



Community Emergency Response Team Training

Section 1: Natural Hazard Preparedness

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NOAA's National Weather Service, Wakefield VA

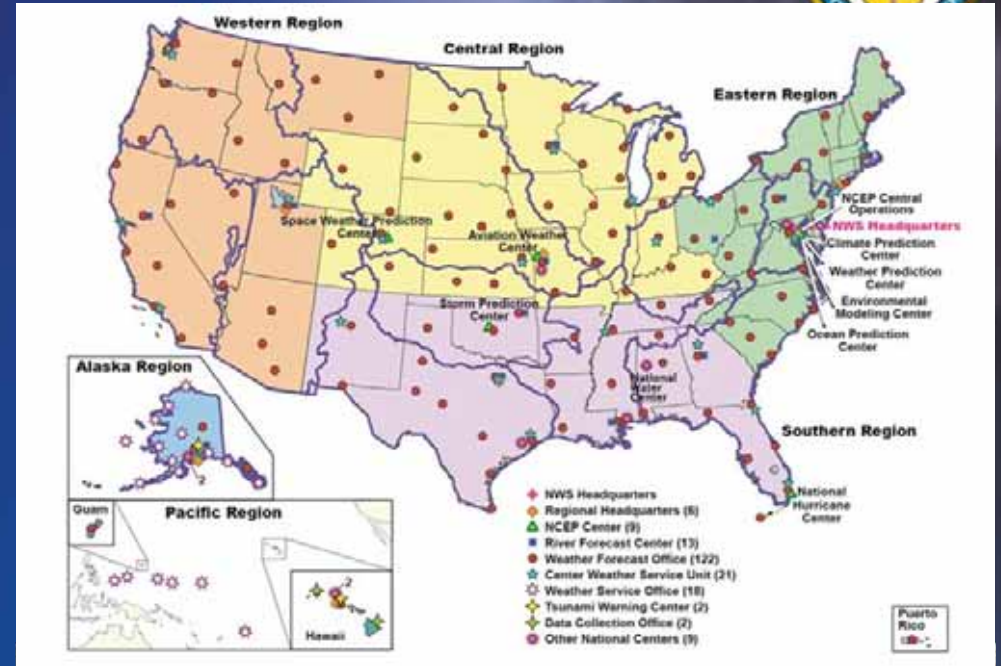
<http://weather.gov/akq>



What is the NWS?



- ▶ **The National Weather Service is:**
 - ▶ **A Federal Government Agency**
 - ▶ **Part of the Dept. of Commerce**
 - ▶ **Nat'l Oceanic and Atmospheric Admin. (NOAA) is our Parent Agency**
 - ▶ **A 4700 Employee Agency Dedicated to Saving Lives and Protecting Property**
 - ▶ **WFO Wakefield is 1 of 122 local offices nationwide (including Puerto Rico & Guam)**





NWS in the Mid-Atlantic

National Weather Service in the Mid Atlantic Region



WFO Pittsburgh, PA
(412) 262-1591
<https://weather.gov/pbz>

WFO Baltimore/Washington DC
(703) 996-0107
<https://weather.gov/lwx>

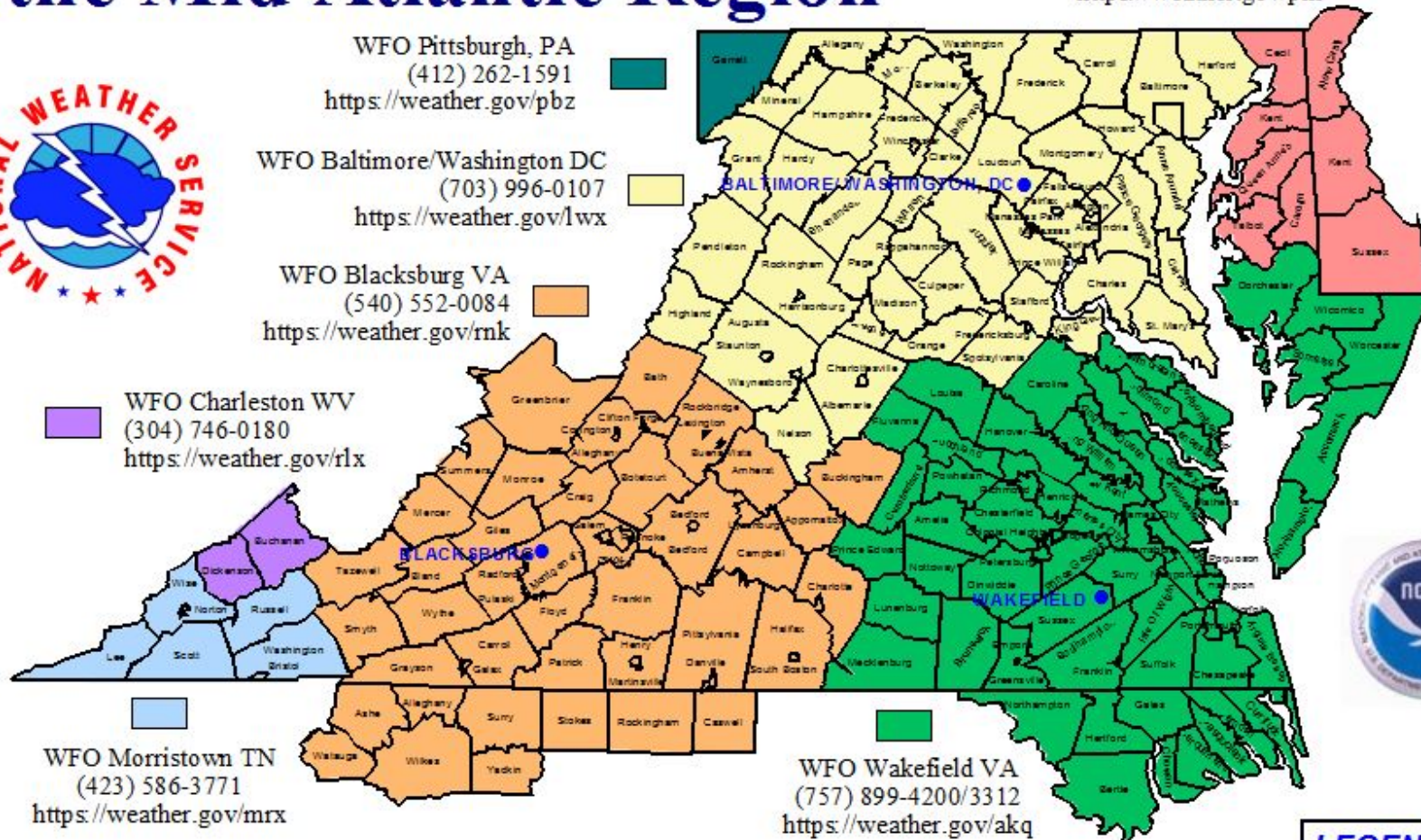
WFO Blacksburg VA
(540) 552-0084
<https://weather.gov/rnk>

WFO Charleston WV
(304) 746-0180
<https://weather.gov/rlx>

WFO Morristown TN
(423) 586-3771
<https://weather.gov/mrx>

WFO Wakefield VA
(757) 899-4200/3312
<https://weather.gov/akq>

WFO Mt. Holly NJ
(609) 261-6602
<https://weather.gov/phi>



LEGEND
● WFOS

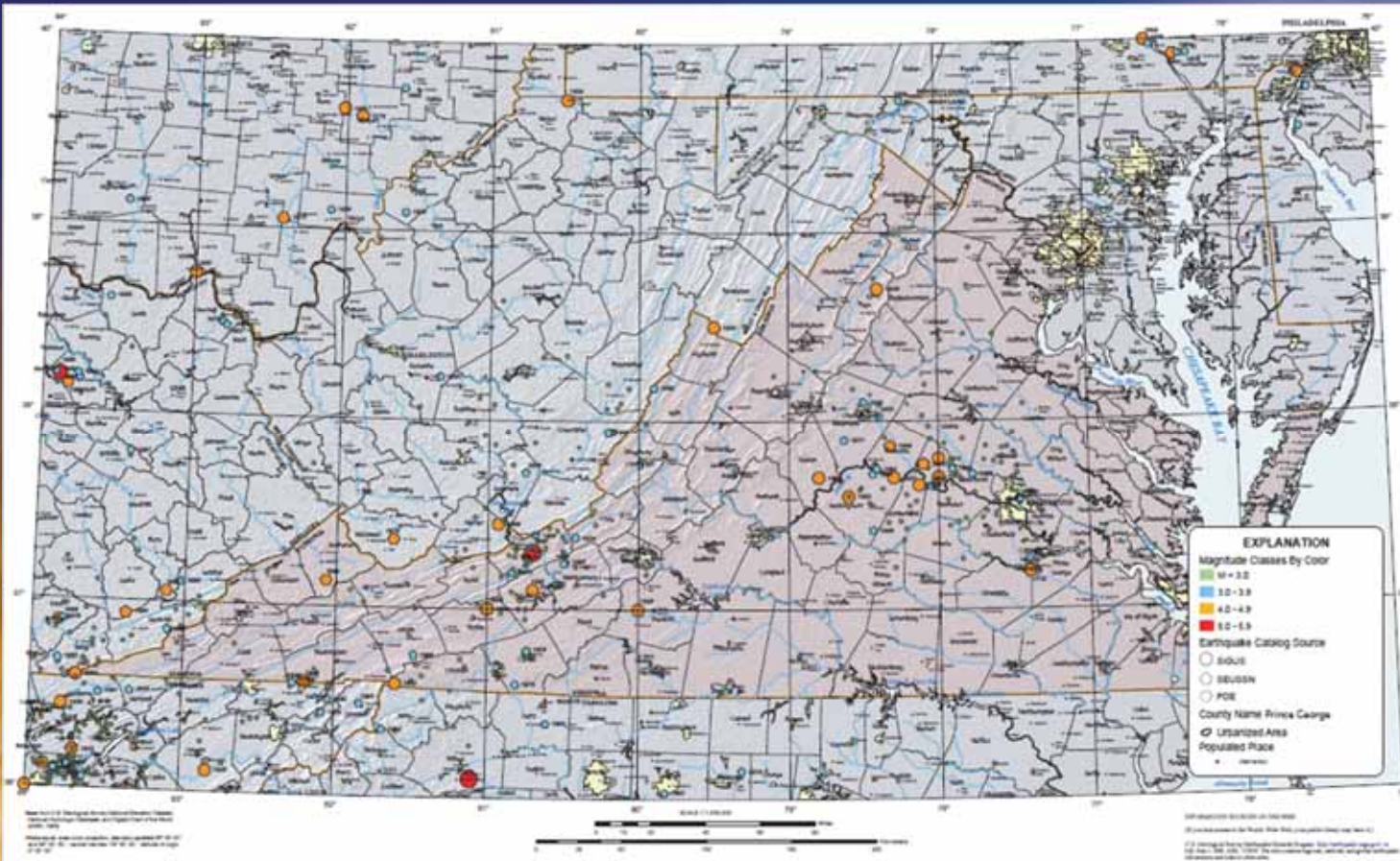


CERT Training - Natural Hazard Topics

- Earthquakes & Tsunamis
- Watch vs. Warning, NOAA Weather Radio
- Hurricanes
- Thunderstorms
 - *Lightning, Severe Thunderstorms, and Tornadoes*
- Flooding
- Excessive Heat and Cold



VA Earthquakes – 1774-2004



SIGNIFICANT SEISMIC EVENTS 1774-2004
VIRGINIA AND VICINITY

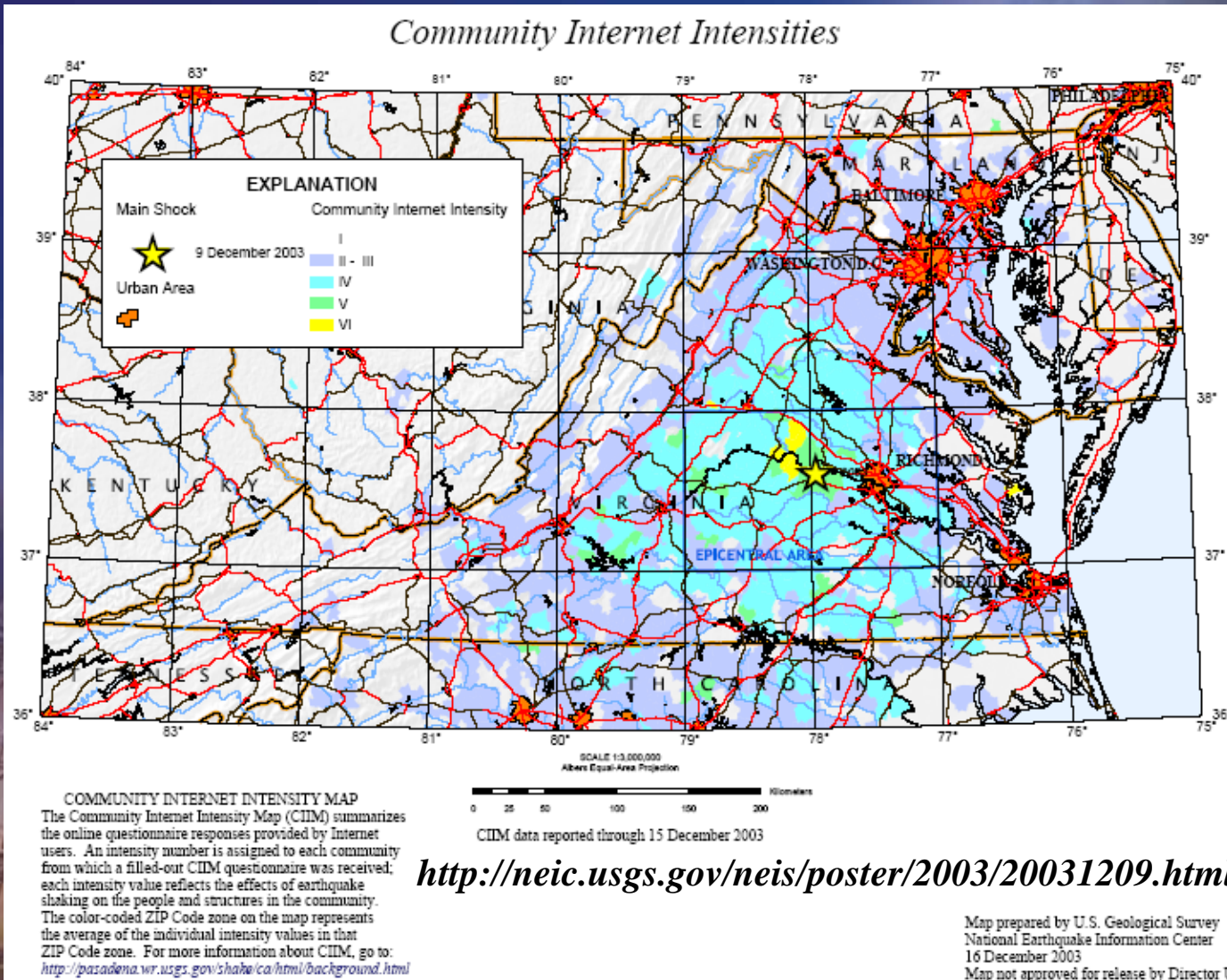
YR	MO	DY	LAT (°N)	LOX (°W)	MAG
1774	2	21	37.2	77.4	4.5
1776			39.6	81.9	4.0
1824	7	15	39.7	80.5	4.1
1828	3	10	37.0	80.0	4.6
1833	8	27	37.7	78.0	4.5
1844	11	28	36.0	84.0	4.2
1852	4	29	36.6	81.6	4.8
1852	11	2	37.6	78.6	4.3
1853	5	2	38.5	79.5	4.6
1861	8	31	36.1	81.1	5.0
1875	12	23	37.8	78.8	4.8
1885	10	10	37.7	78.8	4.4
1889	3	8	40.0	76.5	4.1
1897	5	3	37.1	80.7	4.3PS
1897	5	31	37.3	80.7	5.6
1898	2	5	37.0	81.0	4.4
1898	11	25	37.0	81.0	4.5
1899	2	13	37.0	81.0	4.5
1901	5	17	38.75	83.00	4.2
1907	2	11	37.70	78.30	4.0
1913	3	28	36.20	83.70	4.1
1918	4	10	38.70	78.40	4.6
1924	11	13	36.60	82.20	4.0
1928	11	3	36.112	82.828	4.5
1944	1	8	39.800	75.500	4.2
1952	6	20	39.640	82.023	4.0
1954	1	2	36.600	83.700	4.3
1956	9	7	36.445	83.787	4.1
1957	1	25	36.600	83.700	4.0
1966	5	31	37.660	78.130	4.3
1969	7	13	36.120	83.890	4.1
1969	11	20	37.449	80.932	4.6
1975	2	16	39.050	82.422	4.4
1976	1	19	36.866	83.861	4.0
1976	6	19	37.362	81.624	4.7
1976	9	13	36.624	80.768	4.3
1980	7	27	38.193	83.891	5.2
1984	4	23	39.921	76.355	4.1
1984	8	17	37.868	78.324	4.2
1988	4	14	37.238	81.987	4.1
1988	9	7	38.142	83.834	4.6
1989	4	10	37.136	82.068	4.3ME
1990	8	17	36.934	83.384	4.0
1995	10	26	37.053	83.121	4.0ME
1996	6	29	37.187	81.950	4.1
2003	12	9	37.774	78.100	4.5

