Severe Weather Spotter Training 2018

National Weather Service Wakefield, Virginia

Severe Weather Spotter Line: 1-800-737-8624

NWS Wakefield Webpage: weather.gov/akq

@NWSWakefieldVA **NWSWakefieldVA**

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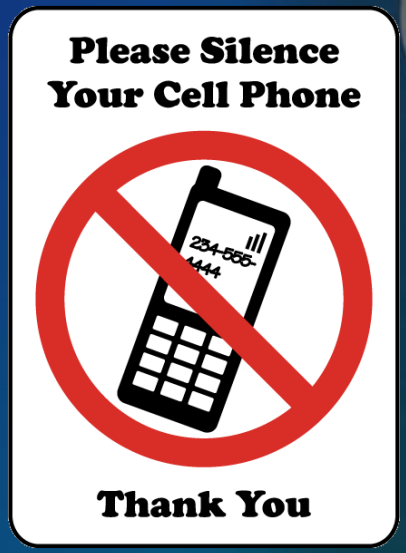
What Will Be Covered Tonight…

- Importance of Spotters
- Types of Severe Weather
  - *Thunderstorm Formation*
  - *Straight-Line Winds*
  - *Hail*
  - *Flash Flooding*
  - *Wall Clouds/Funnel Clouds/Tornadoes*
- Reporting Procedures
- Spotter Safety
- Interactive Quiz



What Are NWS Storm Spotters?

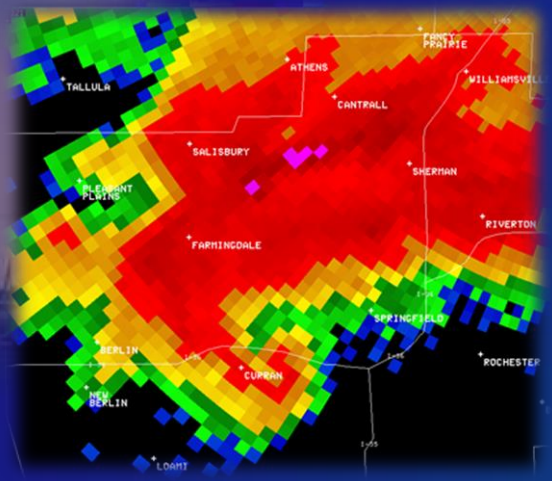
SKYWARN

- Volunteers who relay real-time severe weather reports to NWS
- NWS relies on spotter information to issue warnings
- Spotters keep our communities safe during hazardous weather!

Why WE need YOU!

Why Spotters Are Needed

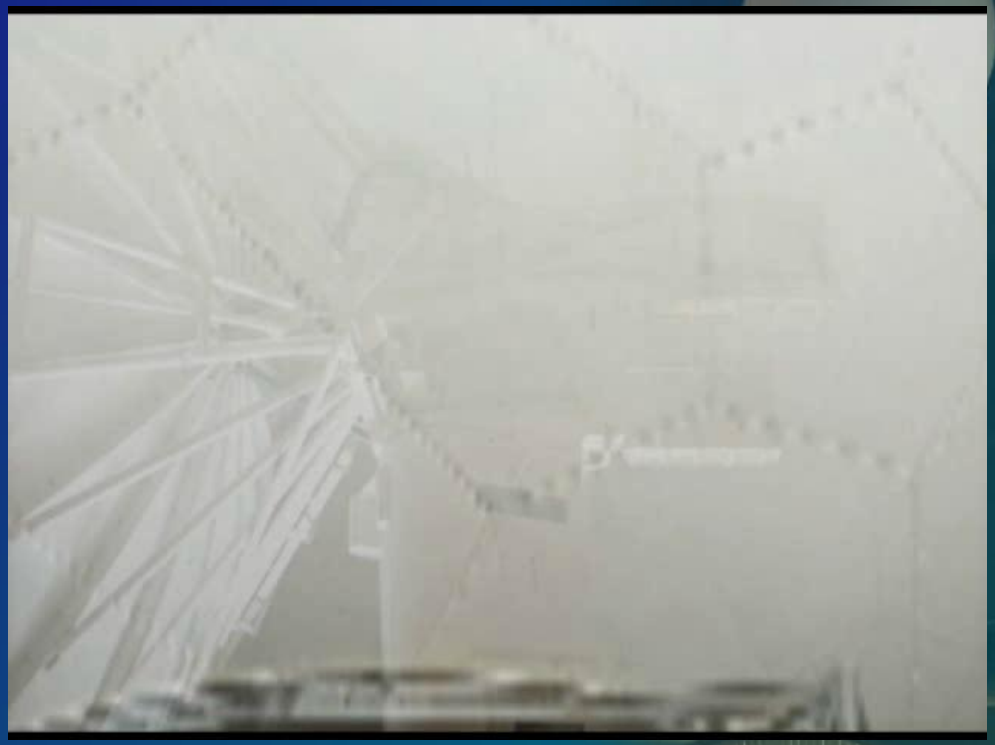
What we see:



