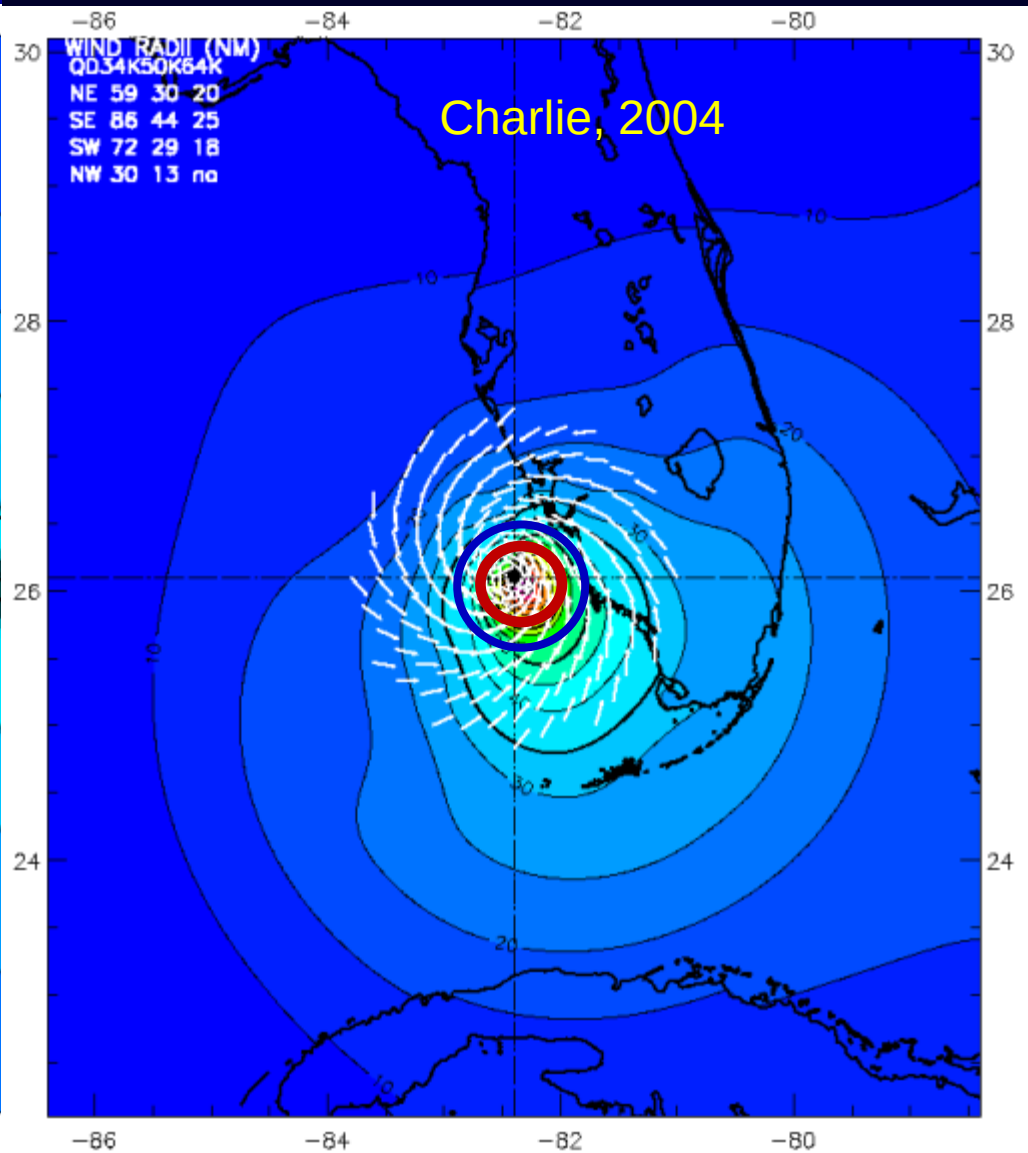
Credit: NHC

86% of wind damage is caused by major hurricanes (Cat 3, 4 & 5)

Large Cat 2→ high surge and moderate wind impact over large area

Small Cat 4→ modest surge near eyewall only; extreme wind impact near eyewall;





Integrated Kinetic Energy: for Winds > TS force: 90 TJ, for Winds > Hurricane Force
Destructive Potential Rating(0-6) Wind: 3.0 , Surge/Waves: 4.6

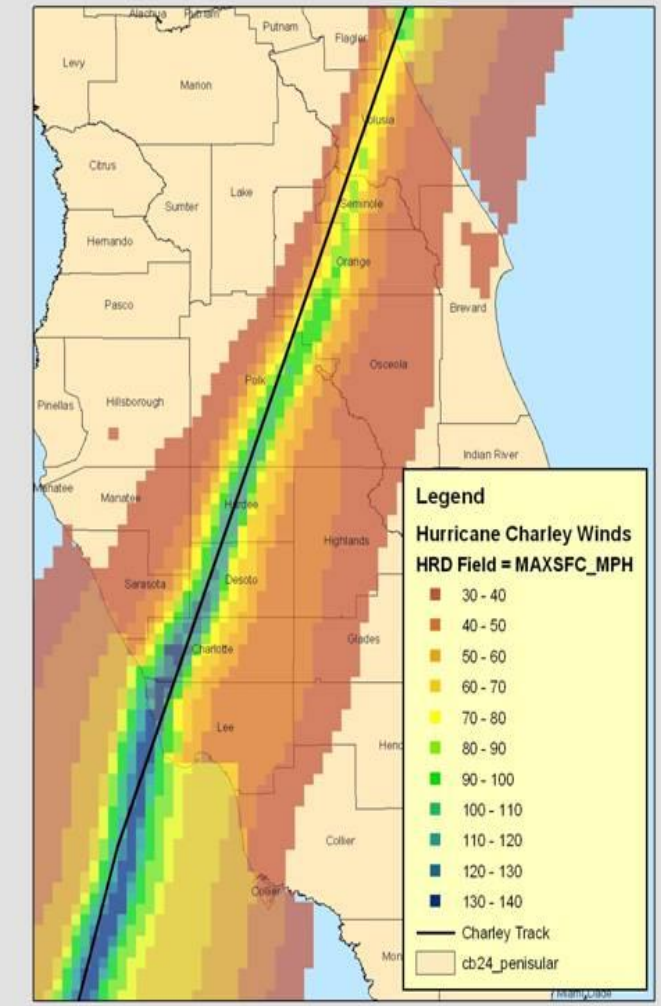
Observed Max. Surface Wind: 90 kts, 24 nm SW of center based on 0231 z SFMR42
Analyzed Max. Wind: 90 kts, 20 nm NE of center