PS: Foreshock
ME: Mine event

<http://pubs.usgs.gov/of/2006/1017/>



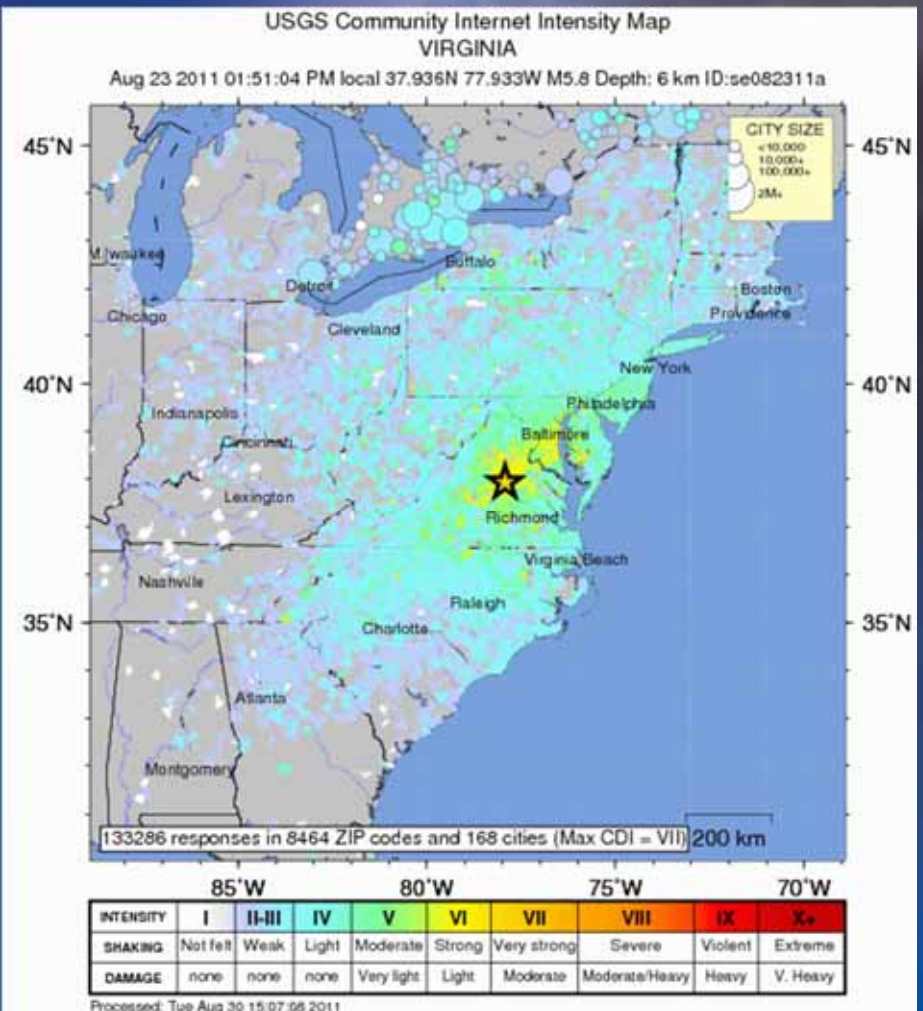
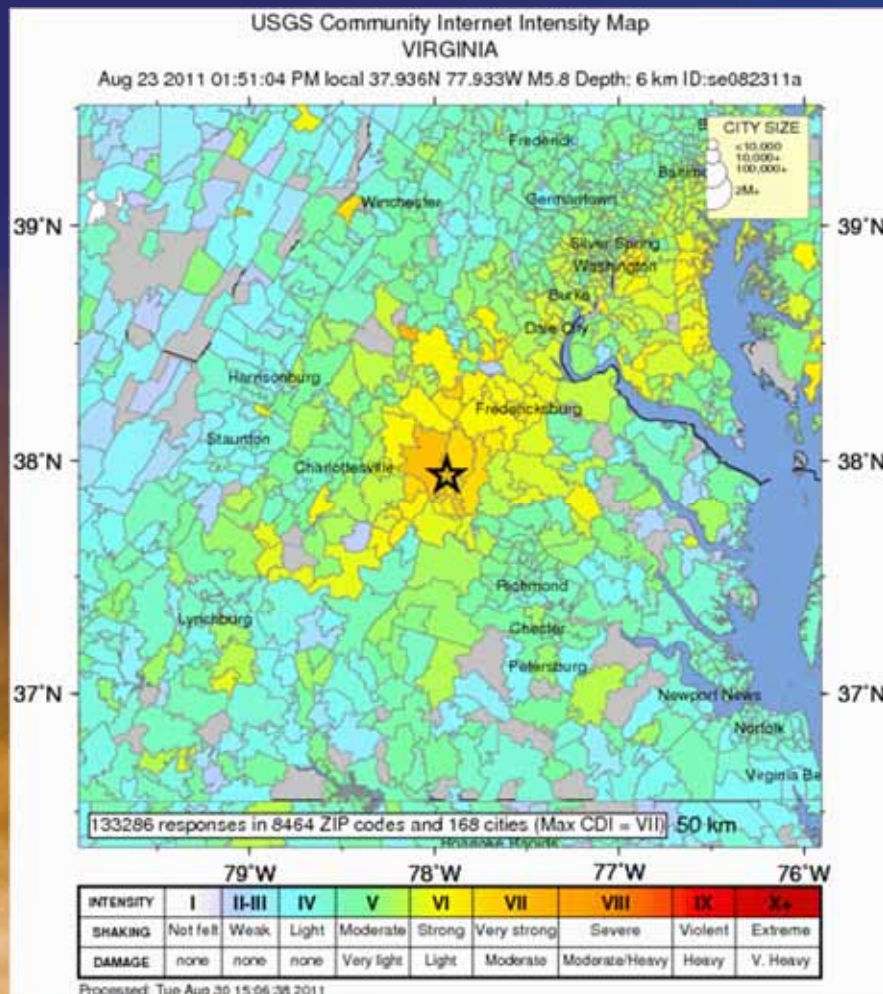
Powhatan Earthquake 9 Dec 2003 (4.5 Magnitude)





Mineral Earthquake

23 Aug 2011 (5.8 Magnitude)



<http://earthquake.usgs.gov/earthquakes/recenteqsus/Quakes/se082311a.html#maps>



Earthquake Safety

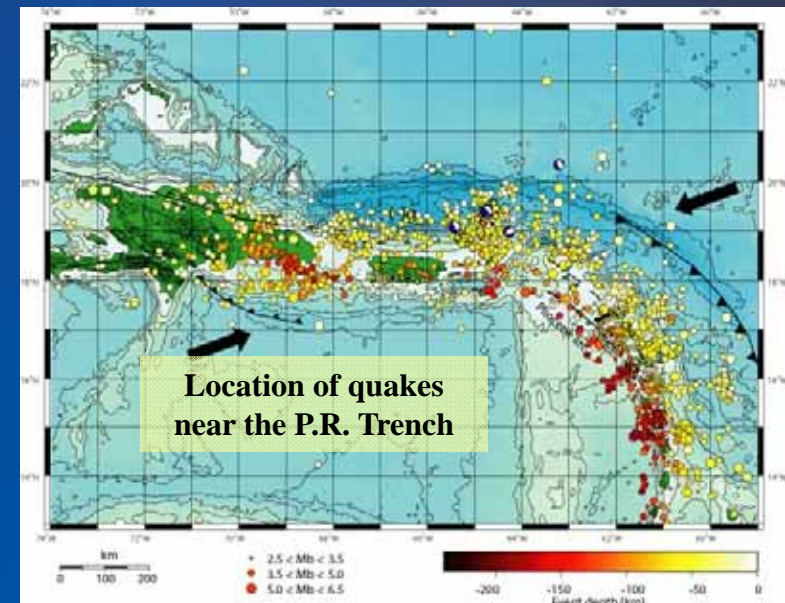
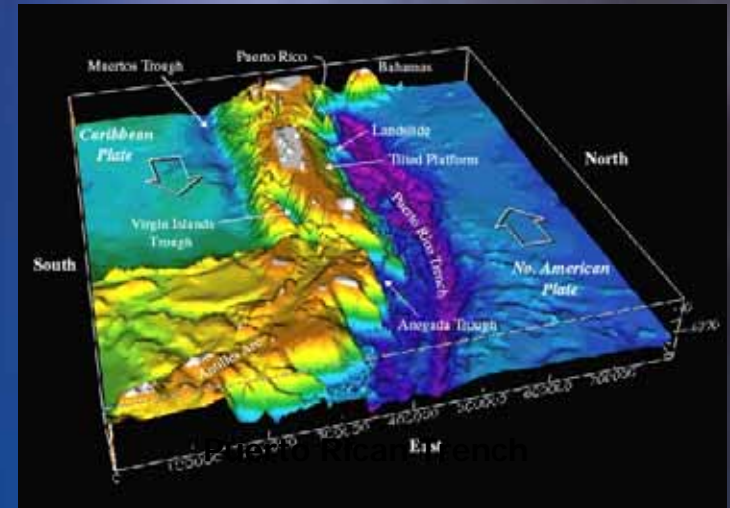
- If **INDOORS** - **STAY THERE!** - **Falling Debris is your Biggest Concern**
 - *Get next to or under a desk, sofa, or heavy table,*
 - **Curl Up (Fetal Position) and Hang On**
 - *Wooden Construction Better than Brick/Concrete (Flexibility)*
- If **OUTSIDE** - **Get into the OPEN**, away anything that might fall on you.



East Coast Tsunamis



- Rare – roughly 1 in 100 year event in eastern U.S.
 - *None recorded in mid-Atlantic region to date*
- Mostly likely to occur as a result of a 8.0+ magnitude earthquake along the Puerto Rican Trench
 - *Most wave energy direction in N/S direction*
 - *Mid-Atlantic Coast to have tangential impact*





Puerto Rican Trench Tsunami Simulation



4 Hour Animation

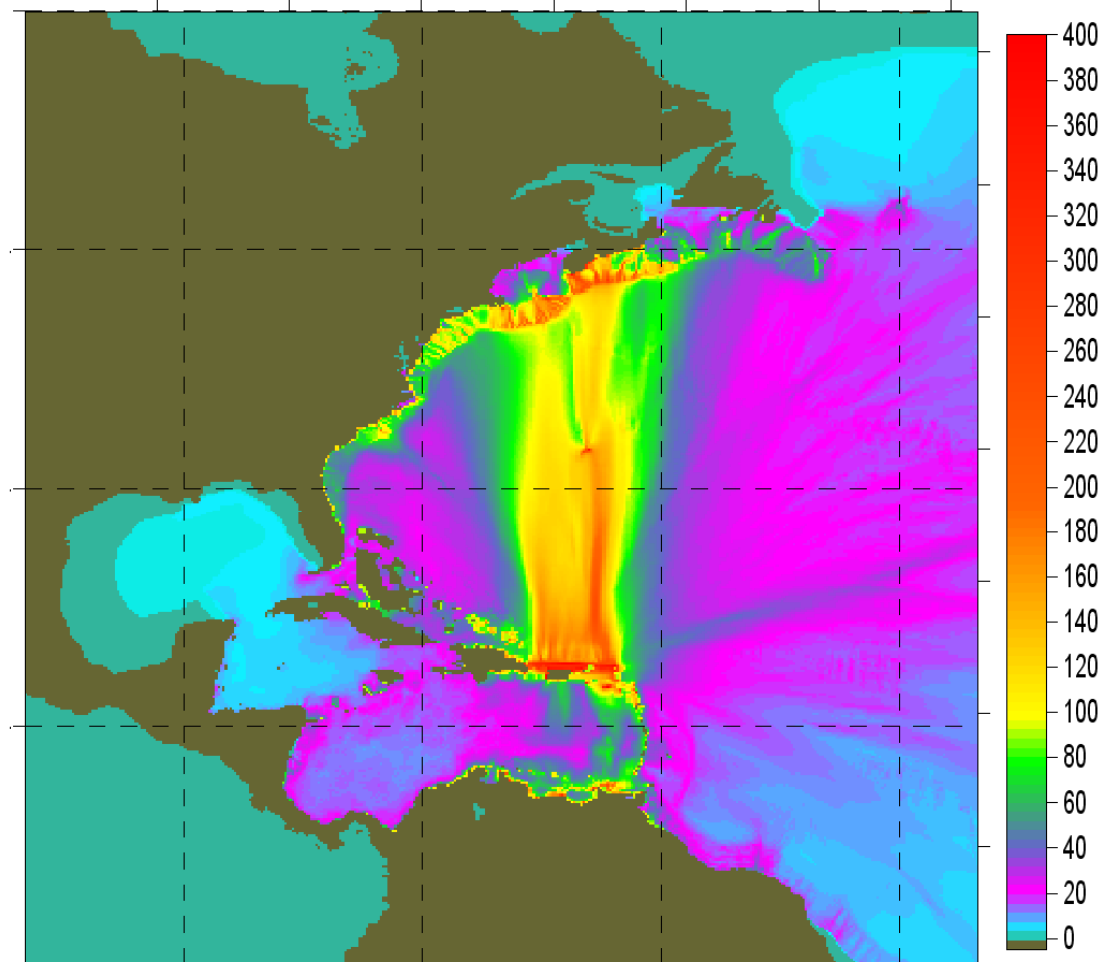
Dark Blue –
wave trough
less than 1
meter

Red – 1
meter or
higher wave
heights





Puerto Rican Trench Tsunami Simulation



Max Wave Height Composite (heights in cm)



Severe Weather Safety – Watches vs. Warnings

- In all instances, **WARNINGS** are more important than watches
- **WATCH** – **ALERT** product – *Conditions are favorable* for the event to occur. Does not mean event WILL occur!
- **WARNING** - **ACTION** product – *Event imminent, occurring and heading your way, or high likelihood of occurring. Take appropriate action to protect life & property!*



NOAA Weather Radio

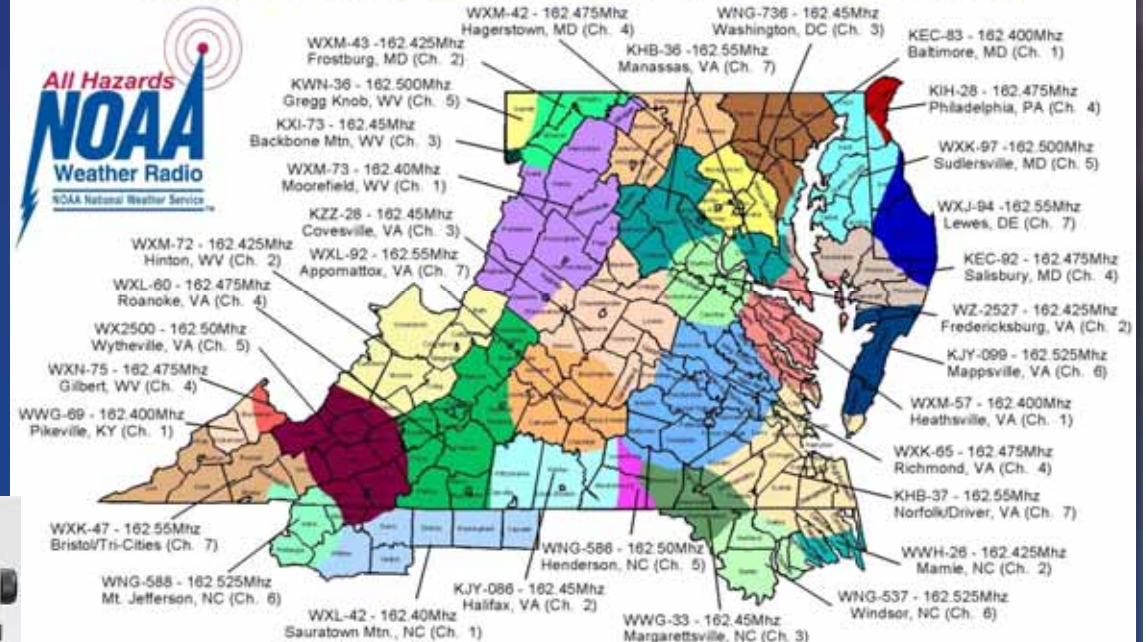


•24/7 Weather Broadcast

•**IMMEDIATE** broadcast
of **Watches & Warnings**

•**S.A.M.E./Public Alert**
Radios are
programmable to local
areas

Mid-Atlantic NOAA Weather Radio



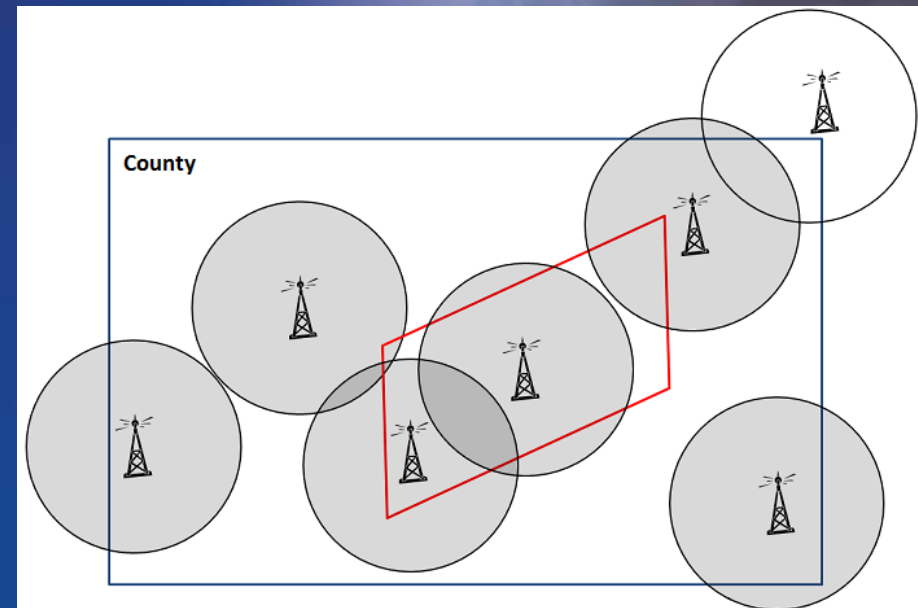
<http://weather.gov/akq/docs/MidAtlanticNWRandFIPS.pdf>





Wireless Emergency Alerts (WEA)

- Began in 2012
- Alerts You “Where You Are”
- Based on Cell Tower Coverage
- Enabled on newer (2012 on) cell/smart phones