What you see:

- *The ONLY way for us to know is to get ground truth from spotter reports!*
- *Real-time verification adds credibility, enhances public response, and improves warning accuracy.*

NWS Radar – Operations



- National Weather Service WSR-88D Radar

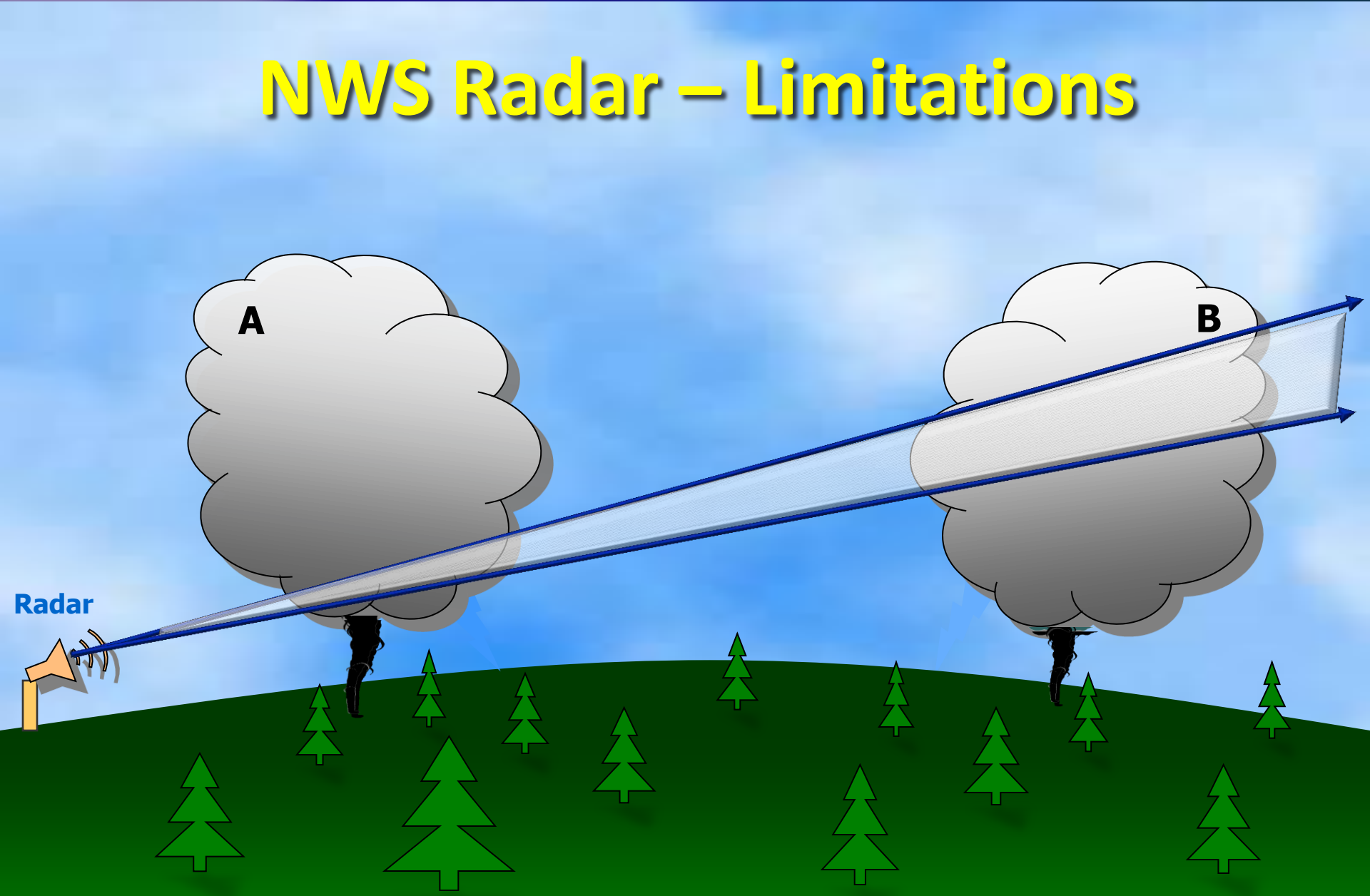
NWS Radar – Operations

NWS Doppler radar enables us to estimate:

- Reflectivity (amount or strength of the signal)
- Velocity (direction in which the air is moving)

However, there are some significant limitations…

NWS Radar – Limitations



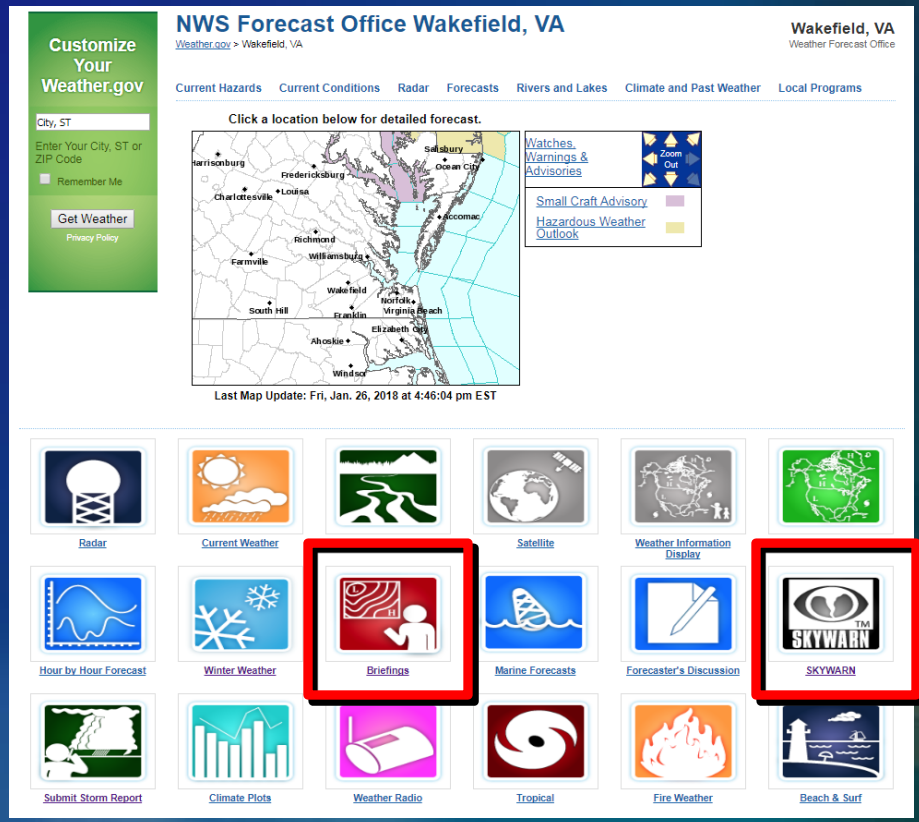
Radar beam cannot see the lower portion of storm *B*.

Resolution is poor at distances far from the radar.

Spotters + NWS = Saved Lives!

Hazardous Product Definitions

- Weather.gov/Wakefield
- Always keep up with the latest forecasts, statements, and warnings…
  - For safety
  - For spotting
  - For awareness



All Hazards NOAA Weather Radio
NOAA's National Weather Service

What are some ways we provide this information?

Hazardous Weather Outlook

- Discusses potential for hazardous weather within the next week (especially the first 24 hours)
- Issued at least once a day
- Updated more frequently during significant weather

VAZ060-061-067>069-080>082-088>090-093-513-514-523>525-231100-
Prince Edward-Cumberland-Nottoway-Amelia-Powhatan-Dinwiddie-
Prince George-Charles City-Sussex-Surry-James City-Isle of Wight-
Western Chesterfield-Eastern Chesterfield (Including Col. Heights)-
York-Newport News-Hampton/Poquoson-
649 AM EDT Sat Apr 22 2017

This Hazardous Weather Outlook is for central Virginia, east central Virginia, south central Virginia and southeast Virginia.