Observed Max. Surface Wind: 117 kts, 4 nm SE of center based on 1929 z AFREC sfc measure
Analyzed Max. Wind: 115 kts, 5 nm SE of center

Cat 1 Damage in Houston

Typical damage with Ike around Houston: downed or snapped Trees, some roof damage

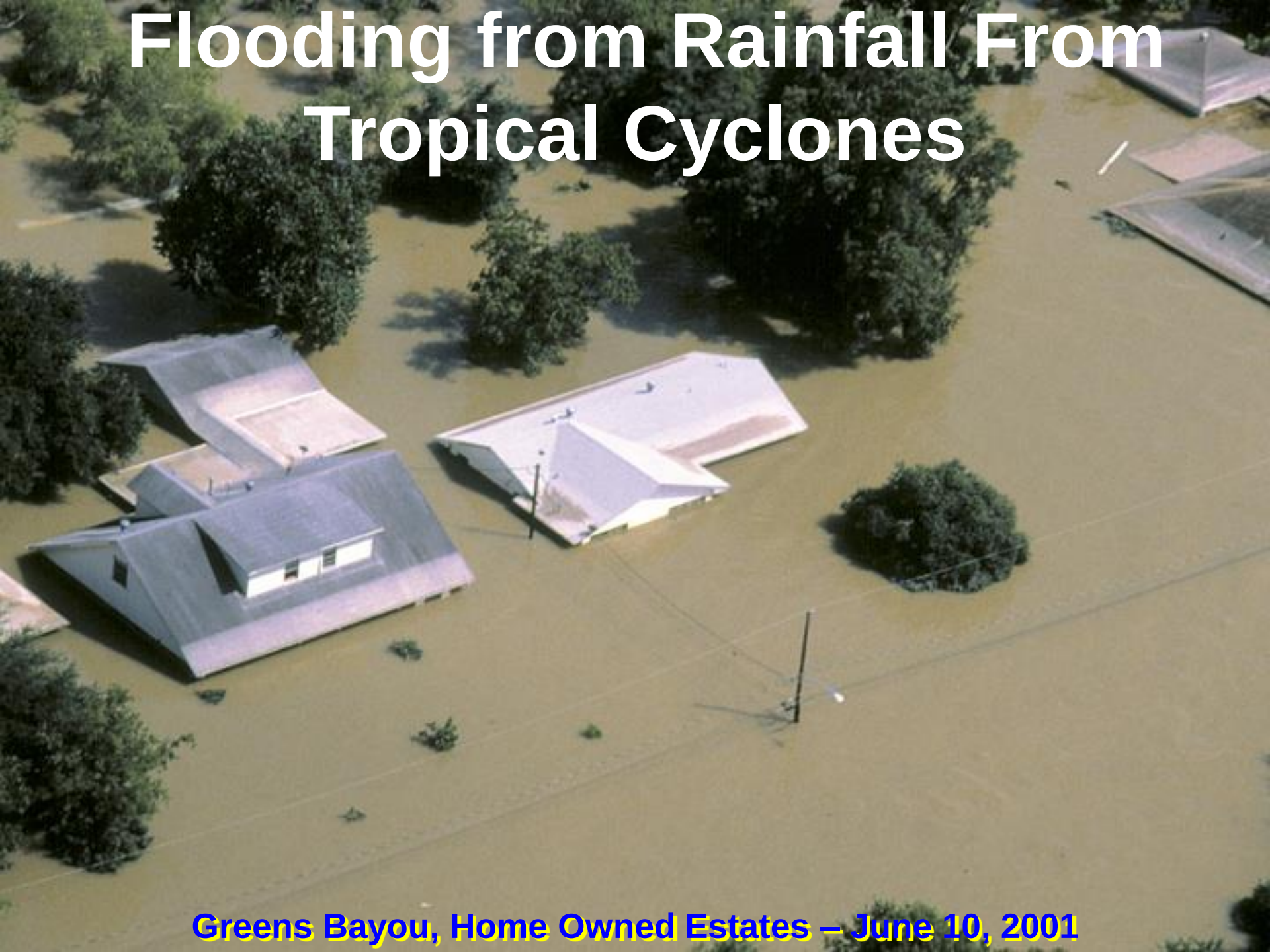
2004 Hurricane Charley – SW Florida



Category 4 (130 – 156 mph)