Warning Type	WEA Message
Tsunami Warning	Tsunami danger on the coast. Go to high ground or move inland. Listen to local news. -NWS
Tornado Warning	Tornado Warning in this area til hh:mm tzT. Take shelter now. Check local media. -NWS -- or -- Tornado EMERGENCY til hh:mm tzT. Tornado spotted in this area. Find shelter now! -NWS
Extreme Wind Warning	Extreme Wind Warning this area til hh:mm tzT ddd. Take shelter. -NWS
Hurricane Warning	Hurricane Warning this area. Check local media and authorities. -NWS
Typhoon Warning	Typhoon Warning this area til hh:mm tzT ddd. Check local media and authorities. -NWS
Storm Surge Warning	NWS: Life-threatening storm surge danger. Check for possible evacuation orders.
Flash Flood Warning	Flash Flood Warning this area til hh:mm tzT. Avoid flooded areas. Check local media. -NWS
Dust Storm Warning	Dust Storm Warning til hh:mm tzT. Remember, Pull Aside, Stay Alive -NWS



NWS Wakefield Web Site

<https://weather.gov/akq>

Clickable
Forecast
Map

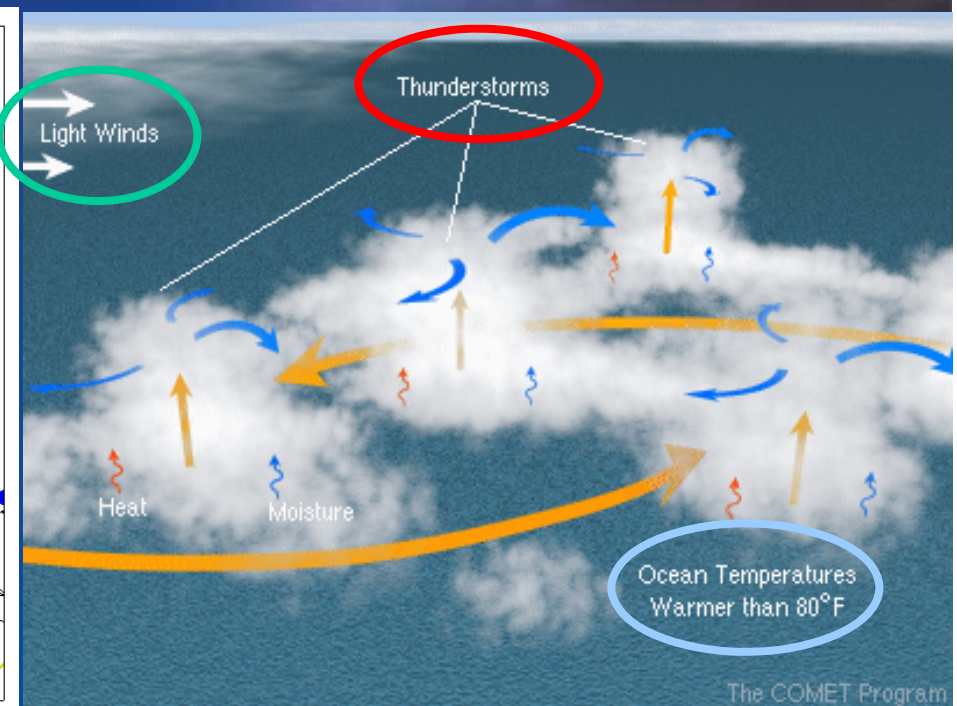
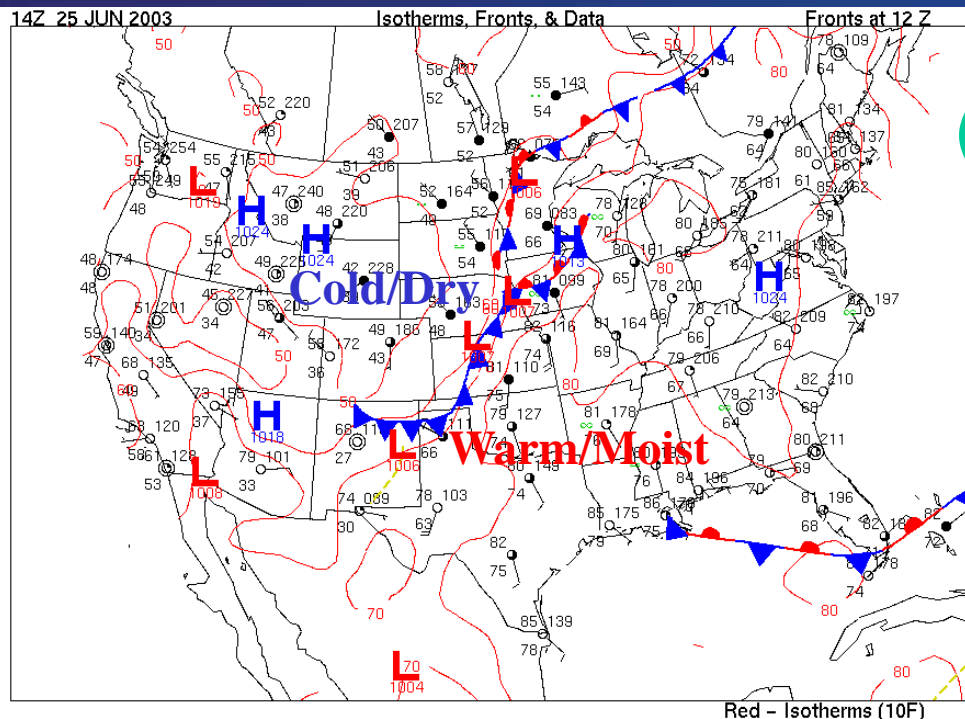
The screenshot shows the NWS Wakefield website interface. At the top, there's a navigation bar with links: HOME, FORECAST, PAST WEATHER, WEATHER SAFETY, INFORMATION CENTER, NEWS, SEARCH, and ABOUT. Below this, a 'Local Forecast by' section allows users to enter a city or ZIP code. The main heading is 'NWS Forecast Office Wakefield, VA'. A sidebar on the left offers a 'Customize Your Weather.gov' option. The central area features a map of the Wakefield area with a 'Click on the map below to zoom in.' prompt. To the right of the map are links for 'Watches, Warnings & Advisories' and 'Hazardous Weather Outlook'. Below the map is a grid of 18 icons representing different weather services: Radar, Current Weather, Rivers & Lakes, Satellite, Weather Information, Forecast Maps, Hourly Forecast, Detailed Forecast, Briefings, Marine Forecasts, Surf Forecast/Cave, Forecast's Discussion, SKYWARN, Submit Storm Report, Climate Photo, Weather Radio, Tropical, and Air Quality. At the bottom, there are sections for 'CURRENT CONDITIONS', 'FORECASTS', 'MODEL DATA', 'SAFETY/EDUCATION', 'PAST WEATHER', and 'ABOUT US'.

Links to
Various
Program
Areas &
Data



Hurricanes – The Basics

Hurricanes are, **from a storm perspective**, unique in nature



Circulation intensity dependent upon temperature contrast/jet stream

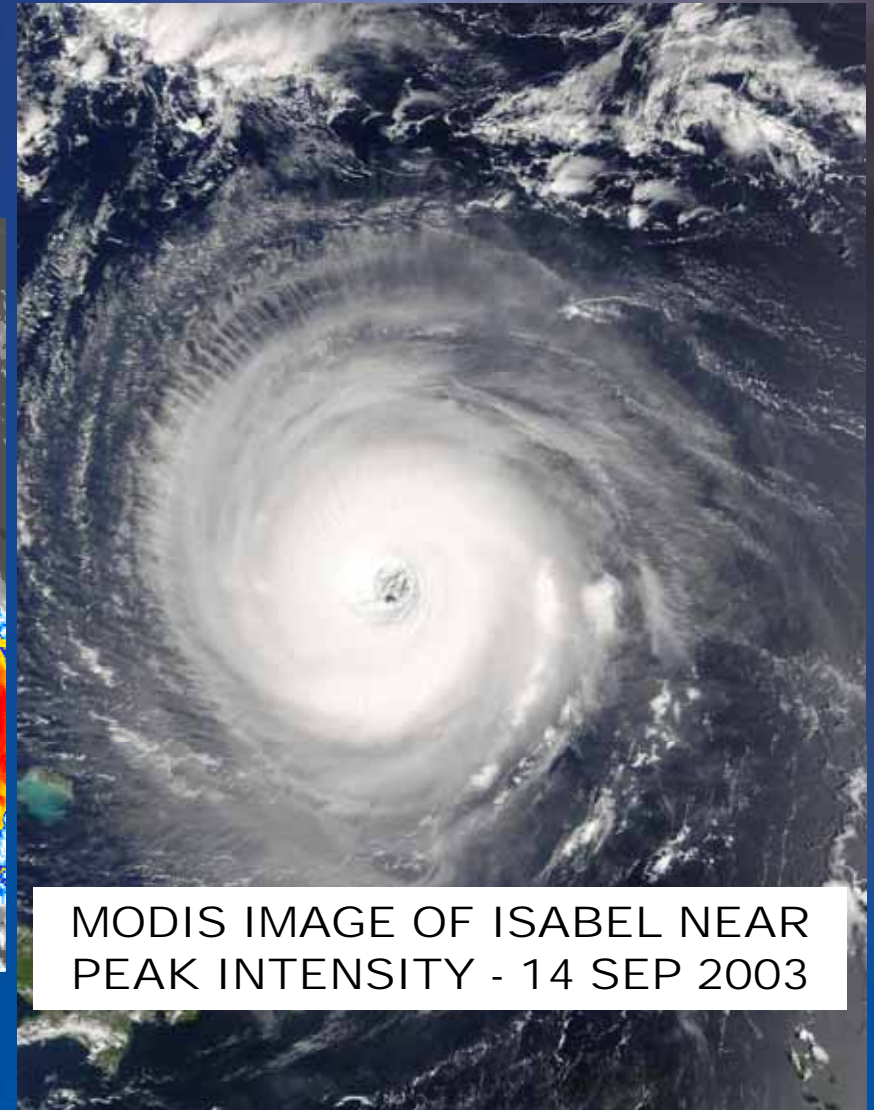
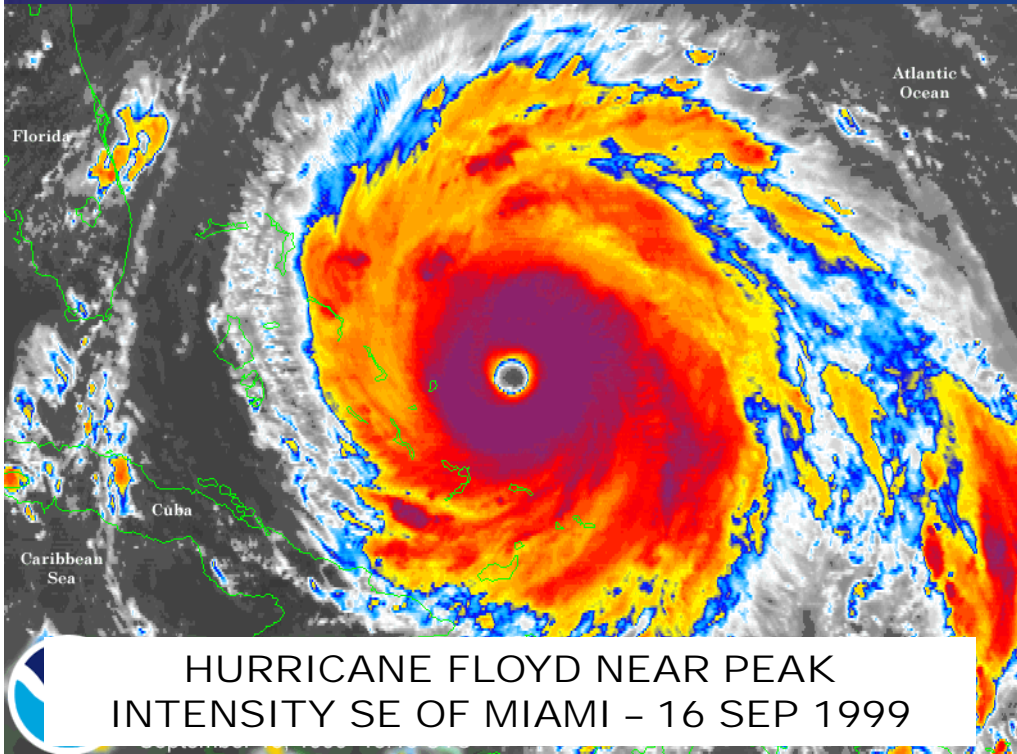
Warm ocean water and weak winds aloft are favorable for tropical development



Hurricanes – The Basics



Hurricanes From a Satellite Perspective

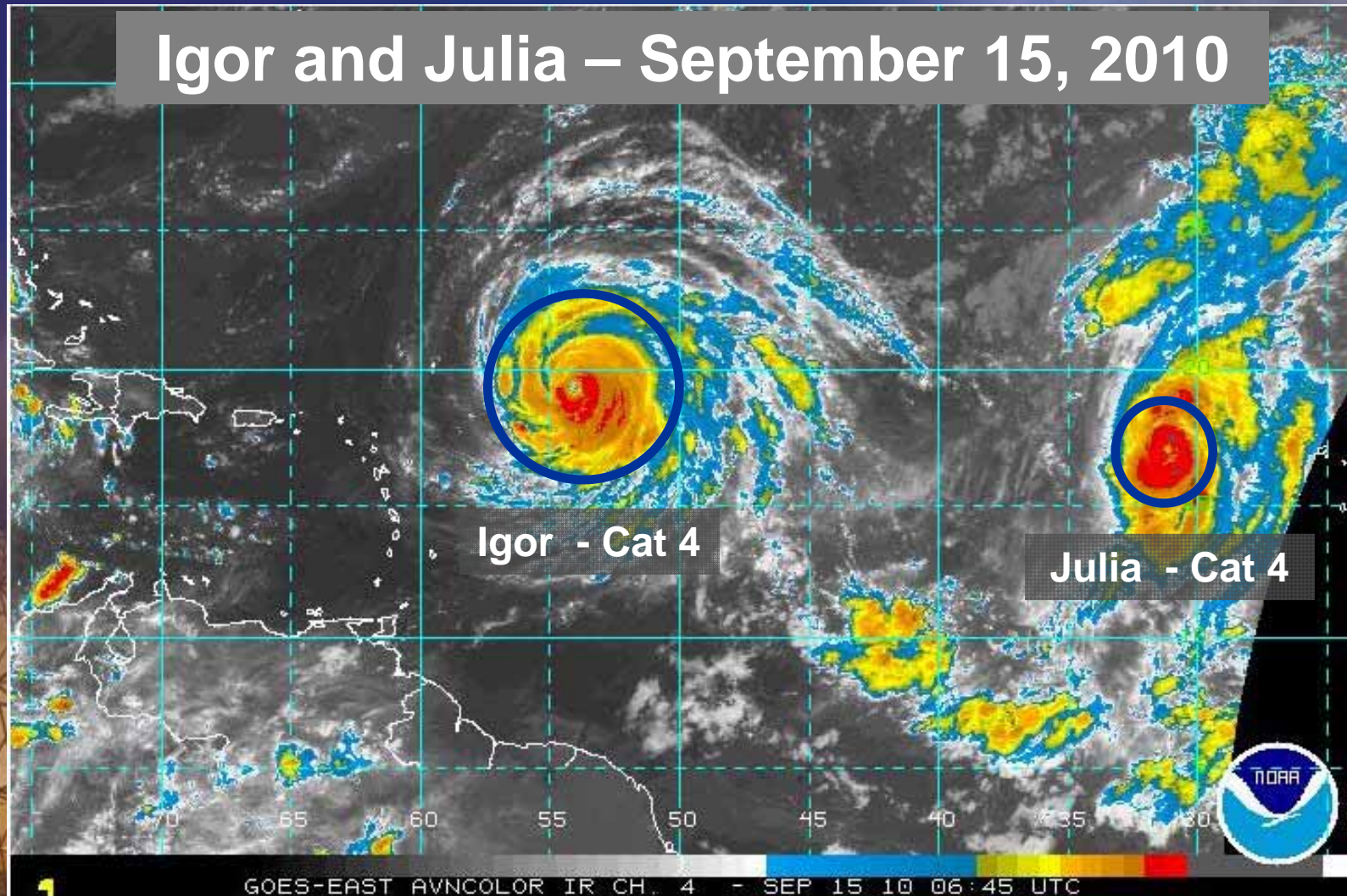




Hurricane Structure

Size and Intensity do not Match

Igor and Julia – September 15, 2010



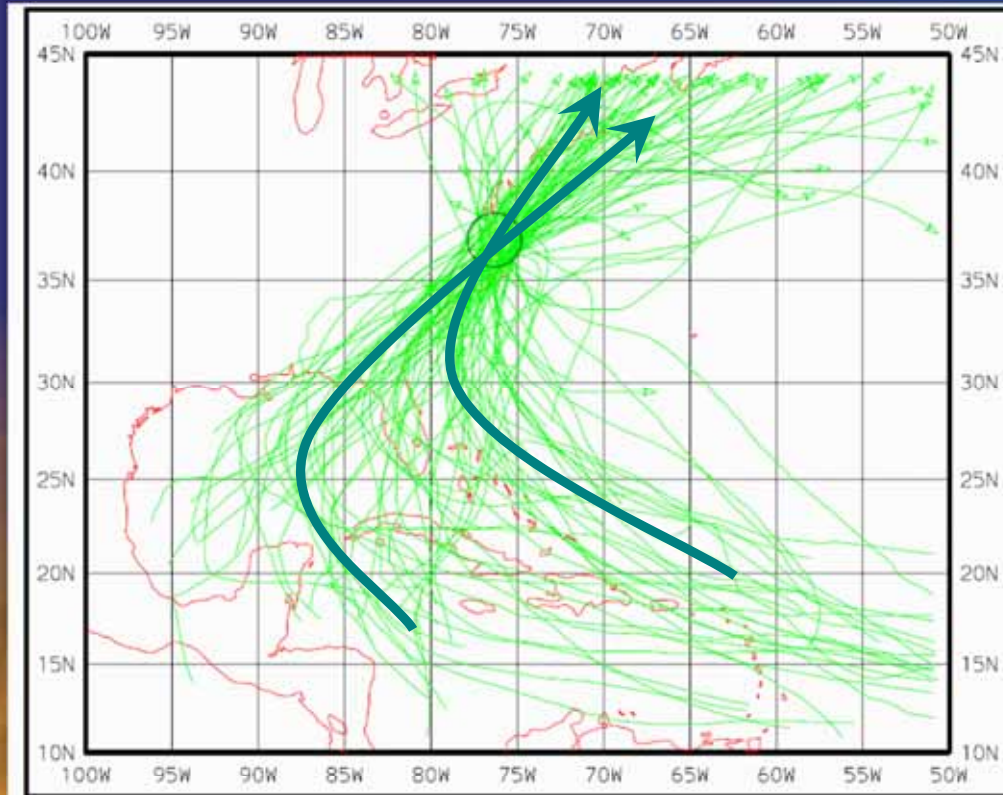


Hurricanes in Virginia

- Irene (2011) – Inland and Coastal
- Ernesto (2006) – Inland and Coastal
- Gaston, Ivan, Frances (2004) – Mainly Inland
- Isabel (2003) – Inland and Coastal
- Floyd (1999) – Coastal and Inland
- Camille (1969) – Inland****
- Donna (1960) – Coastal only
- Hazel (1954) – Inland and Coastal
- 1933 Hurricane – Inland and Coastal
- 1749 Hurricane – Willoughby Spit



Hurricane Stats – SE Va.