.DAY ONE...Today and Tonight.

Isolated thunderstorms will be possible along and south of a Farmville to Wakefield line this afternoon through early this evening. Damaging wind gusts and large hail are the primary hazards in any thunderstorm.

.DAYS TWO THROUGH SEVEN...Sunday through Friday.

A frontal boundary will become nearly stationary across North Carolina Sunday and Sunday night. Meanwhile, low pressure will track east along the frontal boundary from the Mid-South toward the Carolinas. This will result in periods of locally heavy rain across the region from Sunday through Monday.

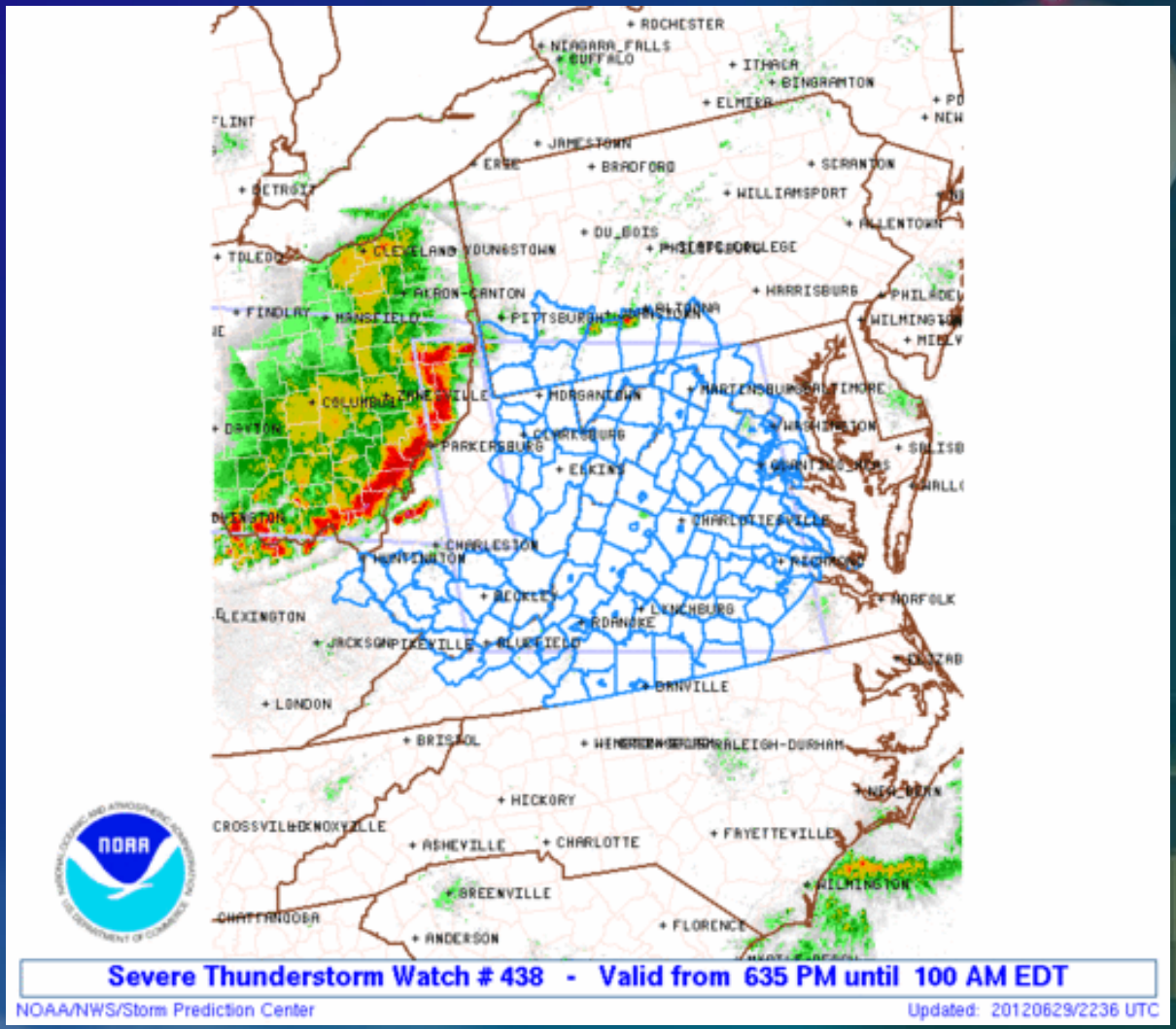
.SPOTTER INFORMATION STATEMENT...