Catastrophic damage will occur

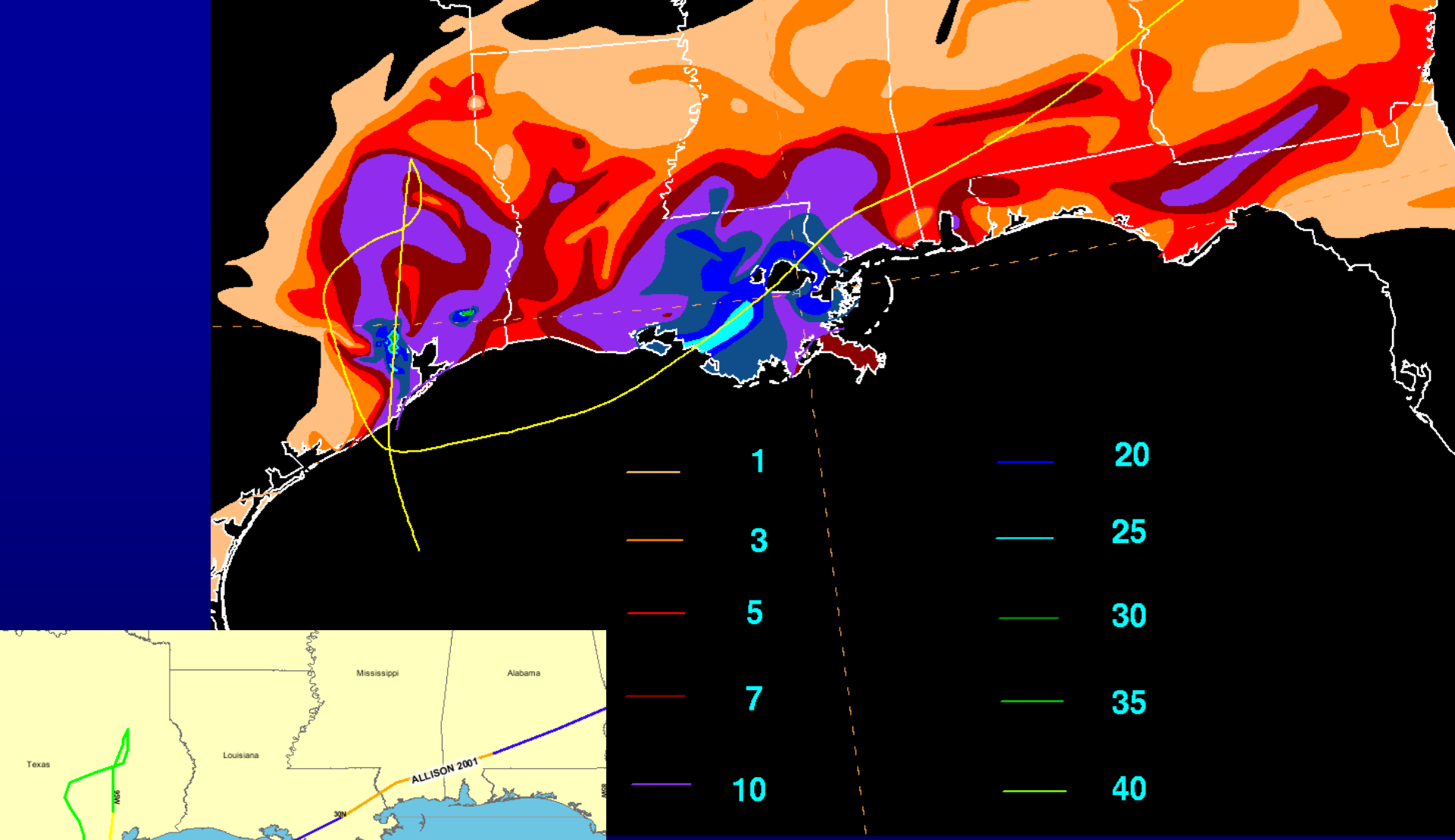
Flooding from Rainfall From Tropical Cyclones

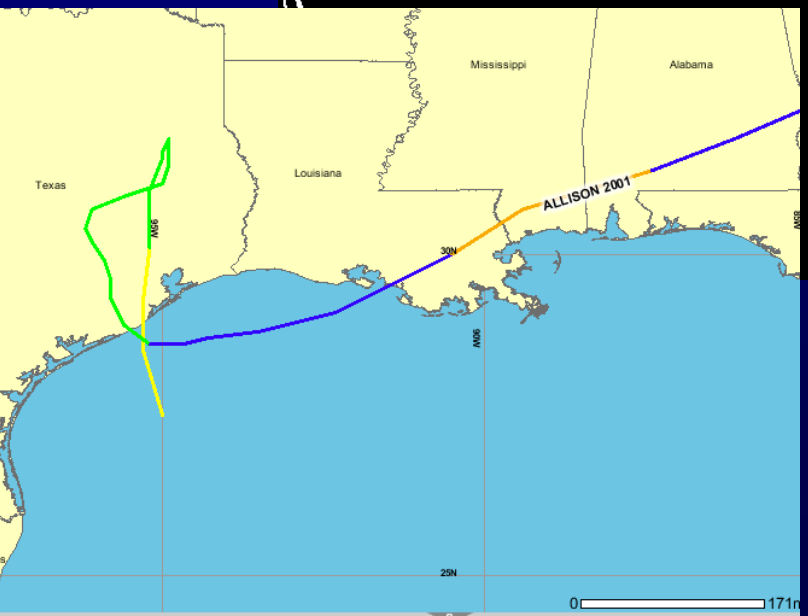


Greens Bayou, Home Owned Estates – June 10, 2001

FACTORS AFFECTING RAINFALL AMOUNTS AND DISTRIBUTION IN TROPICAL CYCLONES

1. SIZE (Bigger storm = more rain)
2. MOTION (Slower storm = more rain)
3. RAIN RATE (Higher rain rate = more rain)
4. VERTICAL WIND SHEAR (more rain on one side)
5. TOPOGRAPHY (more rain on windward side)
6. FRONTAL BOUNDARIES / UPPER LEVEL TROUGHS





Tropical Storm Allison June 2001 Looped Over SE Texas; 36.99 inches of rain Port of Houston