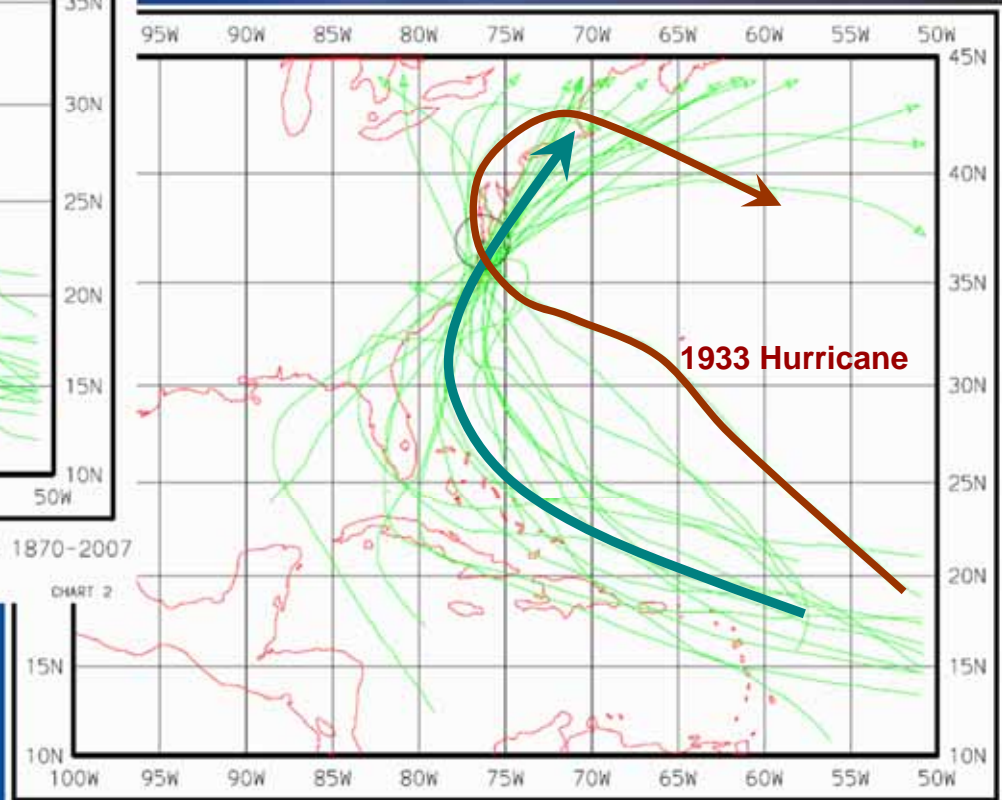


TROPICAL STORMS & HURRICANES PASSING WITHIN 75 NM OF NORFOLK, VA. 1870-2007
NUMBER OF STORMS IS 77

All Tropical Cyclones



Hurricanes Only

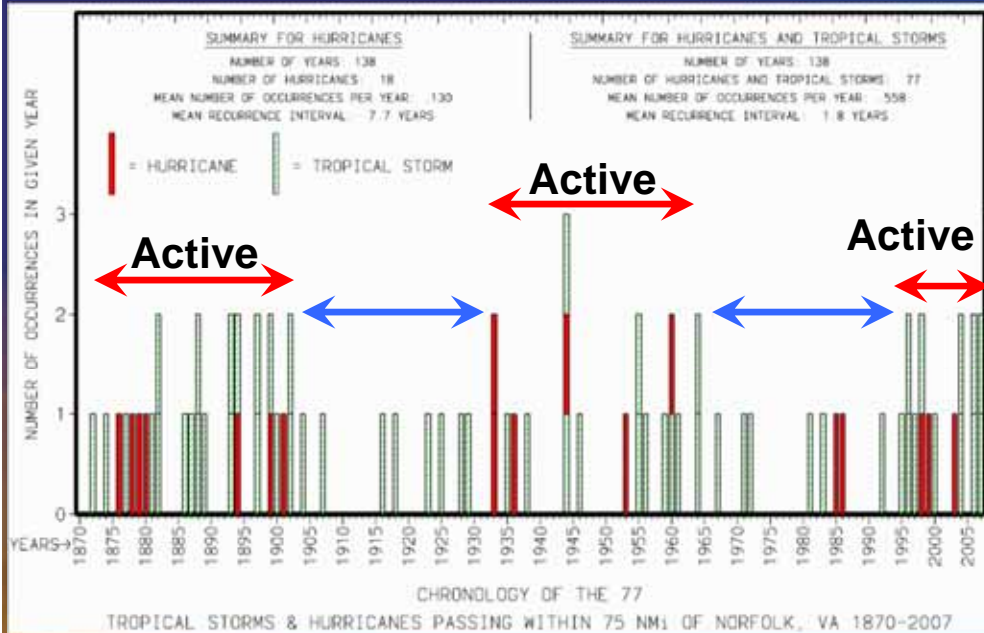


HURRICANES PASSING WITHIN 75 NM OF NORFOLK, VA. 1870-2007
NUMBER OF STORMS IS 21

CHART 3

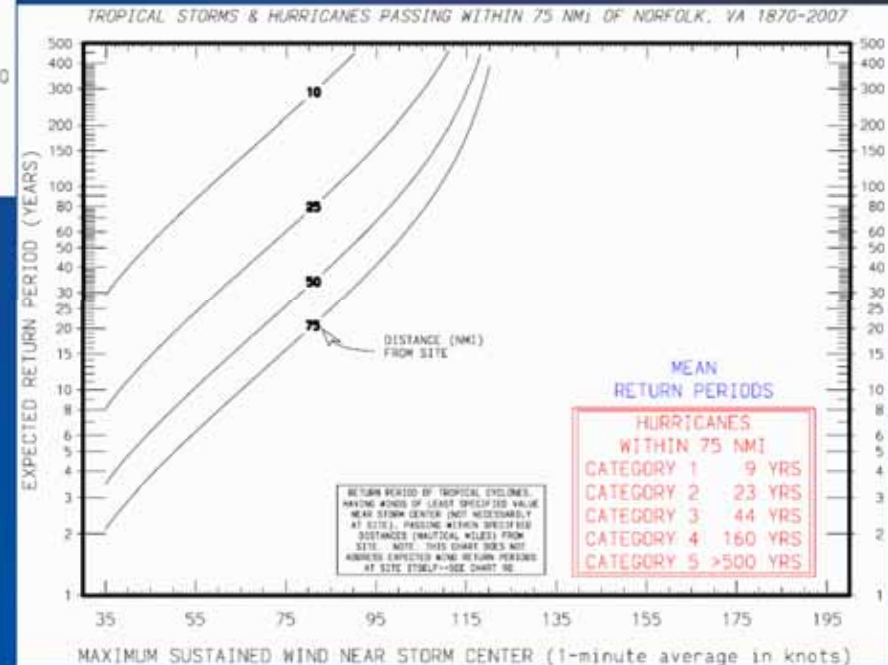


Hurricane Stats – SE Va.