Spotter activation may be needed this afternoon...and rainfall reports are welcome through the weekend.

$$

Watch

- Conditions are favorable for hazardous weather in and near the watch area
- Issued by the Storm Prediction Center (SPC) in Norman, OK

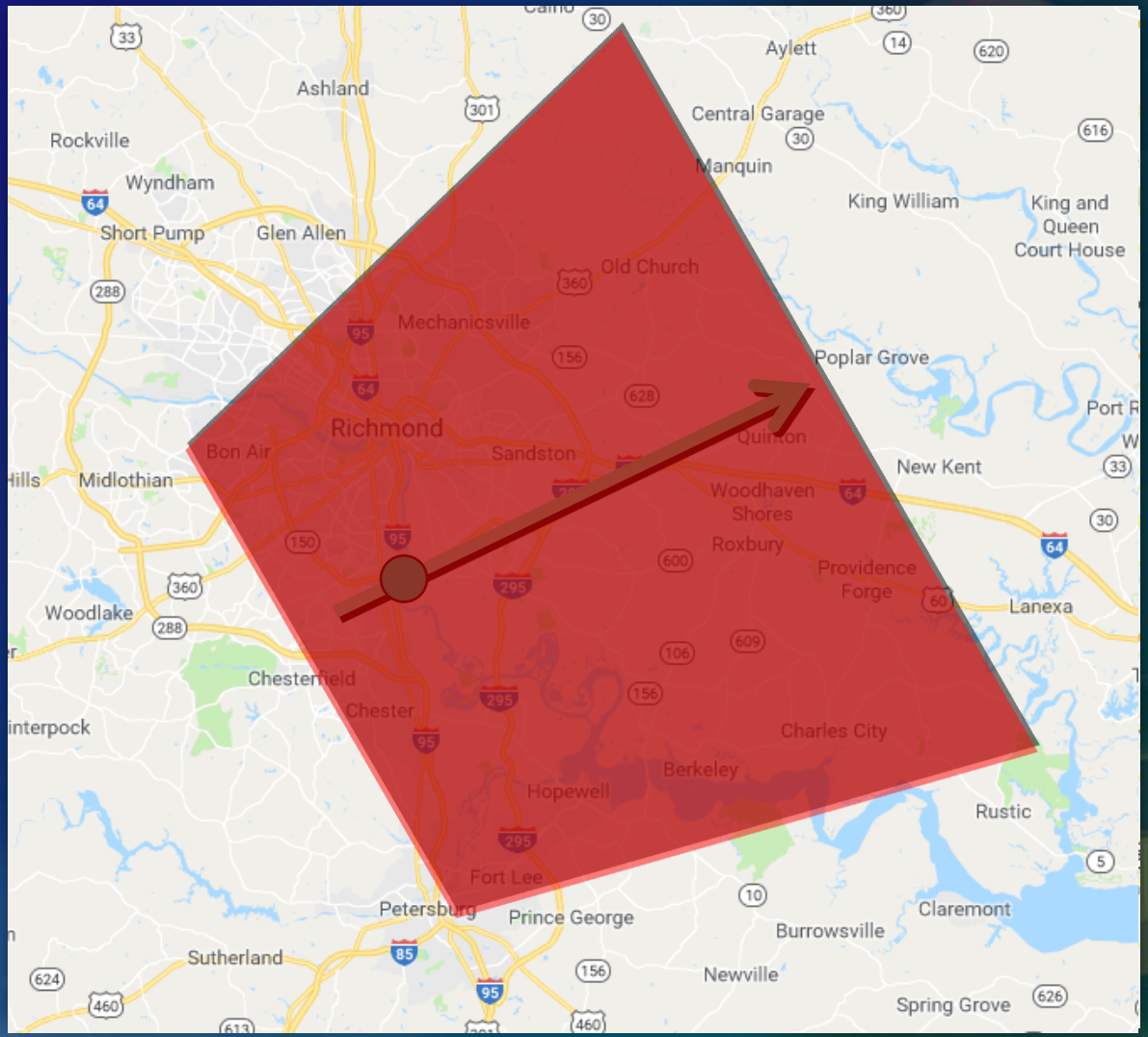


June 29, 2012

Warning

- Expected weather event is imminent or occurring
- Warning polygons are based on area of highest threat

Tornado emergency may be issued in exceedingly rare instances!