Interstate 10

Houston, Texas

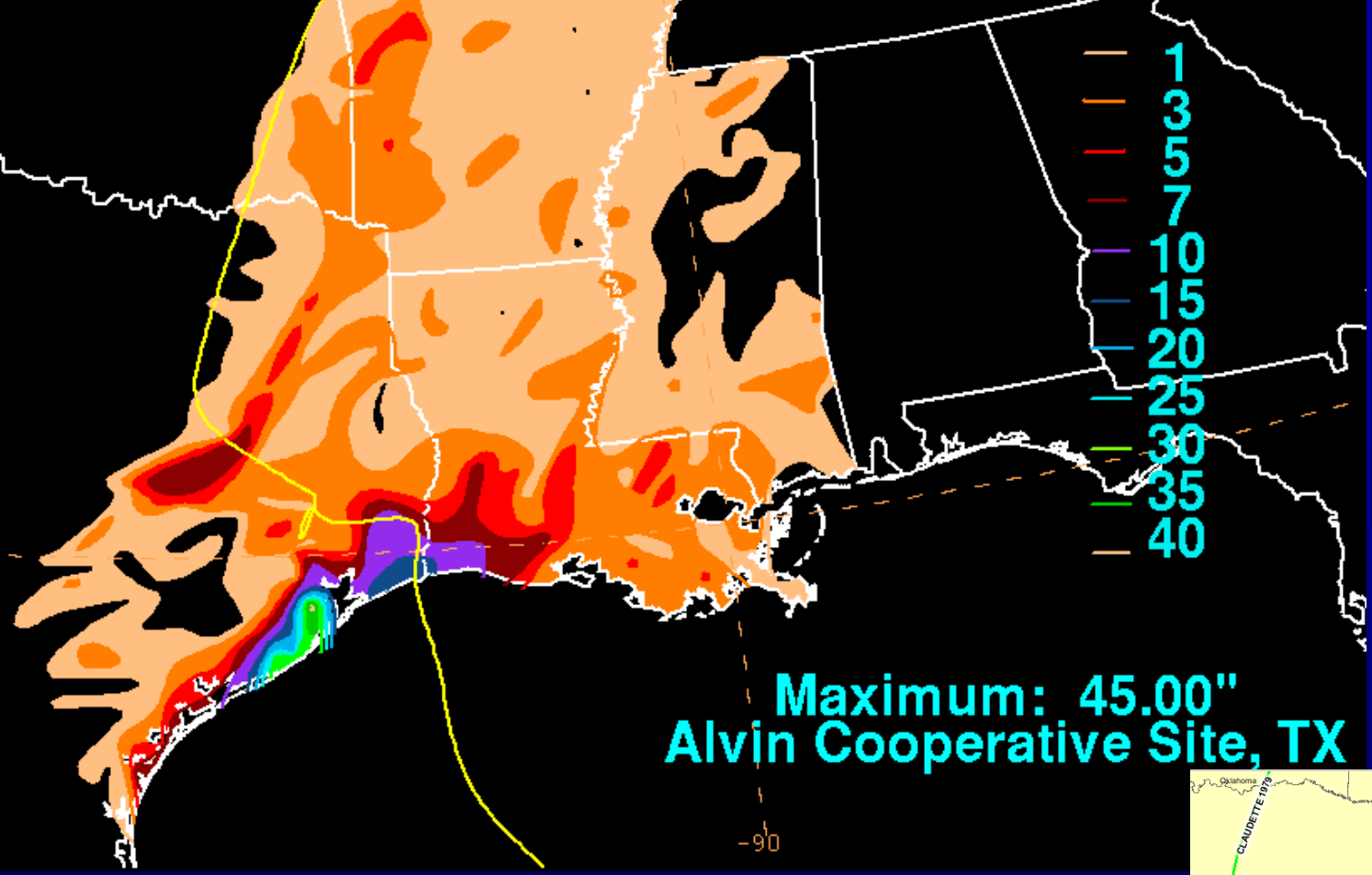
Interstate 10, Looking West, Houston, Texas

Tropical Storm Allison (2001)

Houston, Texas

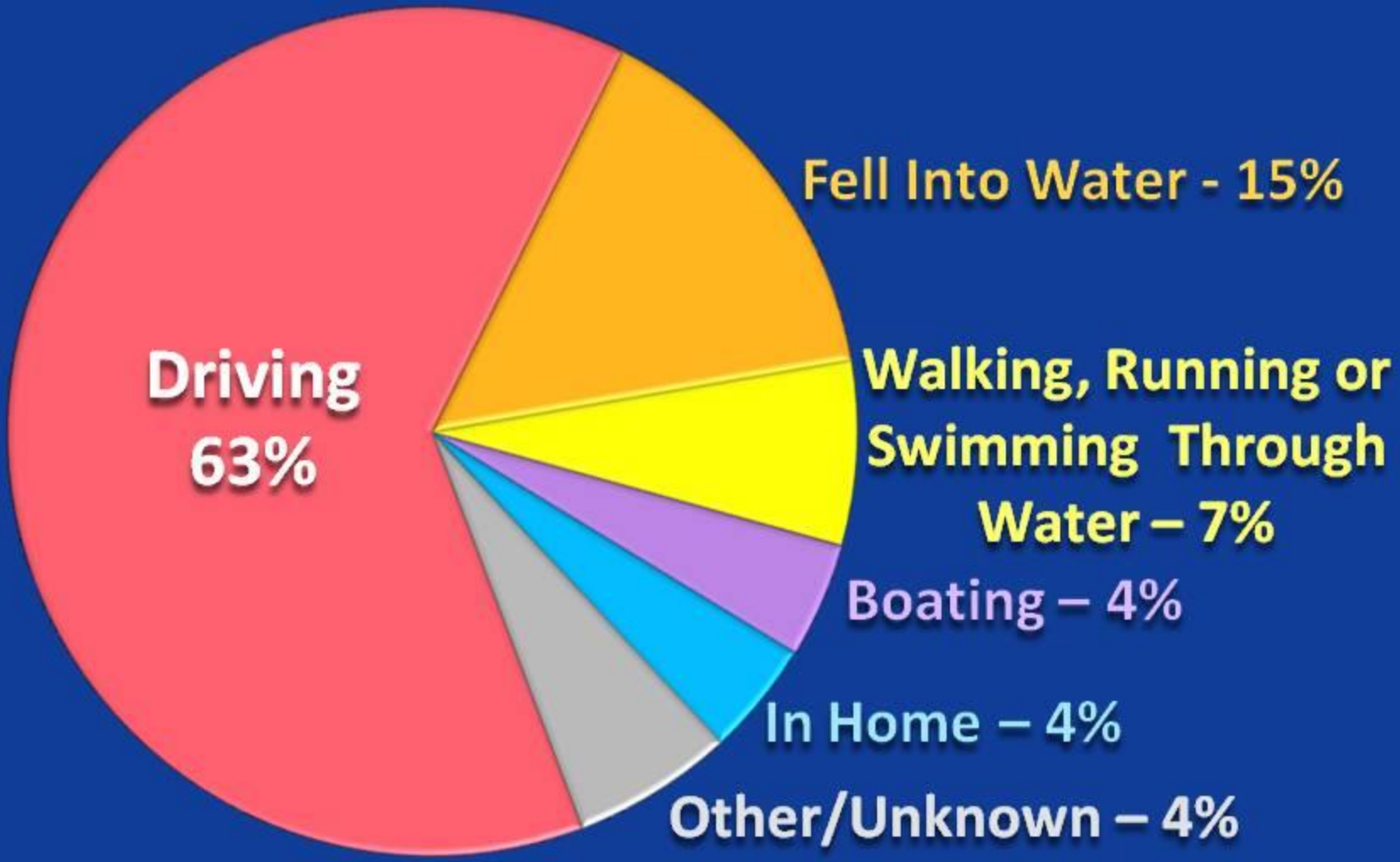
Interstate 10, Looking West, Houston, Texas
Tropical Storm Allison