Hurricane Return Period

Tropical Cyclones by Year

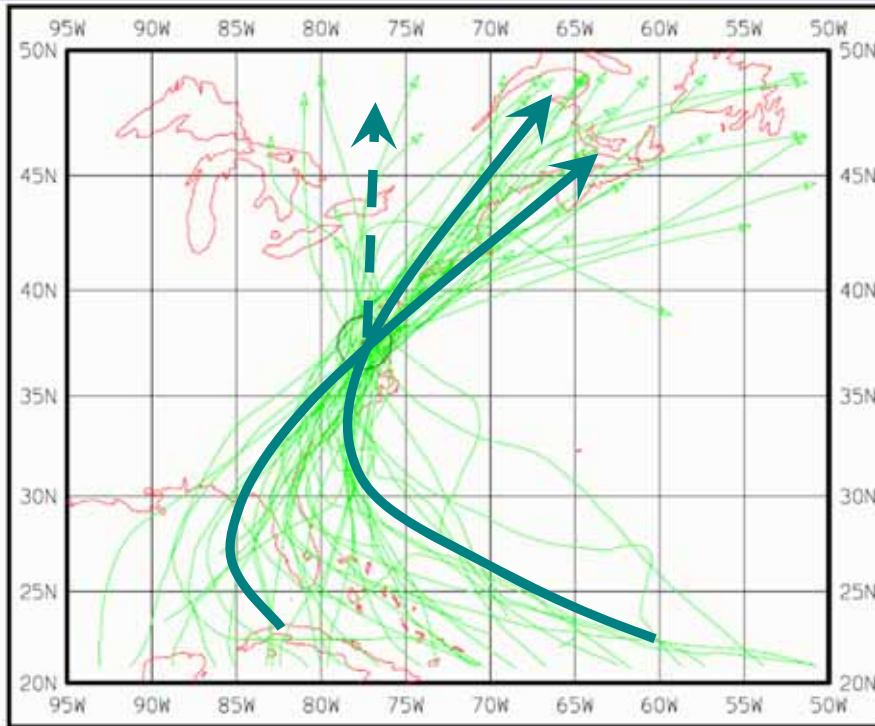




Hurricane Stats – Richmond



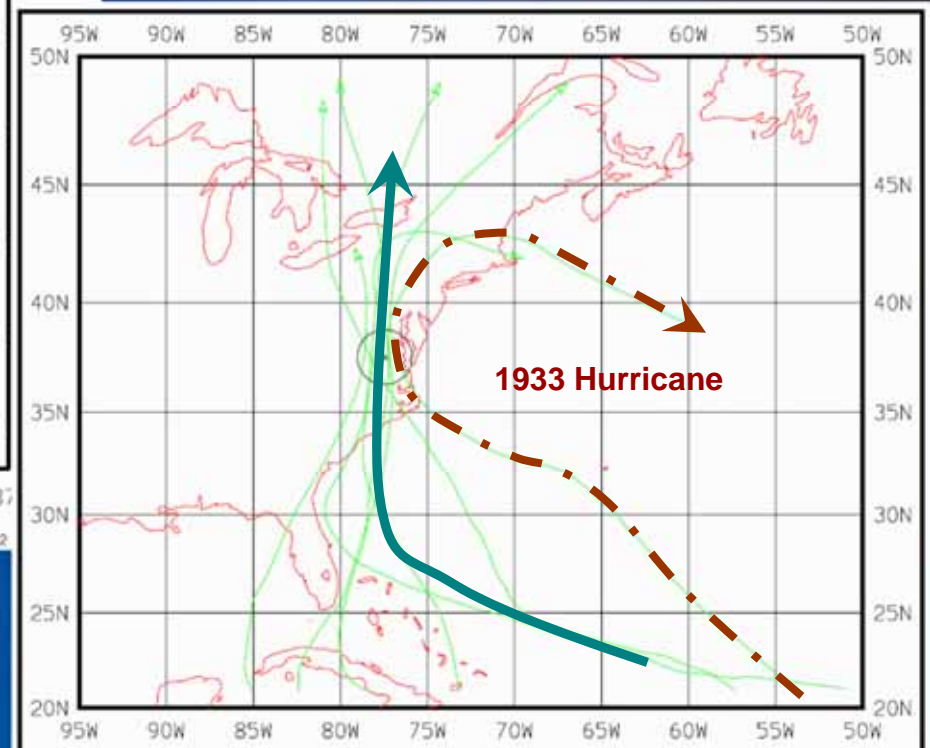
Hurricanes Only



TROPICAL STORMS AND HURRICANES PASSING WITHIN 75 NM OF RICHMOND, VA 1870-2007
NUMBER OF STORMS IS 41

CHART 2

All Tropical Cyclones

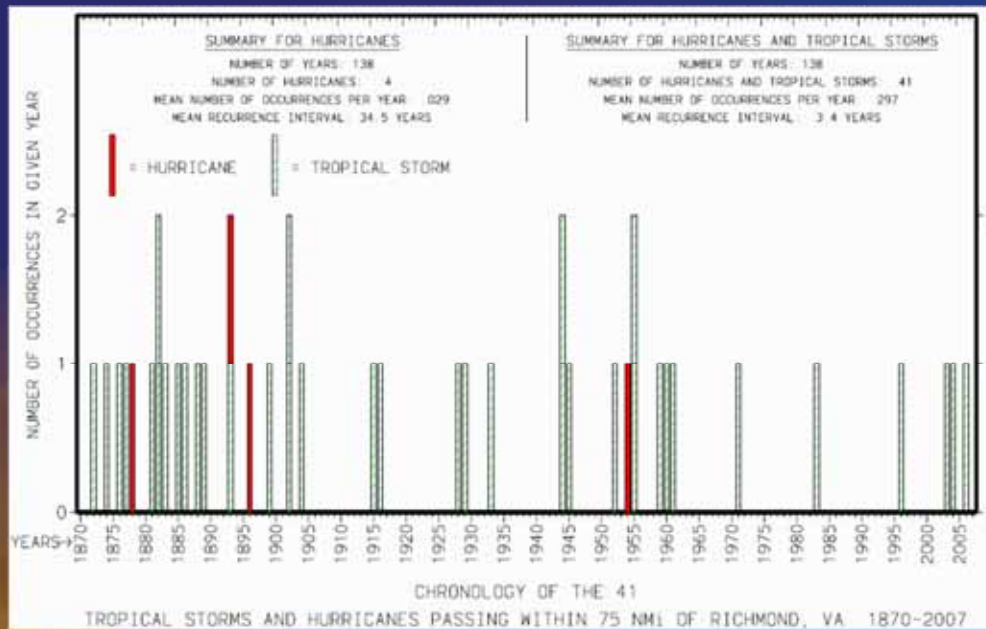


HURRICANES PASSING WITHIN 75 NM OF RICHMOND, VA 1870-2007
NUMBER OF STORMS IS 7

CHART 3

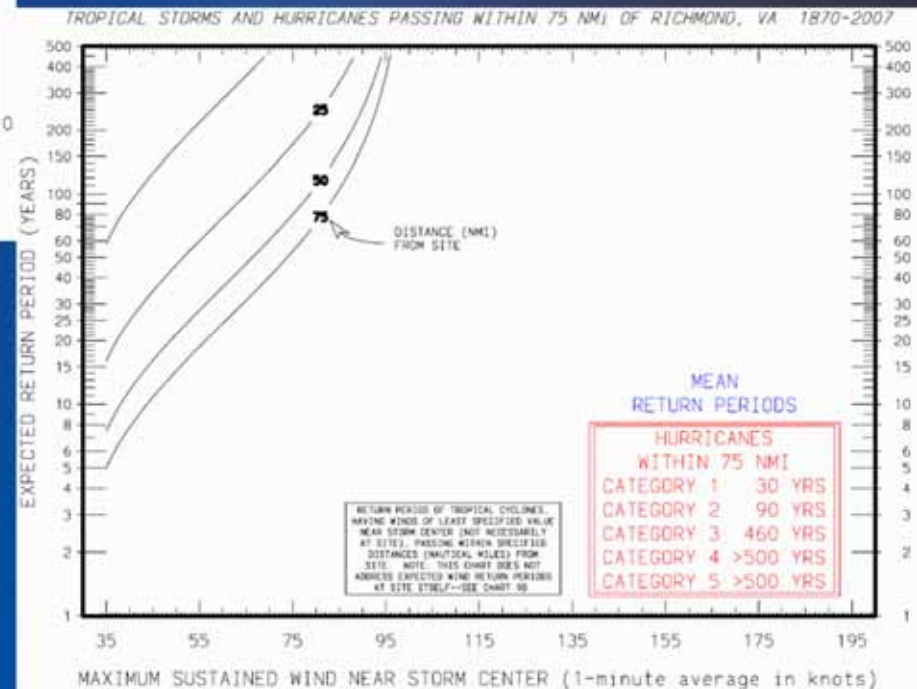


Hurricane Stats – Richmond



Hurricane Return Period

Tropical Cyclones by Year

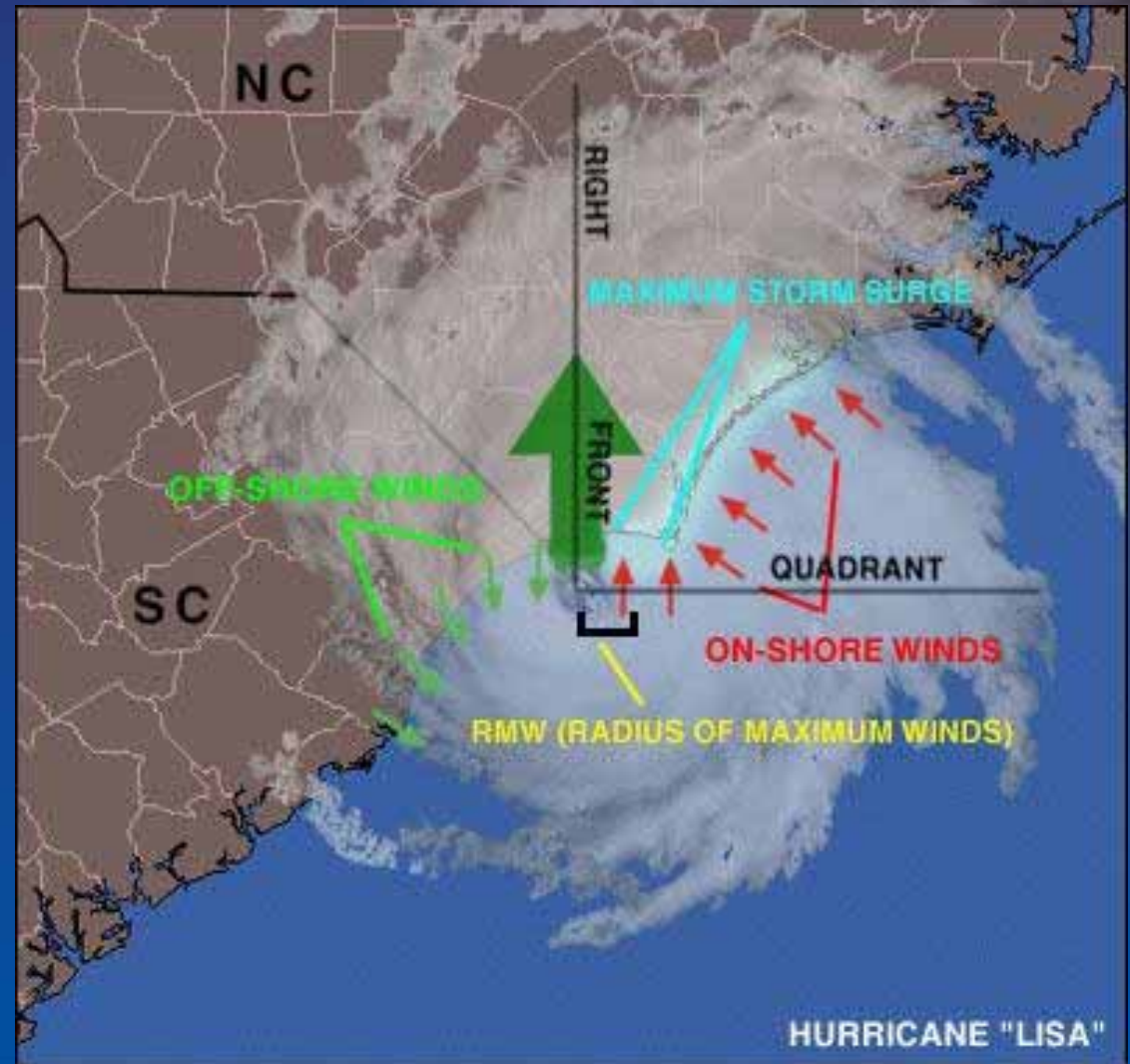




Hurricane Threats

Storm Surge, Strongest Winds

Storm Surge is
highest and
Winds are greatest
in the RIGHT
FORWARD
QUADRANT close
to where center
makes landfall

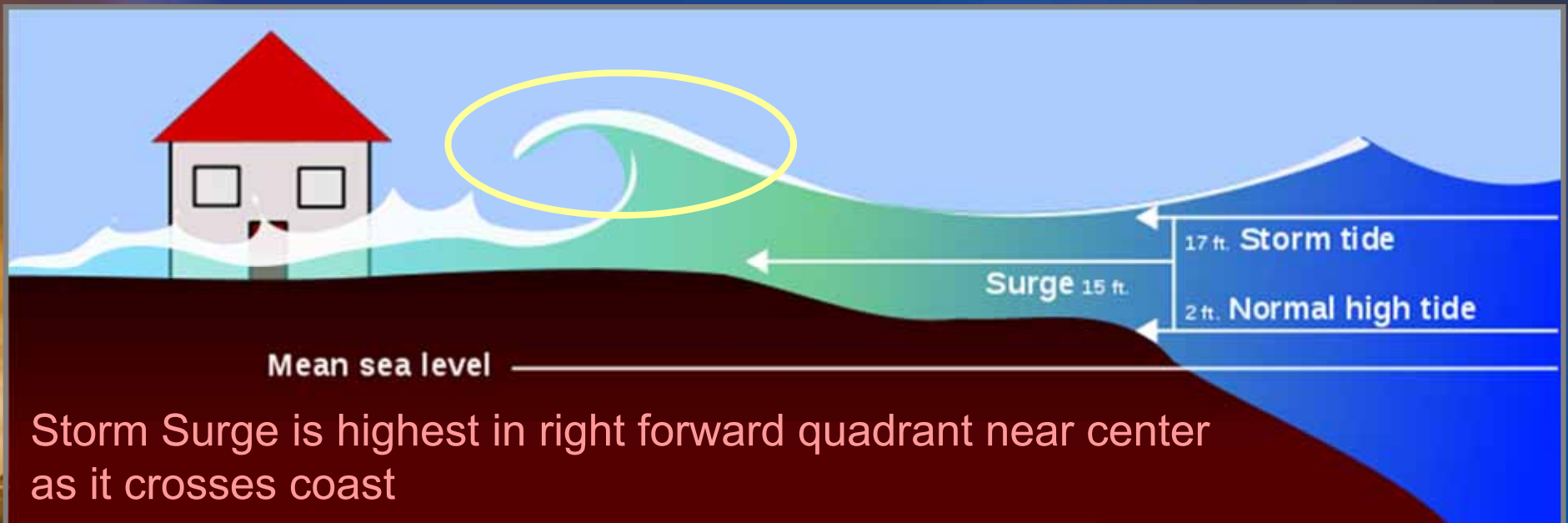




Hurricane Threats

STORM SURGE – The abnormal rise in water level directly associated with the wind and pressure forces associated with a hurricane

Storm Surge Example – hurricane makes landfall at high tide

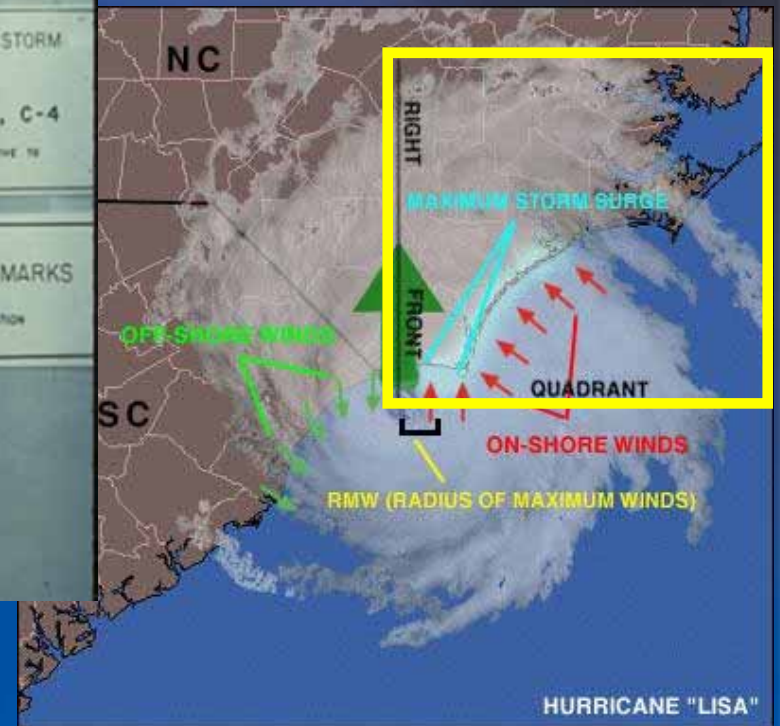
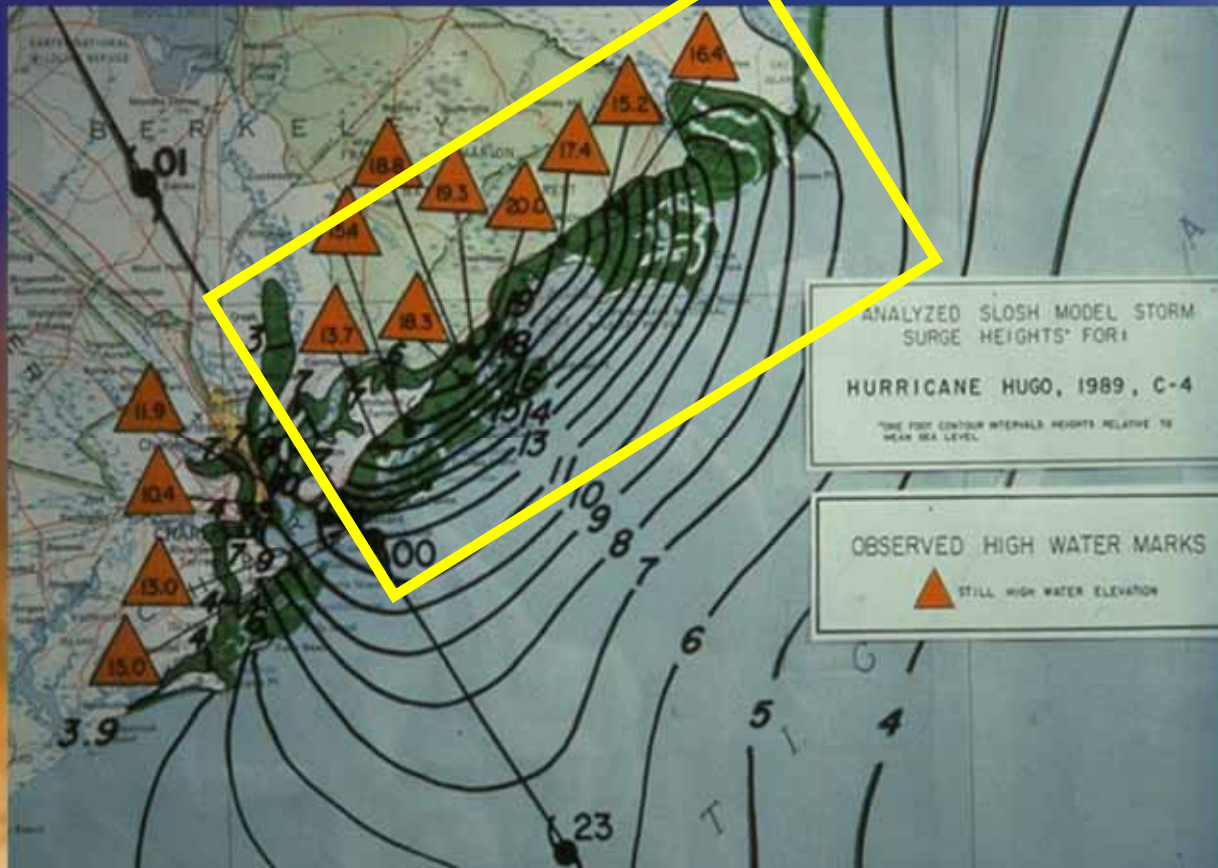




Coastal Hurricane Threats



Storm Surge Example – Hugo 1989

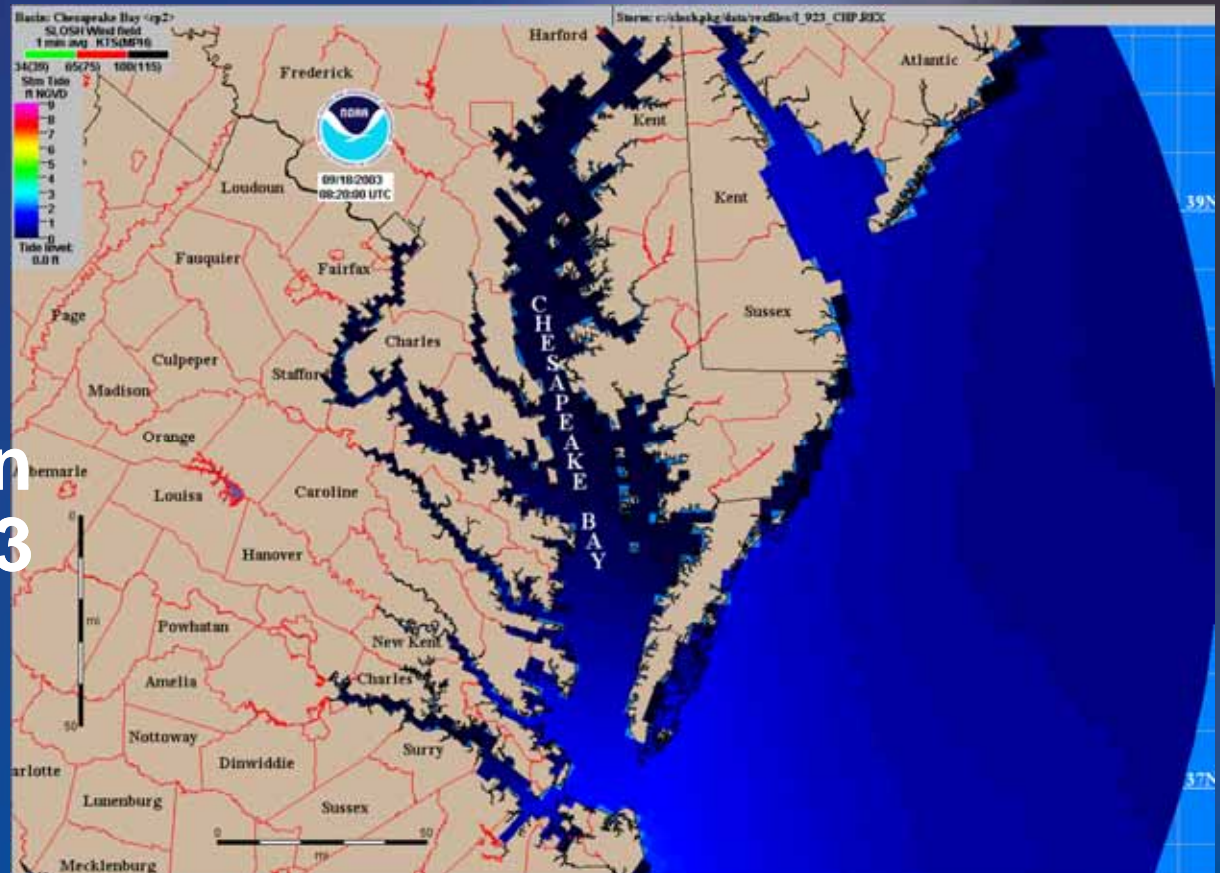




Hurricane Threats

STORM SURGE – contd.

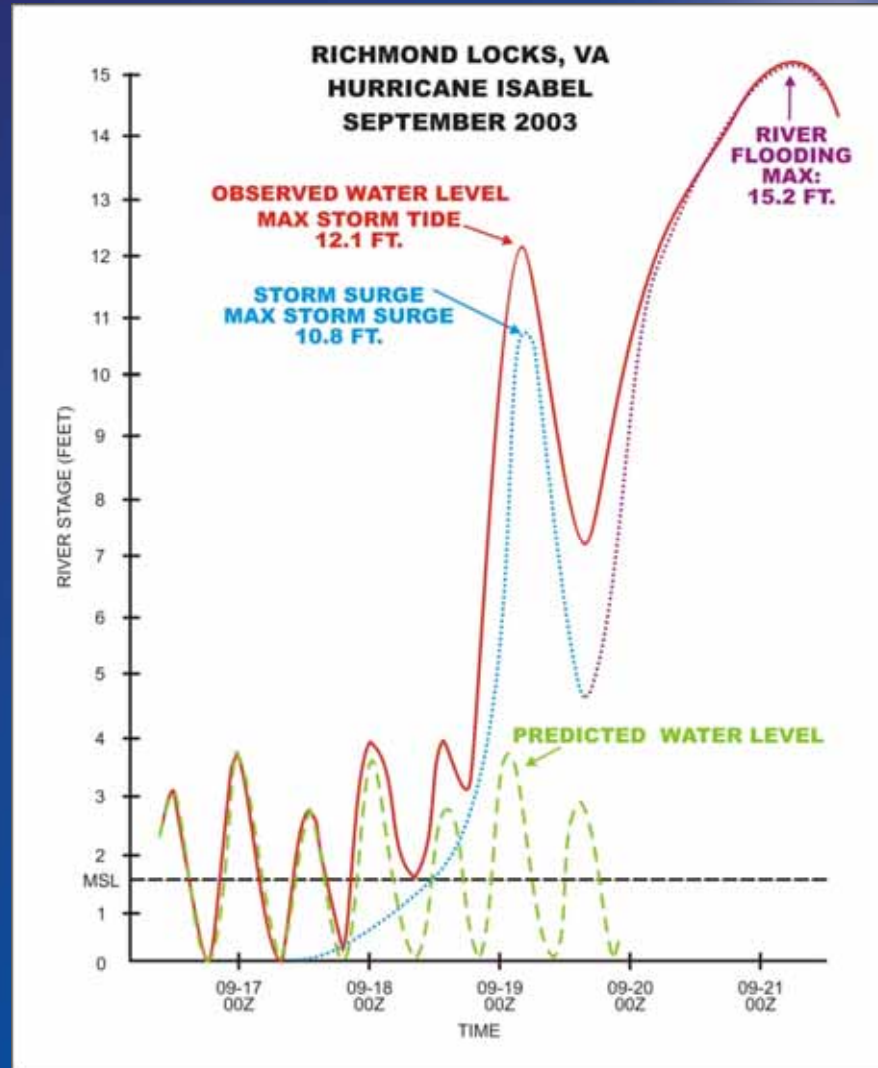
- Can reach 10-15 feet in Hampton Roads (Cat 3-4)
- Highest in region since 1900 - 1933 hurricane and Isabel (2003)