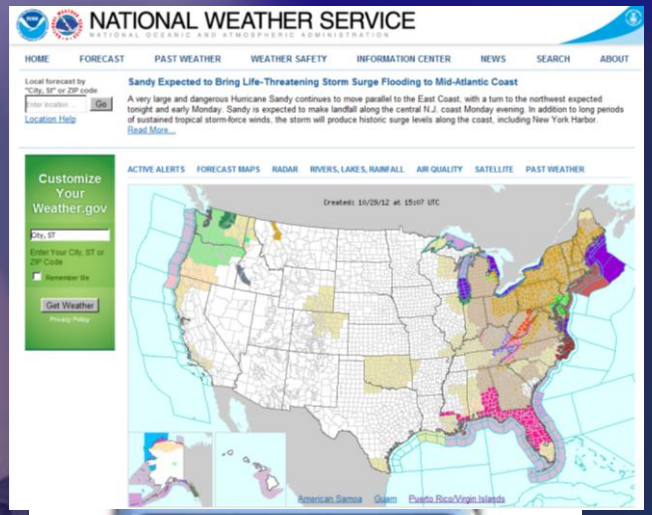
Special Weather Statement (SPS)

- Issued for strong thunderstorms that may strengthen to severe levels
- Also used for other types of significant weather that do not require a warning (i.e. small hail, wind gusts of 30 to 40 MPH, and/or frequent lightning)

...A LINE OF STRONG THUNDERSTORMS WILL AFFECT THE RICHMOND METRO AREA THROUGH 615 PM EDT...

WIND GUSTS TO 40 MPH AND SMALL ARE POSSIBLE WITH THESE STORMS. FREQUENT LIGHTNING IS ALSO EXPECTED WITH THIS LINE OF STORMS.

How do YOU receive Warnings?



Wireless Emergency Alerts

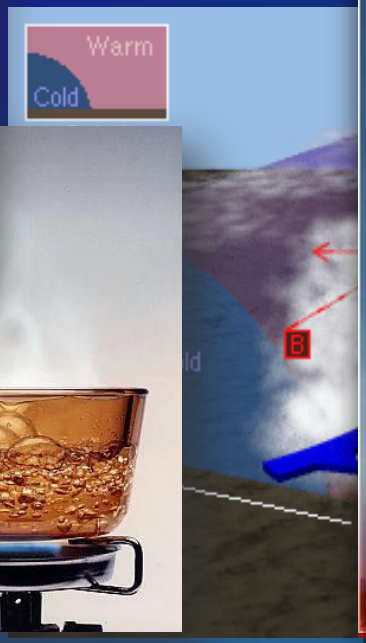
- *Multiple ways of receiving warnings is ideal!*
- *Think about how <u>you</u> would receive a warning at…*
  - *Home (including while you're asleep)?*
  - *In your car?*
  - *Sports practice?*
  - *Work ?*