Houston Chronicle



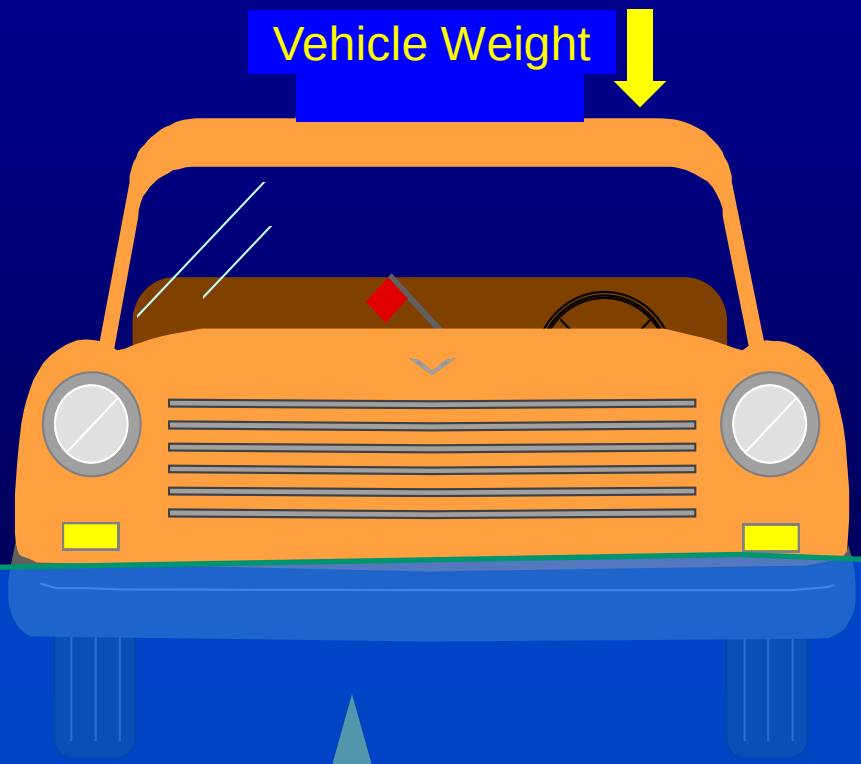
Tropical Storm Claudette
July 21st-25th 1979. Looped Over SE Texas; 43 inches of rain measured in Alvin over 24 hours (record)

2011 U.S. Flood Fatalities
Activity of Victims



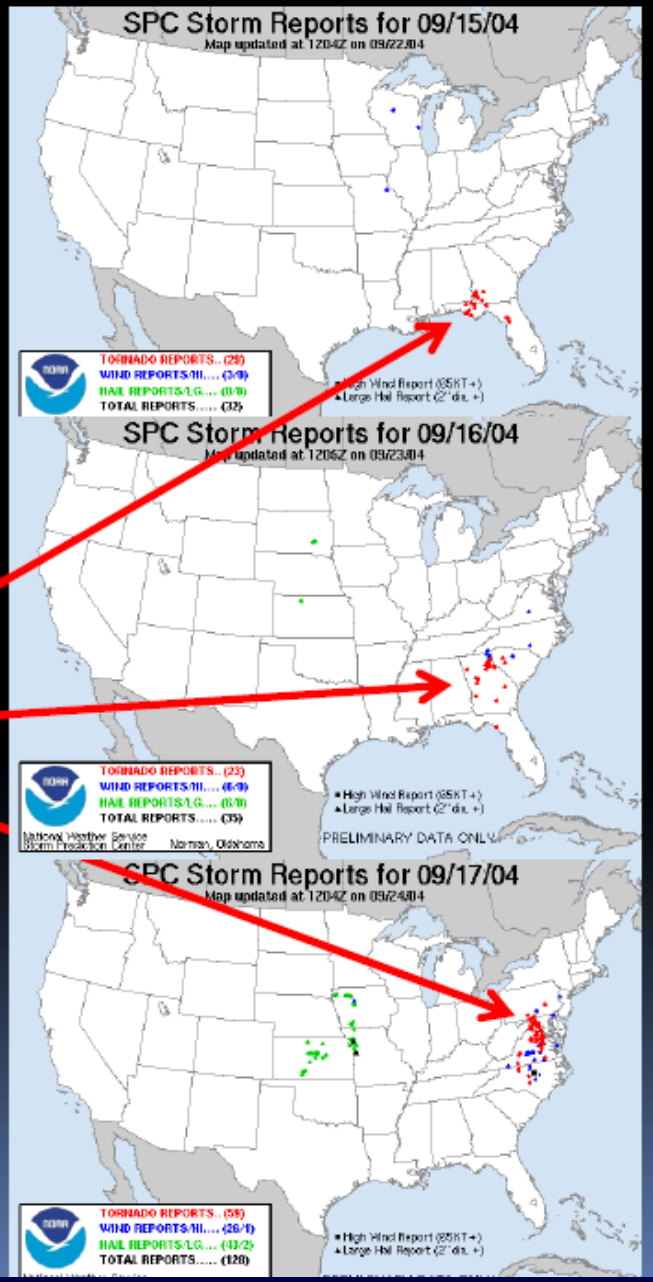
Forces on Vehicles Crossing Streams

The car will float downstream when:
Stream Force > Friction Force



Hurricane-Induced Tornadoes

- Nearly 70% of landfalling hurricanes (1948-2000) spawned at least 1 tornado
- 40% of landfalling hurricanes spawn more than 3 tornadoes
- Some hurricanes produce tornado "outbreaks"
  - Hurricane Beulah (1967): 141
  - Hurricane Ivan (2004): 117
  - Hurricane Frances (2004): 101
  - Hurricane Rita (2005): 90
  - Hurricane Camille (1969): 80
  - Hurricane Katrina (2005): 43



Hurricane Outlook for 2013

- Tropical Atlantic has warmed over the past several months which is necessary for tropical formation. SST's of 80deg F or greater