Hurricane Threats

Storm Surge - Isabel





Hurricane Isabel

Storm Surge & Wave Action





Hurricane Isabel

Storm Surge & Wave Action

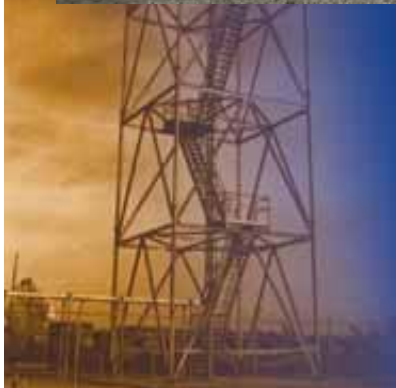
Jordan Point Marina



Near Gloucester



Near Tappahannock

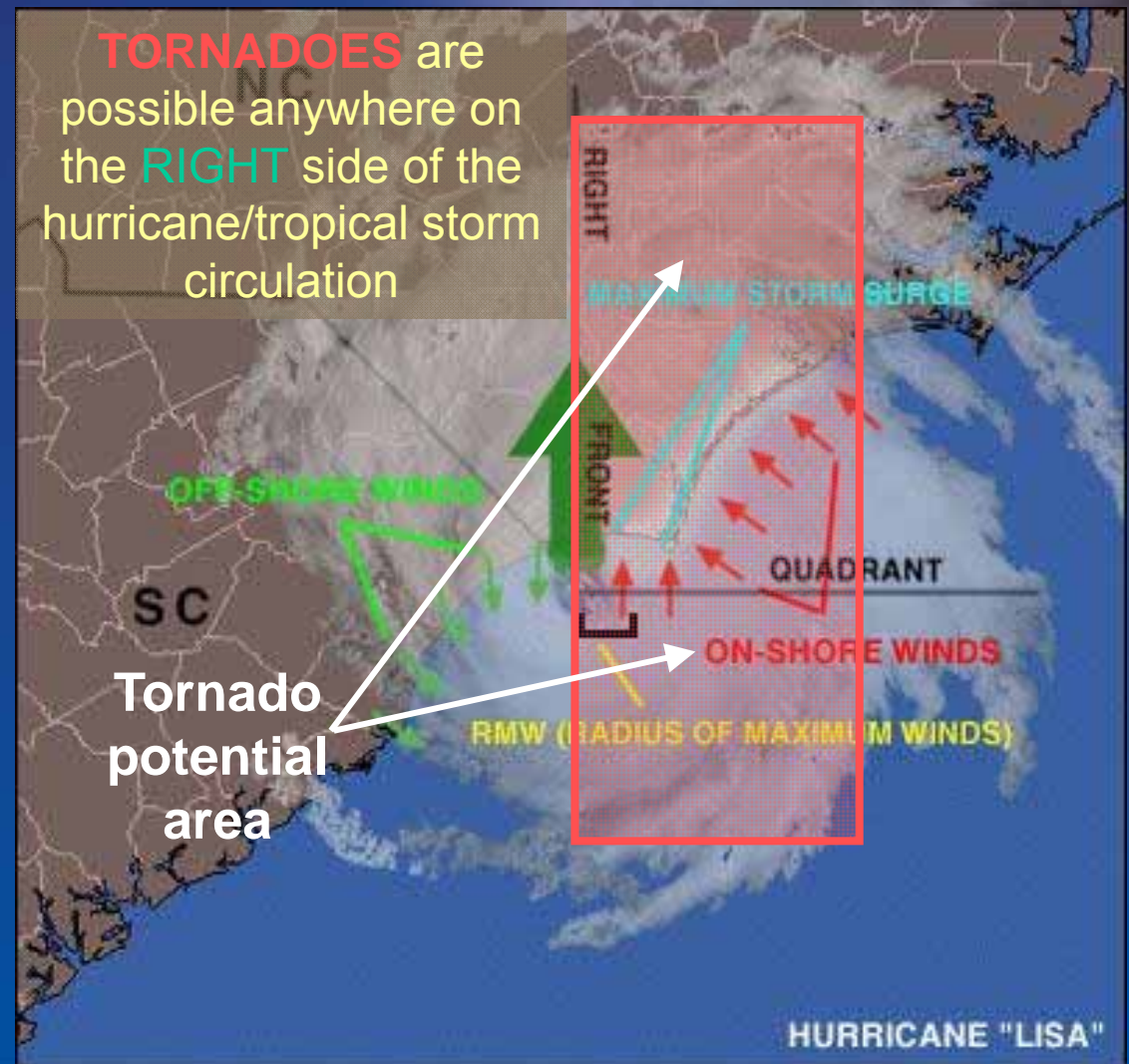




Hurricane Threats

Tornadoes

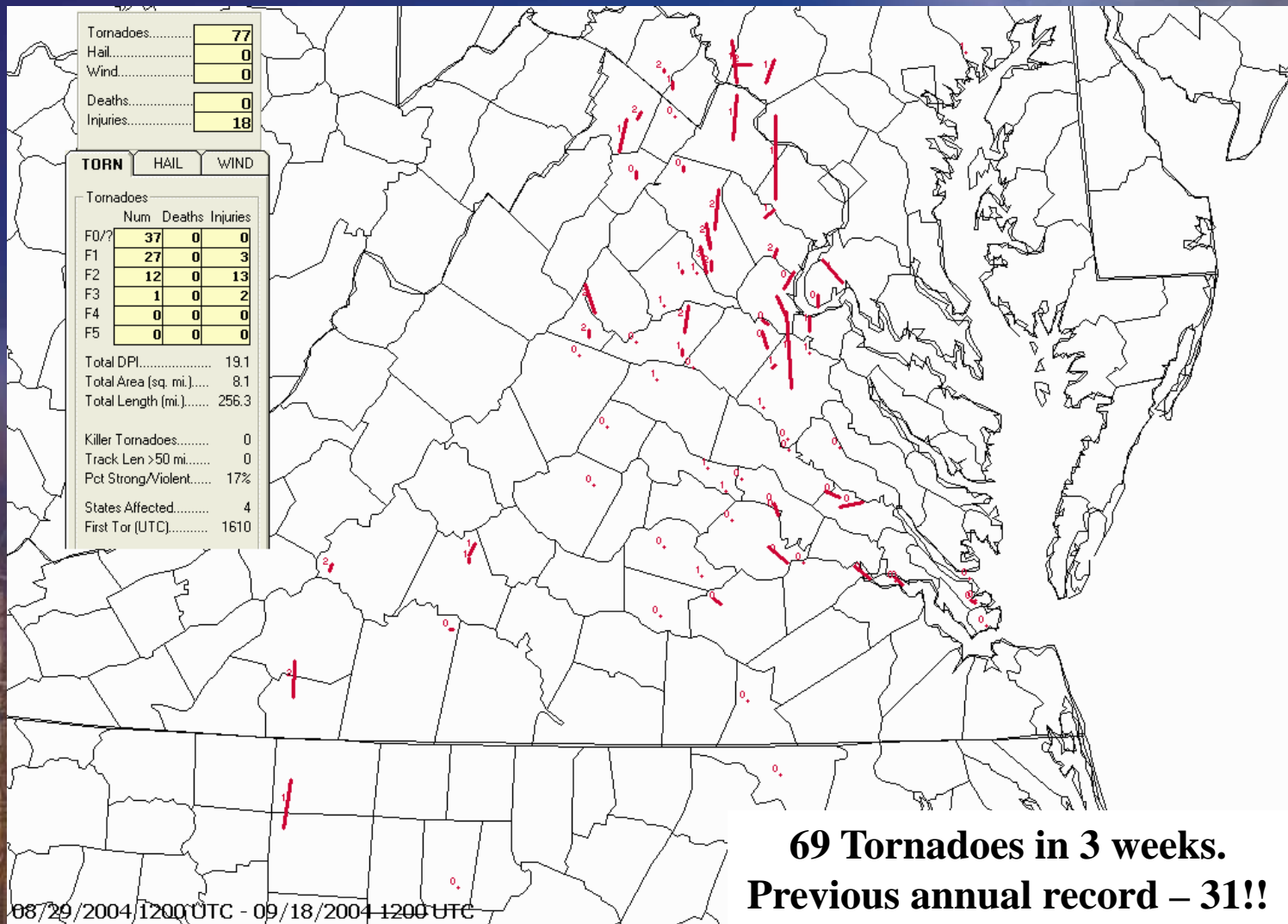
Some tropical systems (**Bertha, 1996, and Gaston, Frances, and Ivan in 2004**) are prolific tornado producers, other (**Fran, 1996 and Isabel, 2003**) produce few or none.





Hurricane Threats

Tropical Tornadoes 2004





Hurricane Safety

What Can You Do?

- Prepare, Prepare, Prepare – **NOW is the time...**
BEFORE A Hurricane Threatens!!!
- Prepare Emergency Supplies Kit (3-7 days)
 - Be Ready for **Multi-day Power Outages**
 - **Bottled Water (1 gallon per person per day)**
 - **Non-perishable Foods – canned meat, peanut butter, baked beans, etc.**
 - **Flashlight(s), Battery Operated/Crank Radio and extra Batteries**
 - **Piece Supplies Kit Together Over Time**



Hurricane Safety

What Can You Do?

- Cut Plywood for Windows – **Keep the Wind OUT!**
 - **Retrofit house** (hurricane clips) for better wind resistance
- Develop Evacuation Plan – Where will you go??
 - **This is STORM TRACK dependent!! LEFT of Track is Preferred!!**
 - **South to North track...Go WEST**
 - **Southeast to Northwest track...Go SOUTHWEST**



Hurricane Safety

As the Storm Threat Increases

- Monitor Approaching Storm - See Weather Sources
- Listen to Local Officials
- Evacuate if Asked!! – **Flood Zones** most critical
- If **Riding Out the Storm** – **similar to tornado**
 - *Remain in Lowest Floor of Building*
 - *Protect Yourself/Family from Glass/Flying Debris*
 - *Prepare for Long-term Utility Outages (7+ days)*



Thunderstorm Hazards



Tornadoes



Hail



Lightning

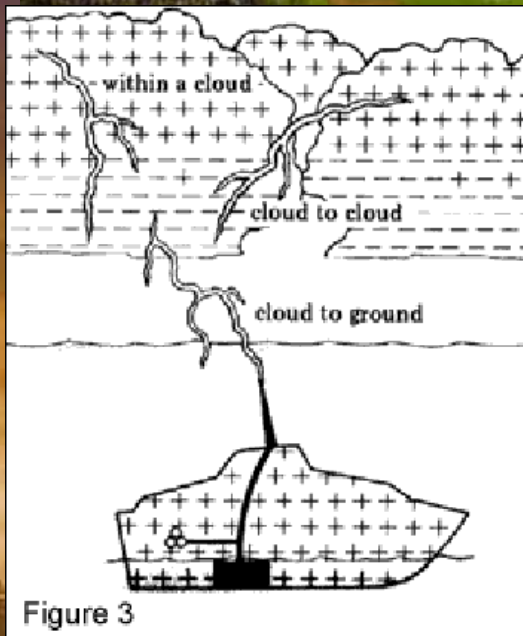


Damaging Winds





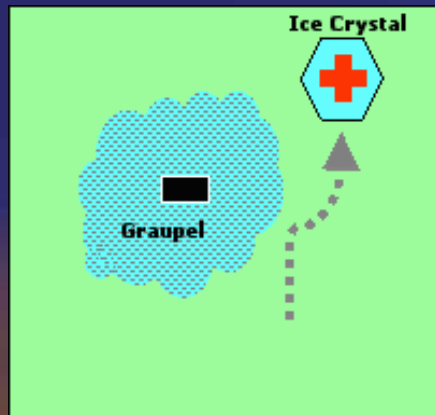
Lightning Safety





Lightning Safety

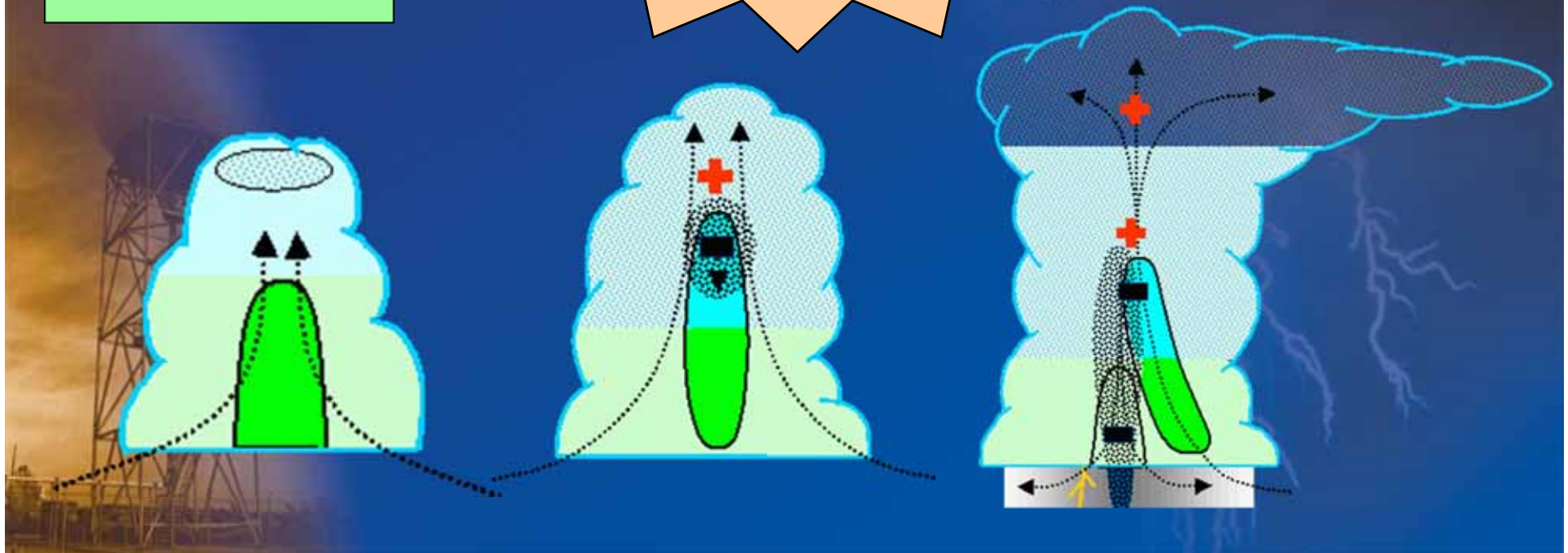
Thunderstorm Electrification



Ice AND **Water** are
Necessary for Lightning
Development

Low CLWC	
High CLWC	
Low SC-CLWC	
High SC-CLWC	
Small ice only	
Large & small ice	