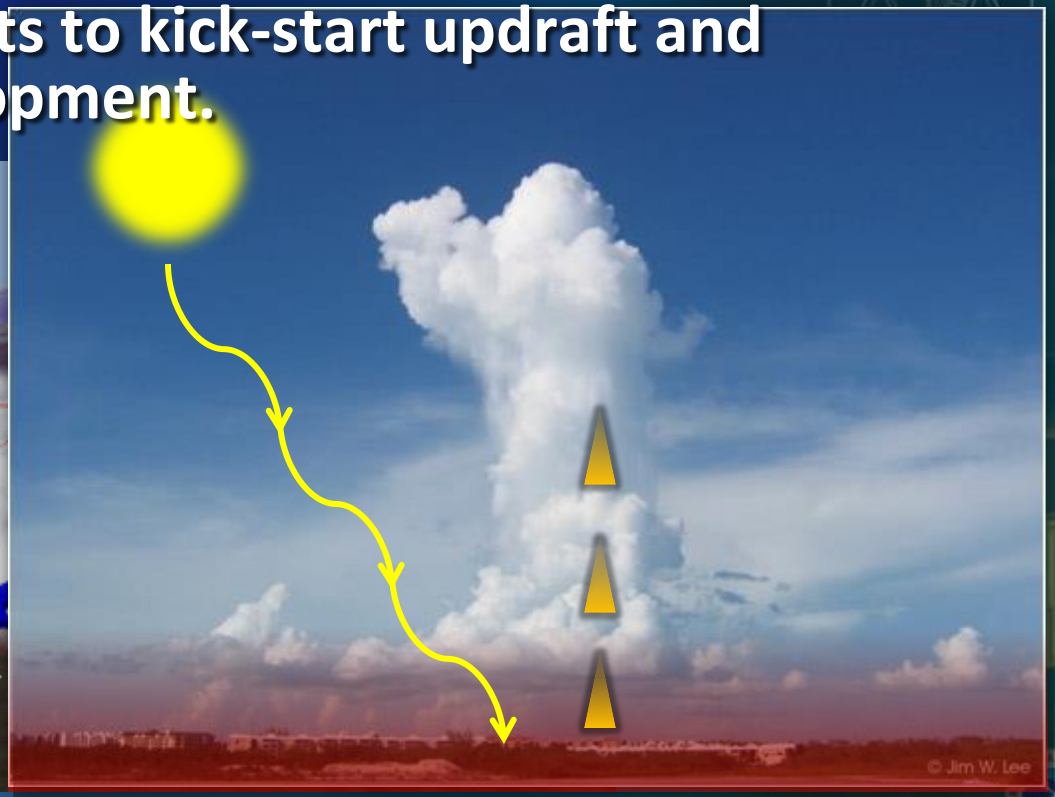
Thunderstorm Formation

When air is heated, it becomes lighter and rises.

If enough moisture is present, this updraft can develop into a towering cumulus cloud.

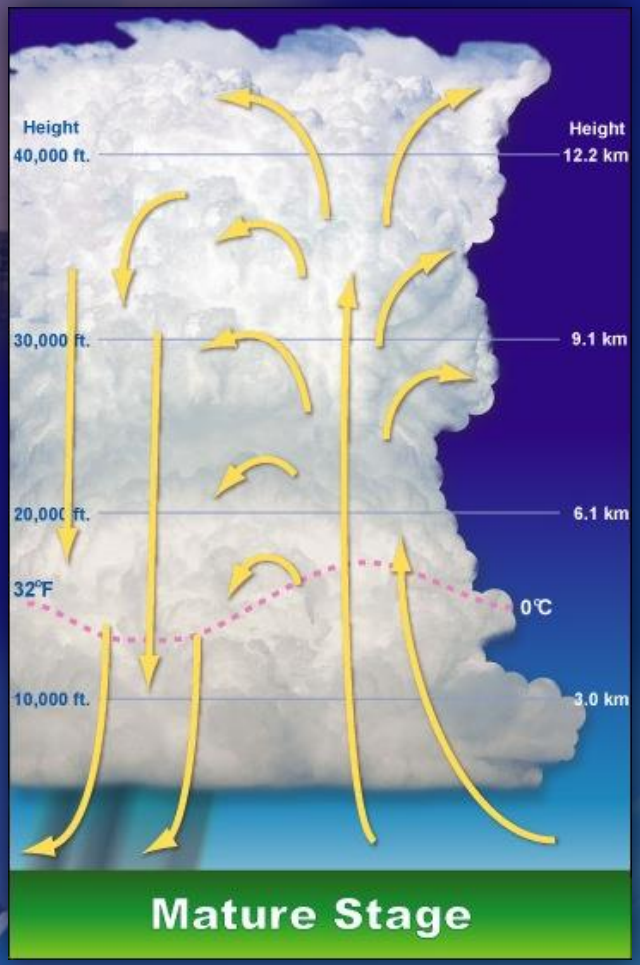
A source of lift often acts to kick-start updraft and thunderstorm development.