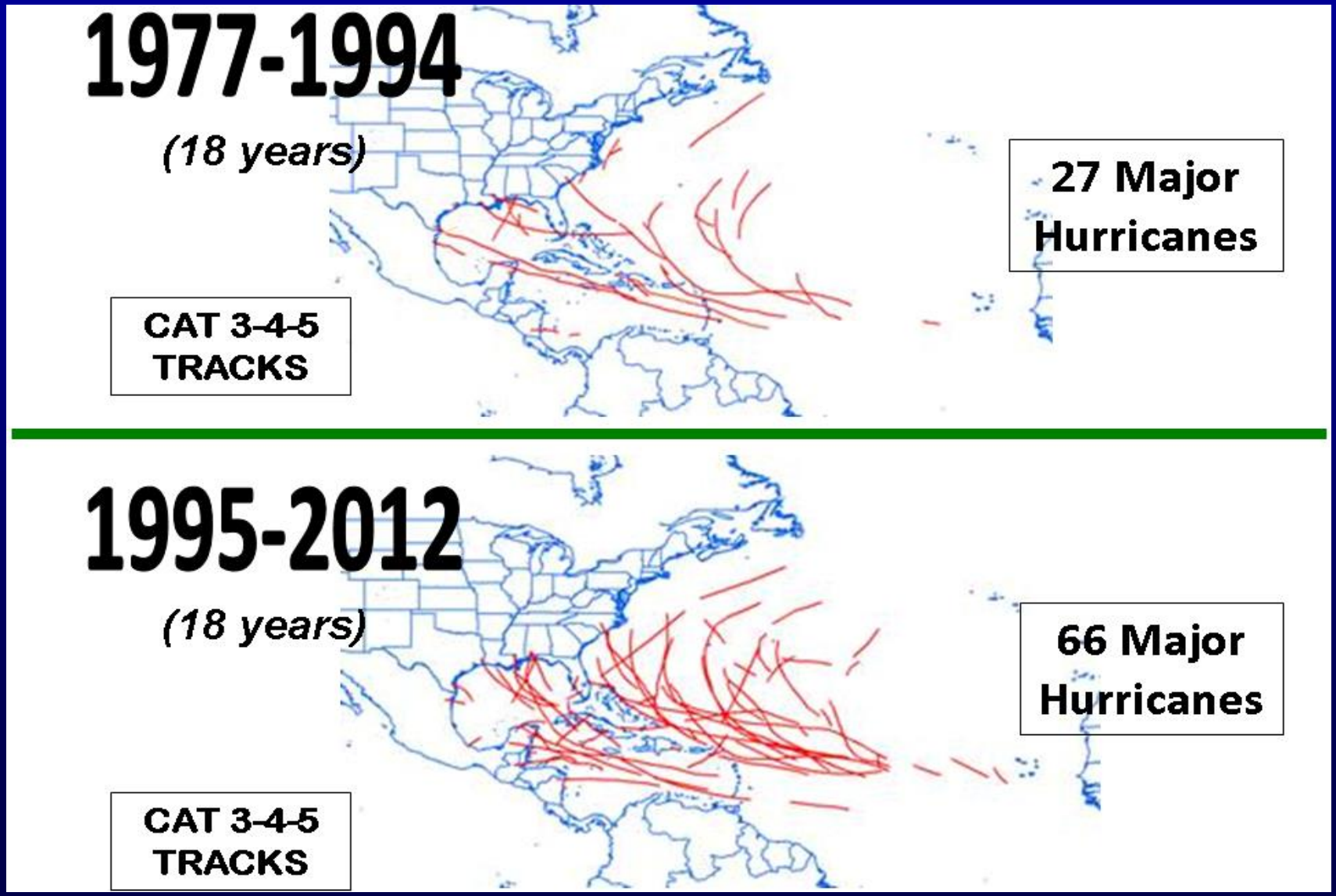
- El Nino unlikely which would generally indicated a less active tropical season

- Since 1900, there were 5 years with similar patterns to February/March 2013…and 4 out of 5 had above normal tropical activity

Hurricane Outlook 2013

- We remain in a warm multi-decadal oscillation
- The MDO does not affect the number of storms and weak hurricanes
- It noticeably increases the number of weak hurricanes that mature and become major hurricanes