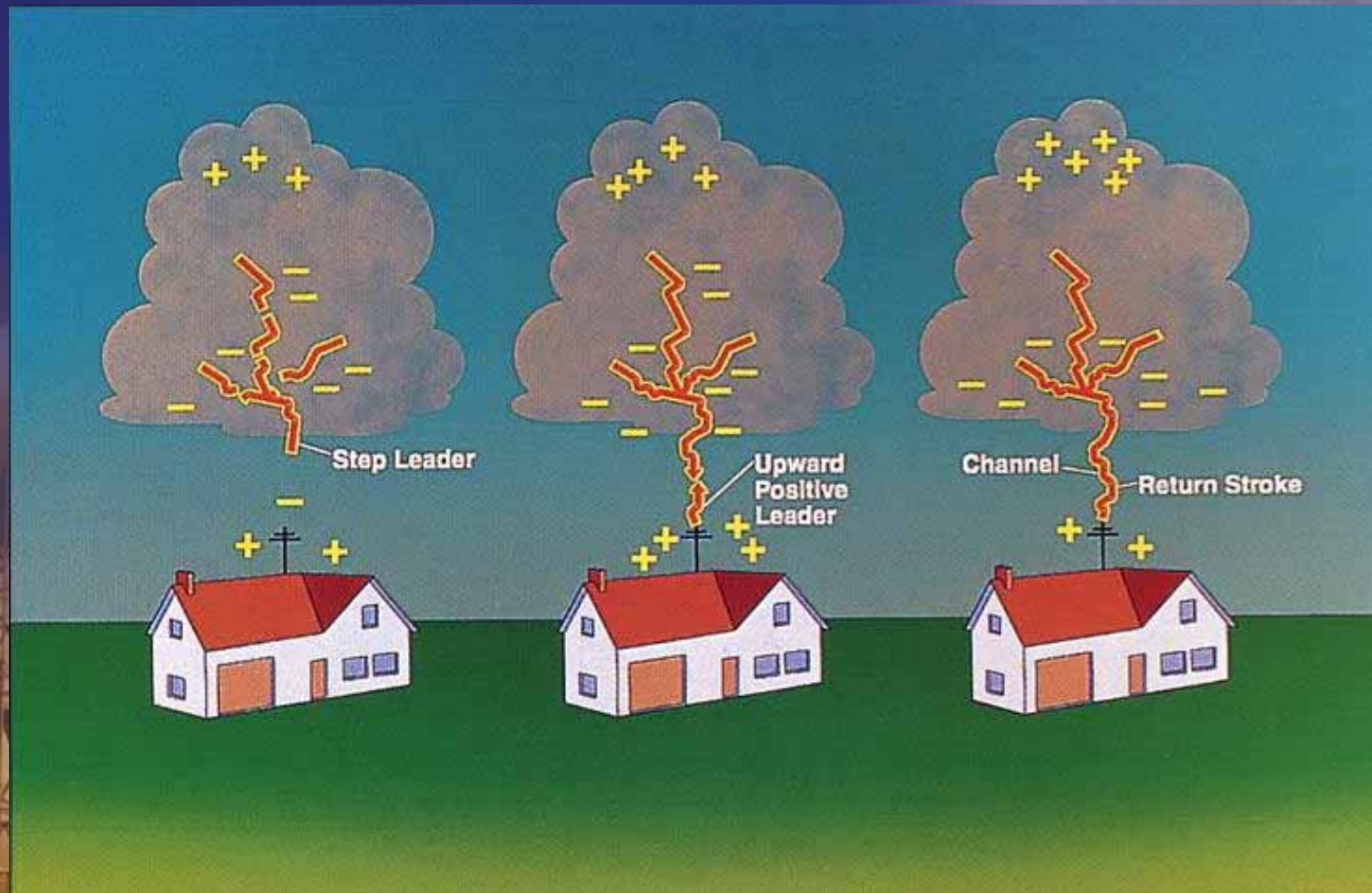
CLWC = Cloud Liquid
Water Content





Lightning Safety

Lightning Strike Development

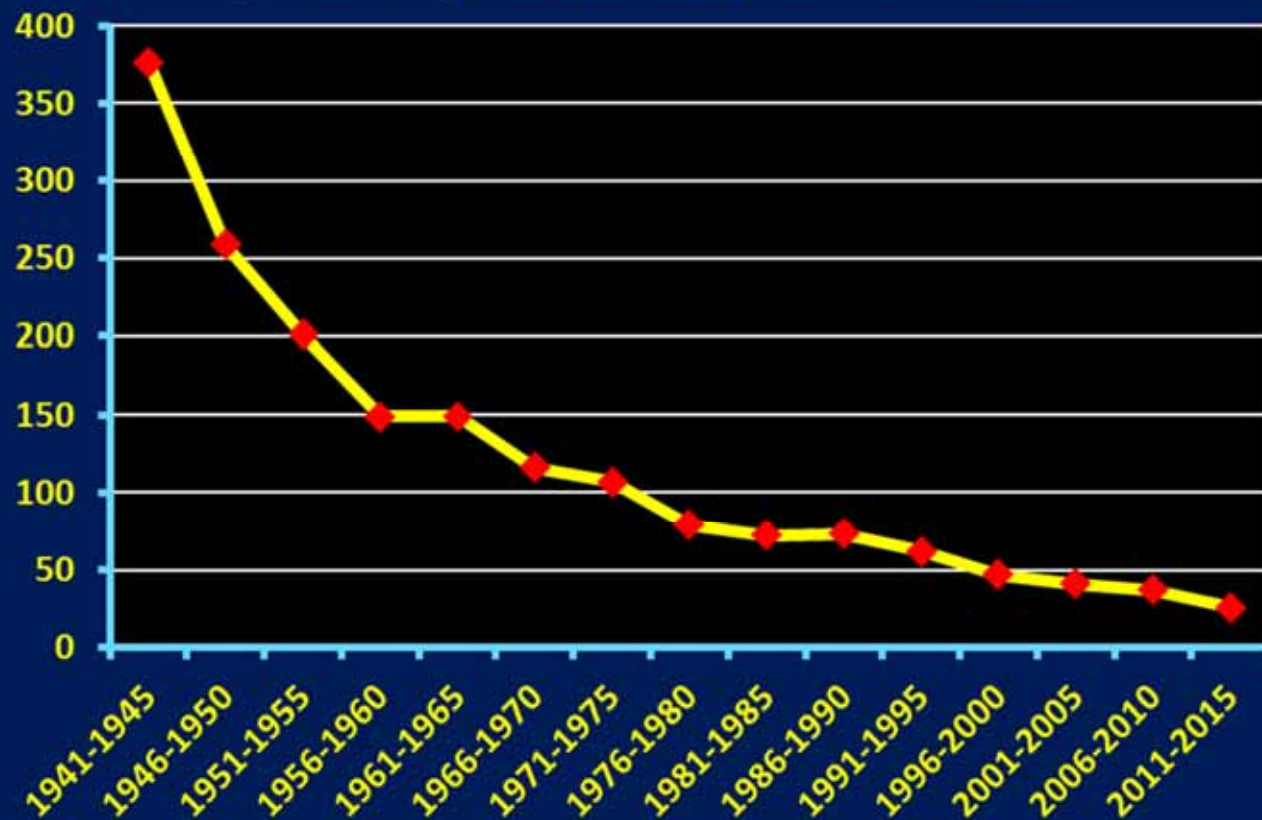




Historical Lightning Deaths



**Average Number Of Yearly
Lightning Fatalities 1941-2015**





Lightning: Realizing the Danger

2018 Lightning Deaths So Far



2018 Lightning Fatalities

Date	D of W	State	City	Age	Sex	Location	Activity
2/6/2018	Tuesday	TX	Honey Island	22	M		Repairing fencing
4/7/2018	Saturday	FL	White Springs	23	F	Standing near tree under gooseneck of trailer	Mud bogging
5/16/2018	Wednesday	FL	Parkland	53	F	Farm	Working at produce farm
5/28/2018	Monday	TN	McKenzie	7	M	Under tree	Playing
6/8/2018	Friday	AR	Maumelle	27	M	Near tree in yard	Construction
6/11/2018	Monday	FL	Margate	55	M	Open area	Weed-wacking
6/24/2018	Sunday	FL	Siesta Beach	33	M	On beach	Beach activities
6/27/2018	Wednesday	FL	Umatilla	44	M	Lake	Fishing
6/28/2018	Thursday	AL	Huntsville	73	F	Near tree	Inspecting Seawall
7/4/2018	Wednesday	GA	Dalton	37	M	Pond	Fishing
7/5/2018	Thursday	MO	Kansas City	23	M	Roof of house	Roofing
7/6/2018	Friday	AR	Russellville	67	M	Outside home	Yardwork
7/6/2018	Friday	TN	Kingston	75	M	Outside home	Mowing lawn
7/10/2018	Tuesday	FL	Lake Worth	39	M	Outside houses	Cutting branches
7/14/2018	Saturday	TN	Somerville	40	M	Outside house near tree	Mowing grass



Lightning - Realizing the Danger



- **ABOVE ALL** - Lightning is **UNPREDICTABLE!!!**
- Can Strike **15+ Miles Away** from Thunderstorm

Kansas – July 7, 2012

Officials say the storm was not directly over Nicholas' home. He was killed by a ~~stay~~ bolt of lightning from a nearby storm.

Wisconsin – August 3, 2014

OCONTO COUNTY (WFRV) Two men were working in tree house Sunday night at 8305 County Highway "E" in the Town of Morgan. Neighbor says skies were somewhat cloudy at that time but nothing to be alarmed about.

"It really didn't seem threatening. Then a big cloud came over head and it just stayed there. Then it started thundering. No lightning just thunder. No rain at all," Mommaerts said.



Lightning - Realizing the Danger



- “When Thunder Roars, Go Indoors”
- Seek Safe Shelter – Enclosed, Grounded Bldg.



– *Tents, Picnic Pavilions and Porches are NOT Good Shelters*



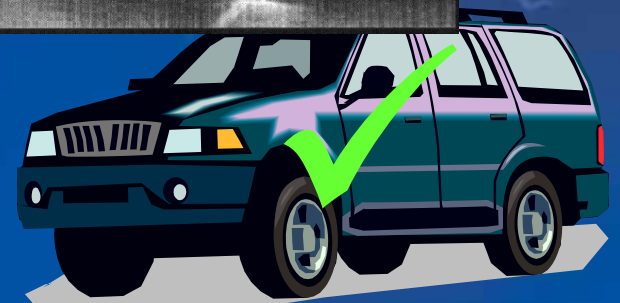
Photo Courtesy Rich Otte



Lightning - Realizing the Danger



- “Use Your Brain, Don’t Wait for Rain”
- If Outdoors – Soccer, LL Baseball, Football, Golf, etc.
 - Non-Convertible Automobile – Windows Closed!





More Lightning Safety Rules



- **RULE of 5:** Count # of seconds between Flash & “Bang”. **Divide that Number by 5!**
- **ALWAYS Remember:**
 - **BEFORE** # of seconds between Flash and “Bang” is ≤ 30 , **Seek Shelter!** Stay inside until 30 minutes since last thunder heard



Photo by John Partipilo, Tennessean.
Permission granted by Tennessean for use
in lightning safety presentations only.
Do NOT post on web.



Severe Thunderstorms



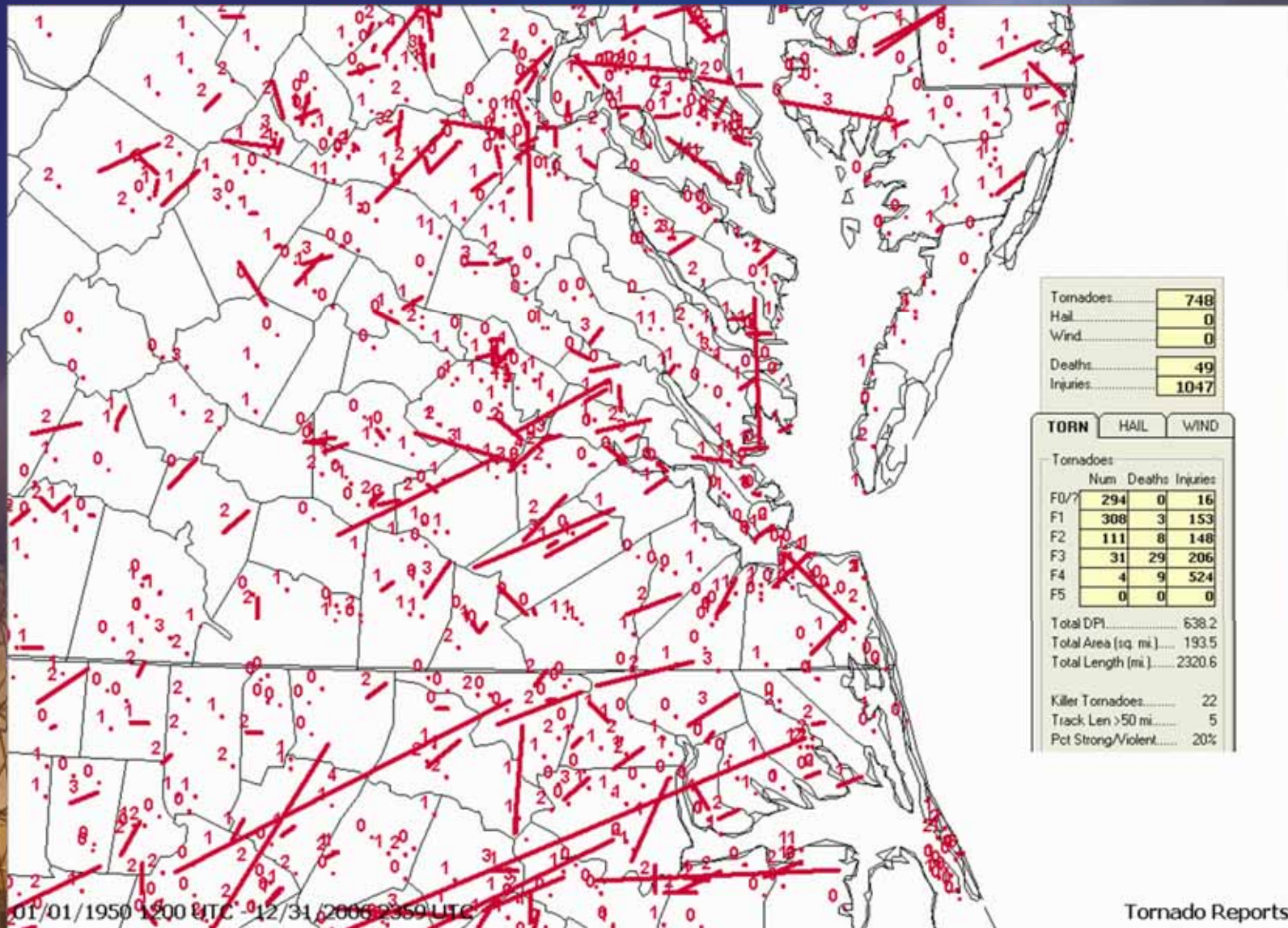
- **Definition** – Produce one or more of the following:
 - **Hail ≥ 1 Inch in Diameter** (quarter size)
 - **Sustained Winds or Gusts ≥ 58 mph (50 knots)**
 - **Produces Wind Damage – Trees Down, Power Lines Down, Structural Damage, etc.**
 - **Produces a Tornado**





Tornado History

Tornadoes 1950-2006



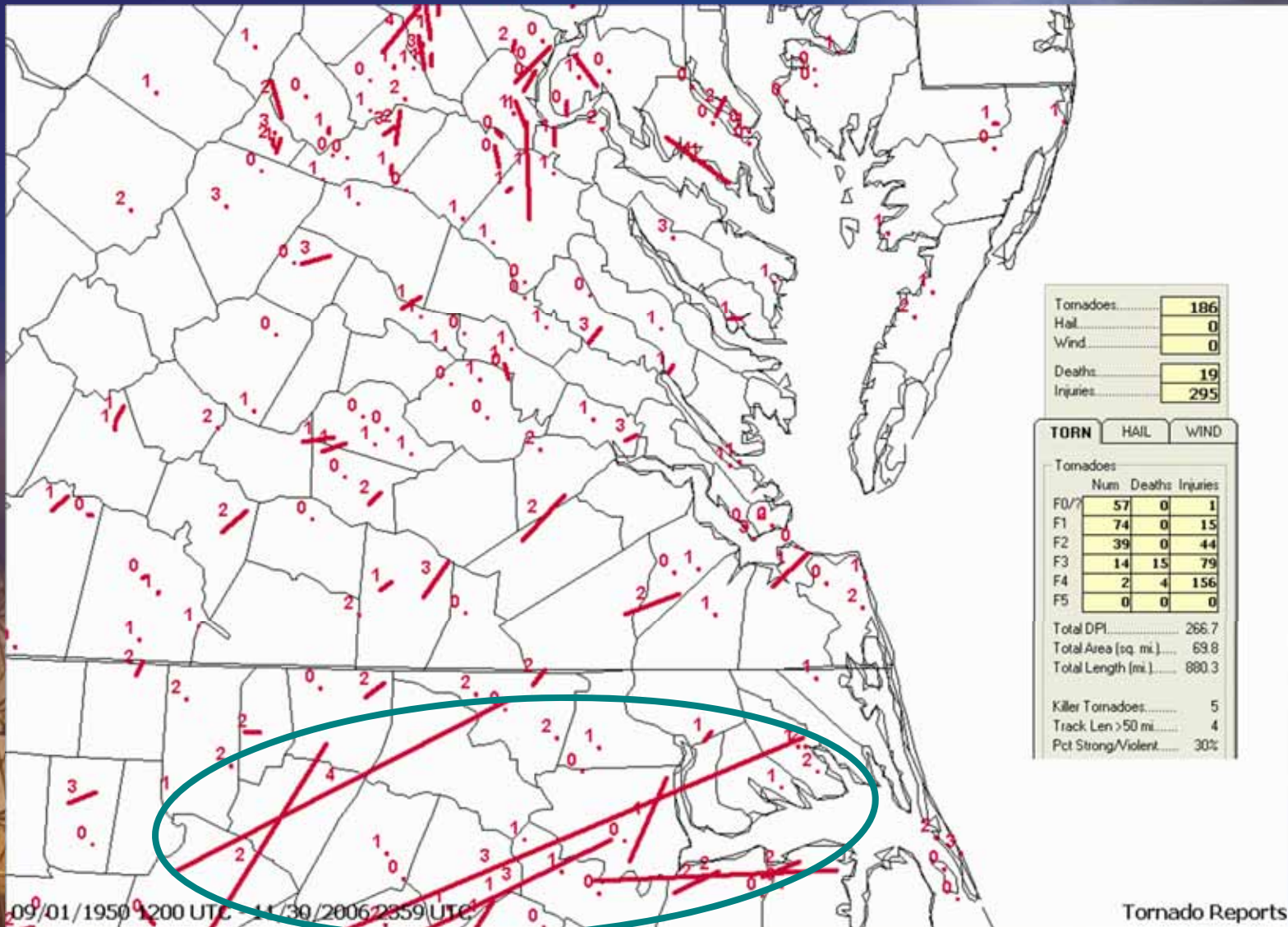
Tornadoes	748
Hail	0
Wind	0
Deaths	49
Injuries	1047

TORN	HAIL	WIND
Tornadoes		
Num Deaths Injuries		
F0/?	294	0 16
F1	308	3 153
F2	111	8 148
F3	31	29 206
F4	4	9 524
F5	0	0 0
Total DPl..... 638.2		
Total Area (sq. mi.)..... 193.5		
Total Length (mi.)..... 2320.6		
Killer Tornadoes..... 22		
Track Len >50 mi..... 5		
Pct Strong/Violent..... 20%		



Fall Tornado History

Fall Tornadoes 1950-2006





Tornado Safety Rules

- **BASIC RULE of Thumb** – “Go Low, Stay Low”
- Seek Safe Shelter – **Sturdy Bldg.**
 - **Basement or *Crawl Space***
 - **Lowest floor bathroom, closet or hallway**
 - **Crouch down**
 - **Use cushions, blankets, coats, etc. as protection from debris**





Tornado Safety Rules

- **BASIC RULE of Thumb** –
“Go Low, Stay Low”
- **If Outside** – Move to Shelter, if possible
- **NO Shelter & Outside**
 - *Get as Low as Possible*
 - *Use Ditch, if nearby*
 - *Crouch down or LIE down*
 - *Cover head with hands*





After the Storm Passes



- **AVOID** Damage Areas
 - *Trees Across Power Lines – Could be Live!!*
 - *Partially Downed Trees/Damaged Buildings*
 - *Smell Gas? – Evacuate and notify Gas Company*
- **Be Prepared for More Storms!**
 - *Use NOAA Weather Radio, Internet Weather Channel or Local Media*

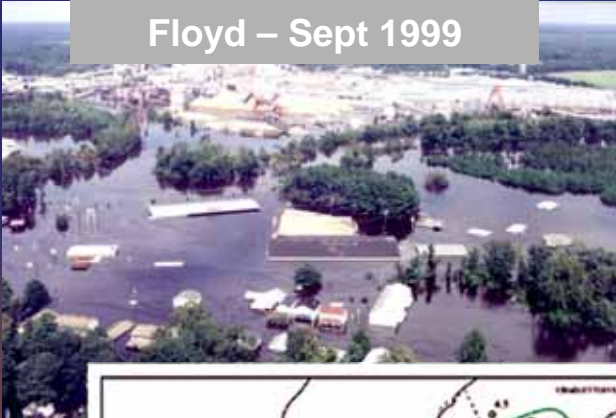




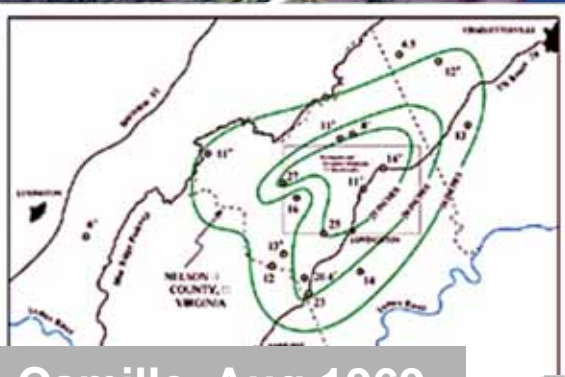
Flash Flood Safety

Flooding = #1 Storm Related Killer

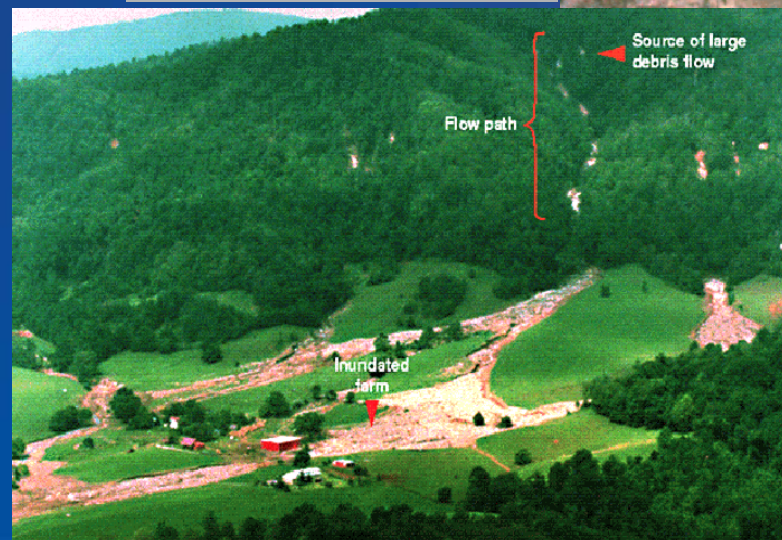
Floyd – Sept 1999



Madison county
VA – June, 1995



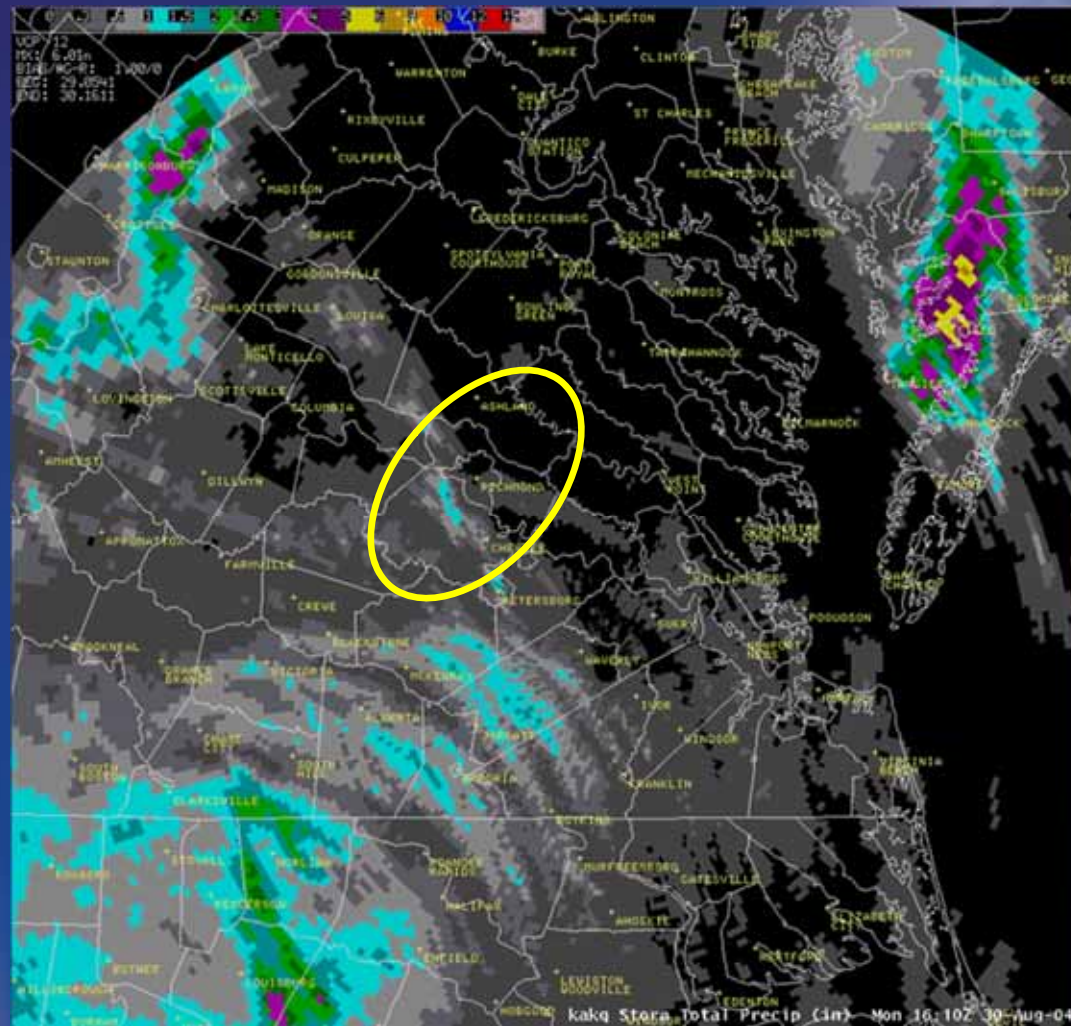
Camille, Aug 1969





Flash Flood Safety

Gaston 2004 in Richmond

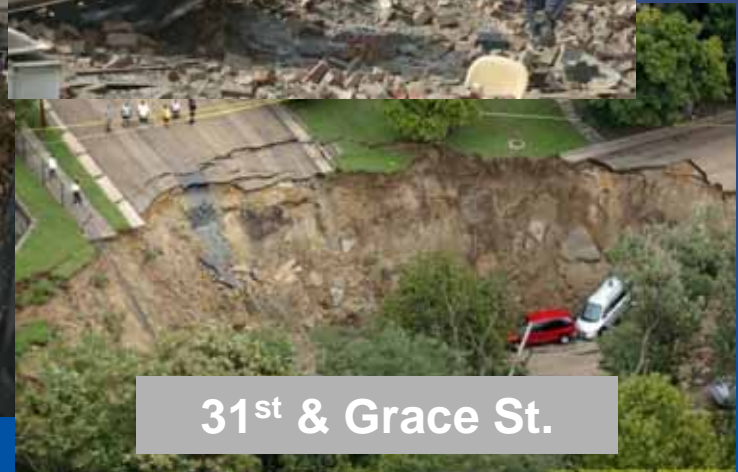


Radar Rainfall Animation



Flash Flood Safety

Gaston 2004 in Richmond



31st & Grace St.



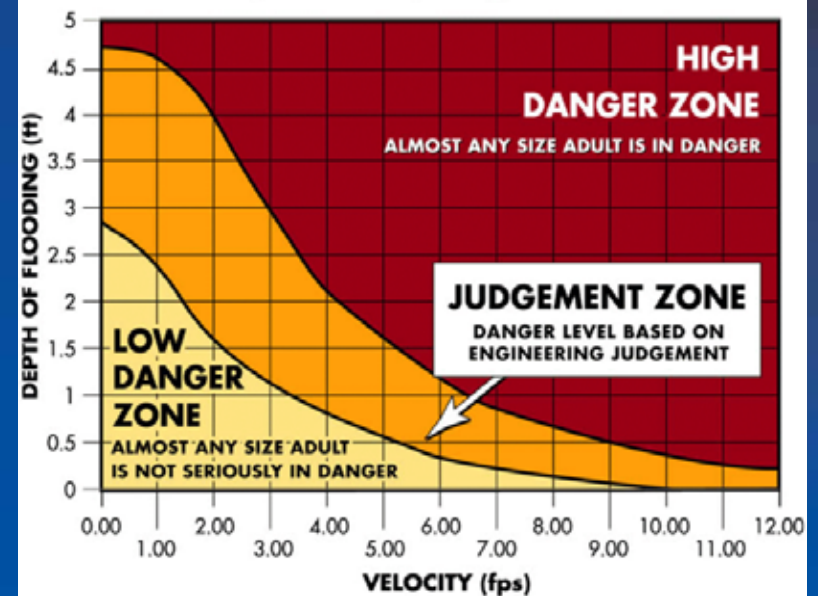
Flash Flood Safety



- **Rule of Thumb #1 – Get to High Ground!!**
 - *Be Aware of Rapid Water Rises*
 - *EVACUATE if you feel threatened*
 - *May be necessary even if warning is not issued!!*



Riverine Flood Hazard Chart for Adults
Depth – Velocity Danger Levels



SOURCE: USBR, "Downstream Hazard Classification Guidelines," 1988



Flash Flood Safety

- **Rule of Thumb #2 – “Turn Around, Don’t Drown”**
 - *2/3 of flood deaths from people driving through flooded roads*
 - *79% of flood deaths in 2009*
 - *No way to tell if road/bridge is still there*

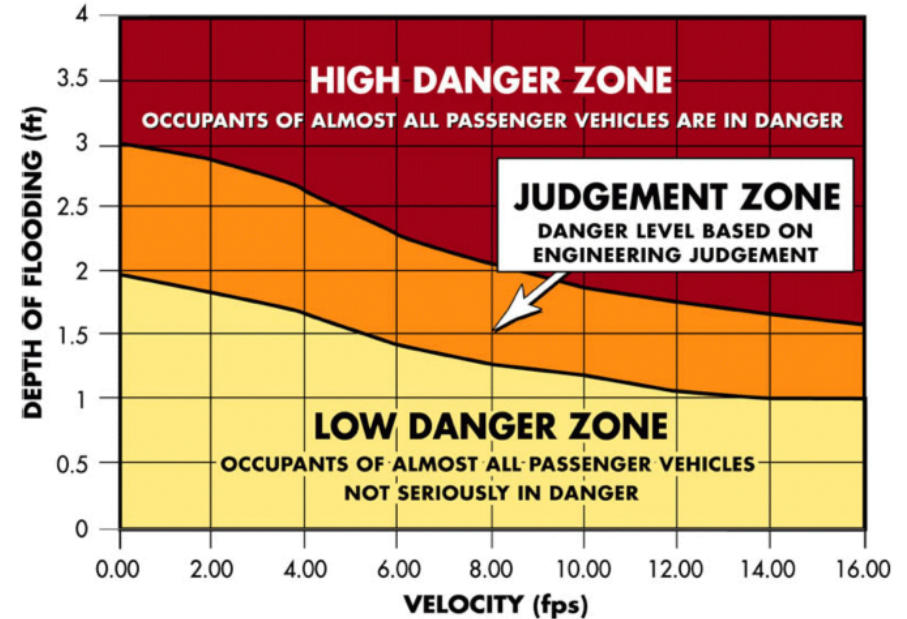




Flash Flood Safety

- **Rule of Thumb #2 – “Turn Around, Don’t Drown”**
 - *Takes < 2 feet of moving water to “float” a vehicle and move it downstream (cars are NOT boats!)*
 - *If water depth across the road is UNKNOWN, or you can’t see center line, TURN AROUND!!*

Riverine Flood Hazard Chart for Cars
Depth – Velocity Danger Levels

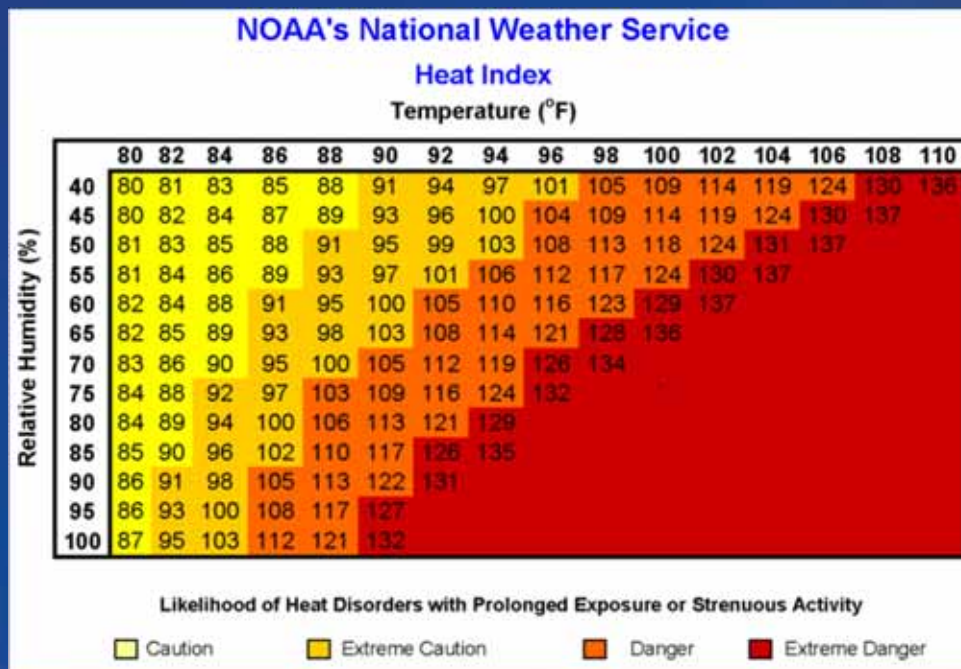


SOURCE: USBR, "Downstream Hazard Classification Guidelines," 1988



Excessive Heat Safety

- **Heat Index** is used to define excessive heat
 - **Heat Advisory** threshold - **afternoon** Heat Index 105° to 110° for 2+ hours
 - **Heat Warning** threshold - **afternoon** Heat Index $\geq 110^\circ$ for 2+ hours





Excessive Heat Safety



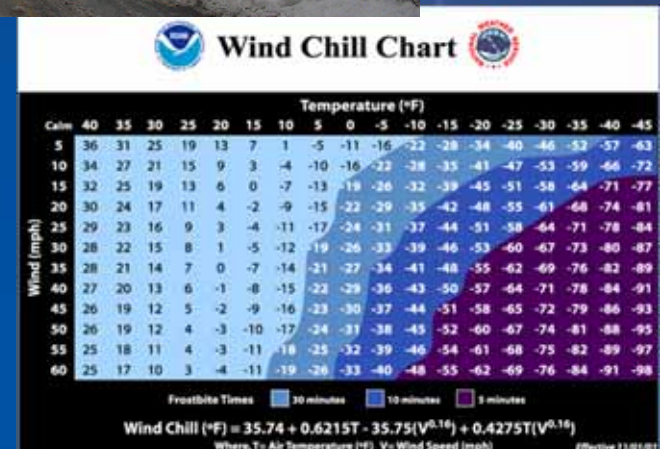
- Avoid **Midday and Afternoon** Work/Play
- Wear **Light Colored, Loose Fitting** Clothing
- Drink plenty of **Non-Alcoholic/Non-Caffeine** beverages, especially WATER
- Use air conditioned areas as much as possible
- **REST**, if feeling **fatigued, nauseated** or **dizzy**



Cold Weather Safety



- Life threatening cold extremely rare in Virginia
 - *Most likely in mountains*
- Wear **LAYERS** of lightweight, loose fitting clothing
 - *Wool, newer synthetics*
- Avoid **over-exertion** while shoveling snow
- **REST**, if feeling **fatigued**, **nauseated** or **dizzy**





One Final Item

Ventilate Alternative Heat and Electric Sources!!!

Power outage led to Va carbon monoxide deaths

08:02 PM EDT on Sunday, June 14, 2009

13News

PORTSMOUTH(AP) -- Portsmouth fire officials say a truck that brought down a power line inadvertently set in motion the events that ultimately saw three people die from carbon monoxide poisoning.

Capt. Paul Hoyle, a spokesman for the fire department, says officials believe that the outage led people in a rental home here to bring a gasoline-powered generator inside the building.

Deaths related to Hurricane Isabel			
Locality	Date	Cause	Number Confirmed
City of Richmond	09.18.03	Drowning	1
City of Richmond	09.18.03	Accident, I-95	1
Chesterfield County	09.18.03	Falling tree	1
City of Richmond	09.18.03	Tree fell on home	1
Fluvanna County	09.18.03	Vehicle collision with fallen tree	3
Albemarle County	09.18.03	Vehicle hit tree	2
New Kent County	09.18.03	Falling tree	1
Accomack County (Parksley)	09.18.03	Tree fell on trailer	1
City of Harrisonburg	09.18.03	Drowning	1
Henrico County	09.19.03 (found)	Drowning (car in creek)	1
Chesterfield County	09.19.03 (found)	Carbon monoxide poisoning (poorly ventilated generator)	2
City of Hopewell	09.19.03	Falling tree limb (storm cleanup)	1
City of Staunton	09.19.03	Carbon monoxide poisoning (poorly ventilated generator)	1



The End!!

Are There Any Additional Questions?



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