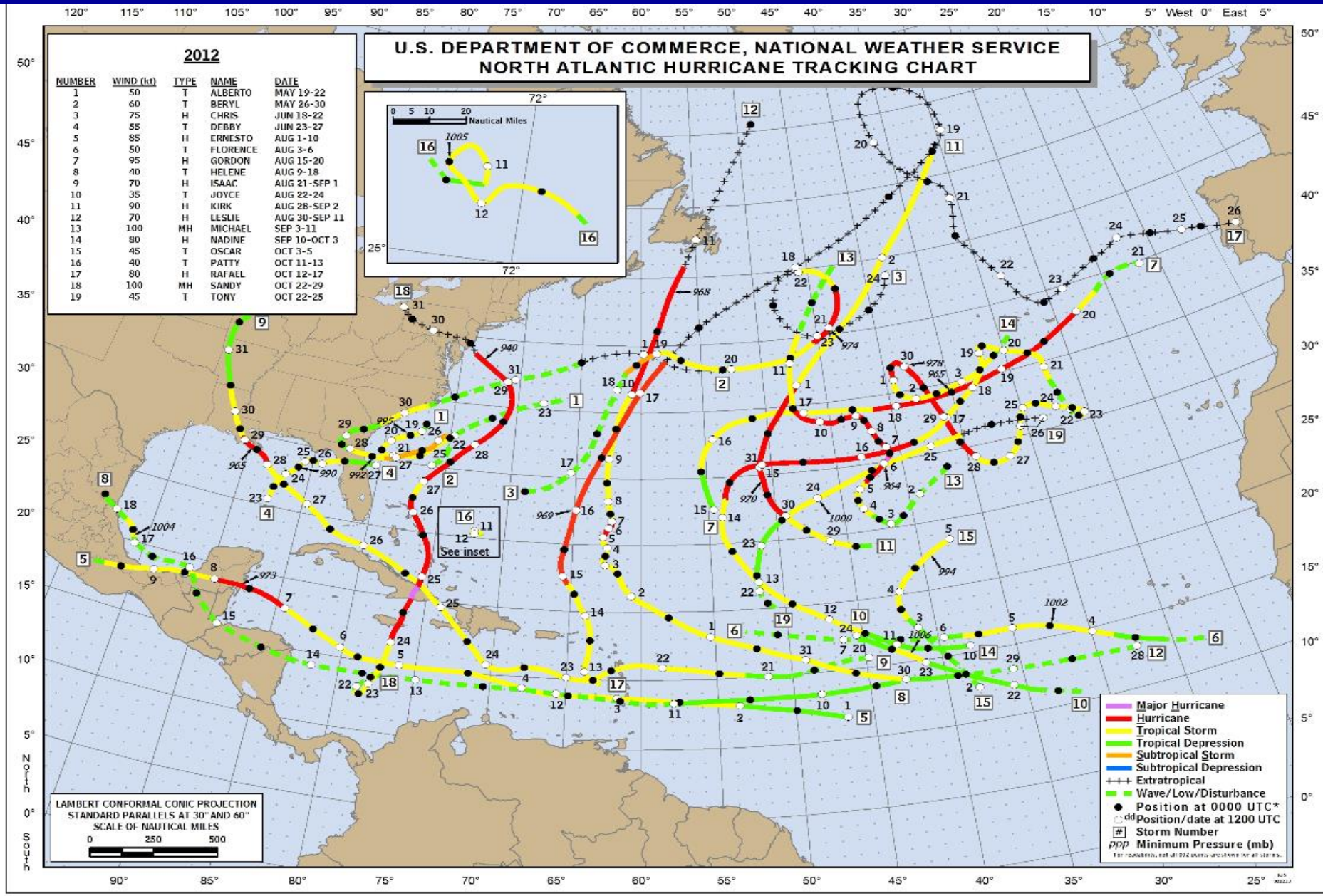
Multi Decadal Oscillation



Atlantic Hurricane Outlooks 2012

Forecast Group	Number of Named Storms	Number of Hurricanes	Number of Major Hurricanes	ACE
Long-Term Average	**12**	**6.5**	**2**	**92**
National Weather Service	9-15	4-8		87.5
Colorado State	10	9	4	70
Penn State	11			
Florida State	13	7		122
Cuba Institute	10	5		
Impact Weather	10	5	2	
Accuweather	12	5	2	
Actual	**19**	**10**	**2**	**123**

19 Named Storms, 7 Hurricanes, 4 Major Hurricanes



Atlantic Hurricane Outlooks 2013

Forecast Group	Number of Named Storms	Number of Hurricanes	Number of Major Hurricanes	ACE
Long-Term Average (1981-2010)	**12**	**6.5**	**2**	**92**
National Weather Service				
Colorado State	18	9	4	165
WSI	12	6	3	
Penn State				
Florida State				
Cuba Institute				
Impact Weather	16-20	7-9	2-4	
Accuweather				
Actual				

1983, VERY Quiet Season (or was it?)

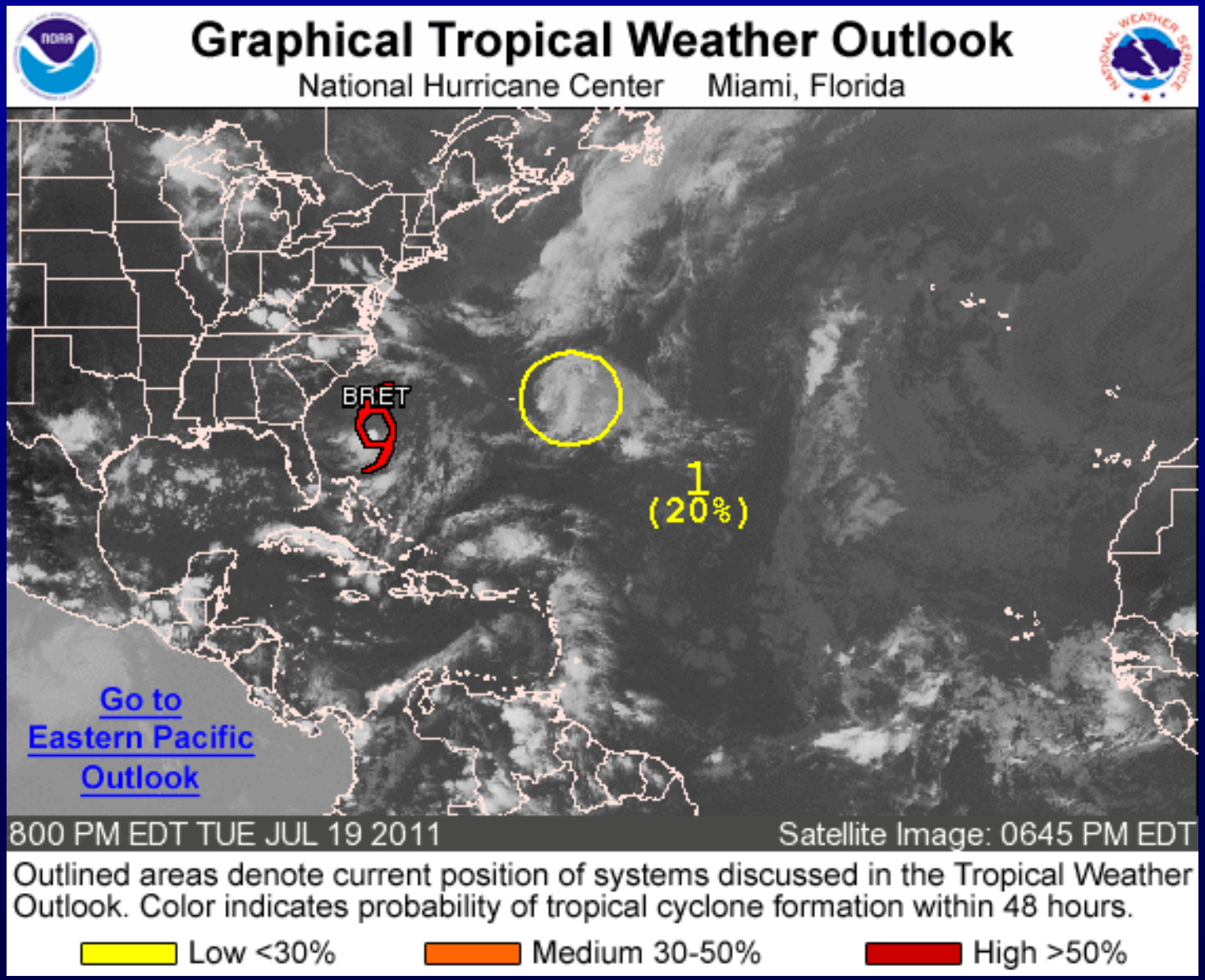
Very low number of storms, but one with major impact on SE Texas

Least active season 1983 (4 named storms

No El Nino or La Nina (neutral)

Tropical Cyclone Preparation

www.hurricanes.gov (National Hurricane Center Web Site)



National Weather Service Web Sites

weather.gov, weather.gov/Houston

- Graphical and text forecasts
- Recorded briefings
- Hurricane audio and video briefings if a storm is approaching
- Facebook page (Like us!)

Also check out your Office of Emergency Management pages, Social Media for weather info and alerts!

Emergency Supply Kit

30-gallon trash barrel

- Flashlight
- Tissues
- Radio
- Pocket knife
- Sanitary Supplies
  - Toothbrush
  - Soap
  - Shampoo
  - Sponge
  - Cleanser
  - Bleach
- Batteries
- Pencils
- Drinks/Juices
- Nuts
- Rice – Pastas
- Soups
- Canned Foods
- Water (1 gal per person per day)
- First Aid Kit
- Medicines
- Rubbing Alcohol
- First Aid Handbook
- Towels
- Blankets
- Paper Towels
- Toilet Paper
- Candles
- Matches
- Can Opener
- Peanut Butter
- Crackers
- Dried Beans
- Change of Clothing
- Foul Weather Gear
- Sterno, Stove, Fuel
- Garbage Bags
- Cooking Utensils
  - Cooking Pot
  - Plastic Dishes
  - Silverware
  - Aluminum Foil

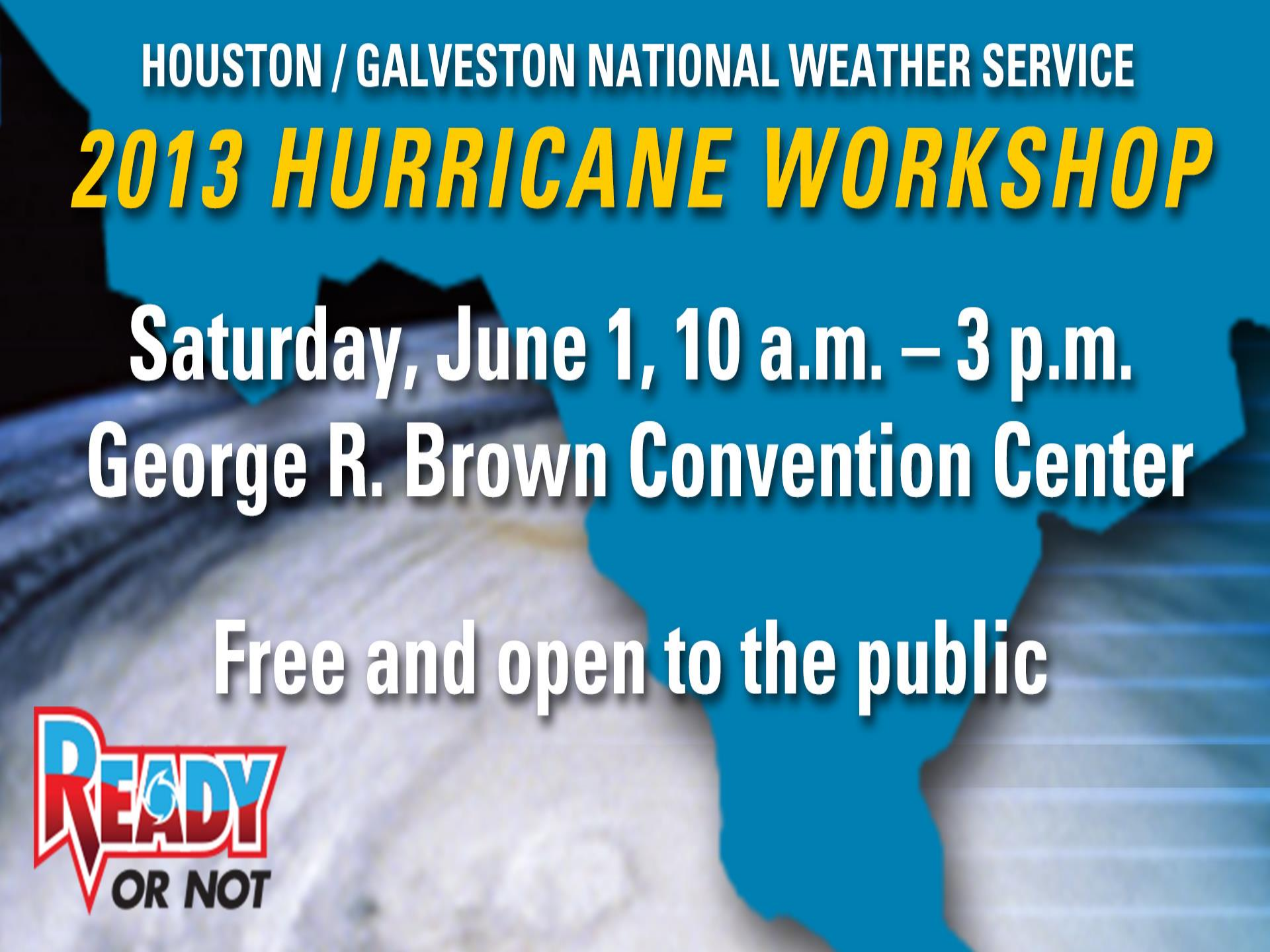
- ✔ Check your portable radio and battery-operated lights and flashlights
- ✔ Monitor weather broadcasts for current conditions and advisories from local emergency management officials
- ✔ Rotate food supplies every six months
- ✔ If you evacuate, be sure to post a prominent note telling where you've gone
- ✔ Provide for your pets, especially if you evacuate

NOTE: This list is not intended to be all-inclusive. You must decide what supplies are best suited for you and your family's survival. This list contains only suggestions for your consideration.

- Make a plan
  - If I choose to evacuate
- Build a kit
  - Non-perishable food items
  - Water
  - Medicines
  - Battery powered radio
  - Can opener
- Keep tank full
- Have cash on hand

More Preparedness Info at:

http://www.ready.gov
Hurricanes.gov/prepare
http://www.fbcoem.org/


HOUSTON / GALVESTON NATIONAL WEATHER SERVICE
2013 HURRICANE WORKSHOP
Saturday, June 1, 10 a.m. – 3 p.m.
George R. Brown Convention Center
Free and open to the public
READY
OR NOT