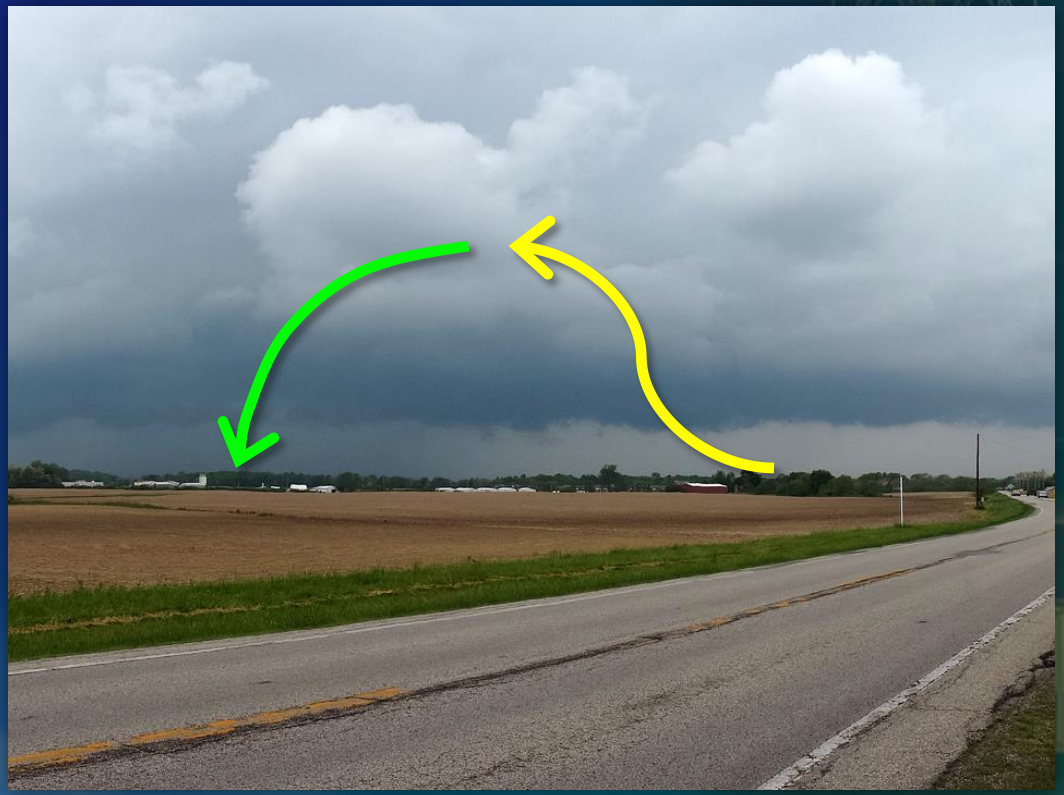




Mature Thunderstorm

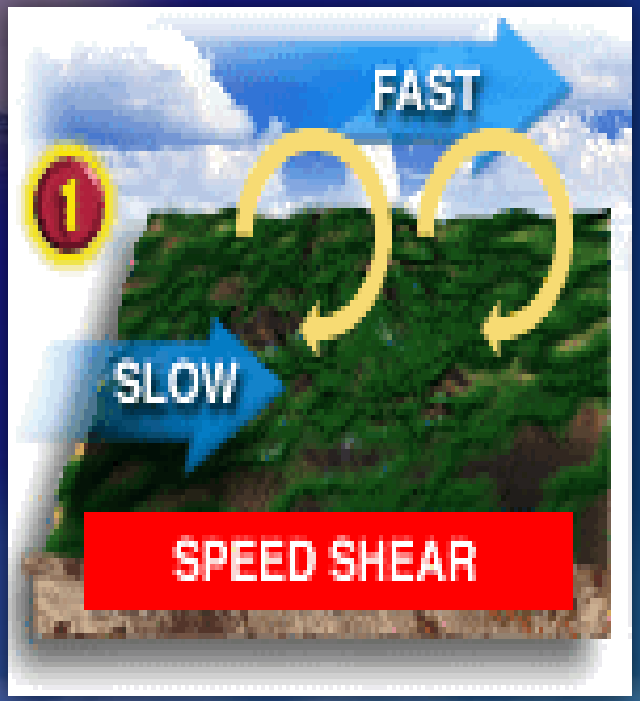
- A fully developed thunderstorm will have a distinct updraft and downdraft





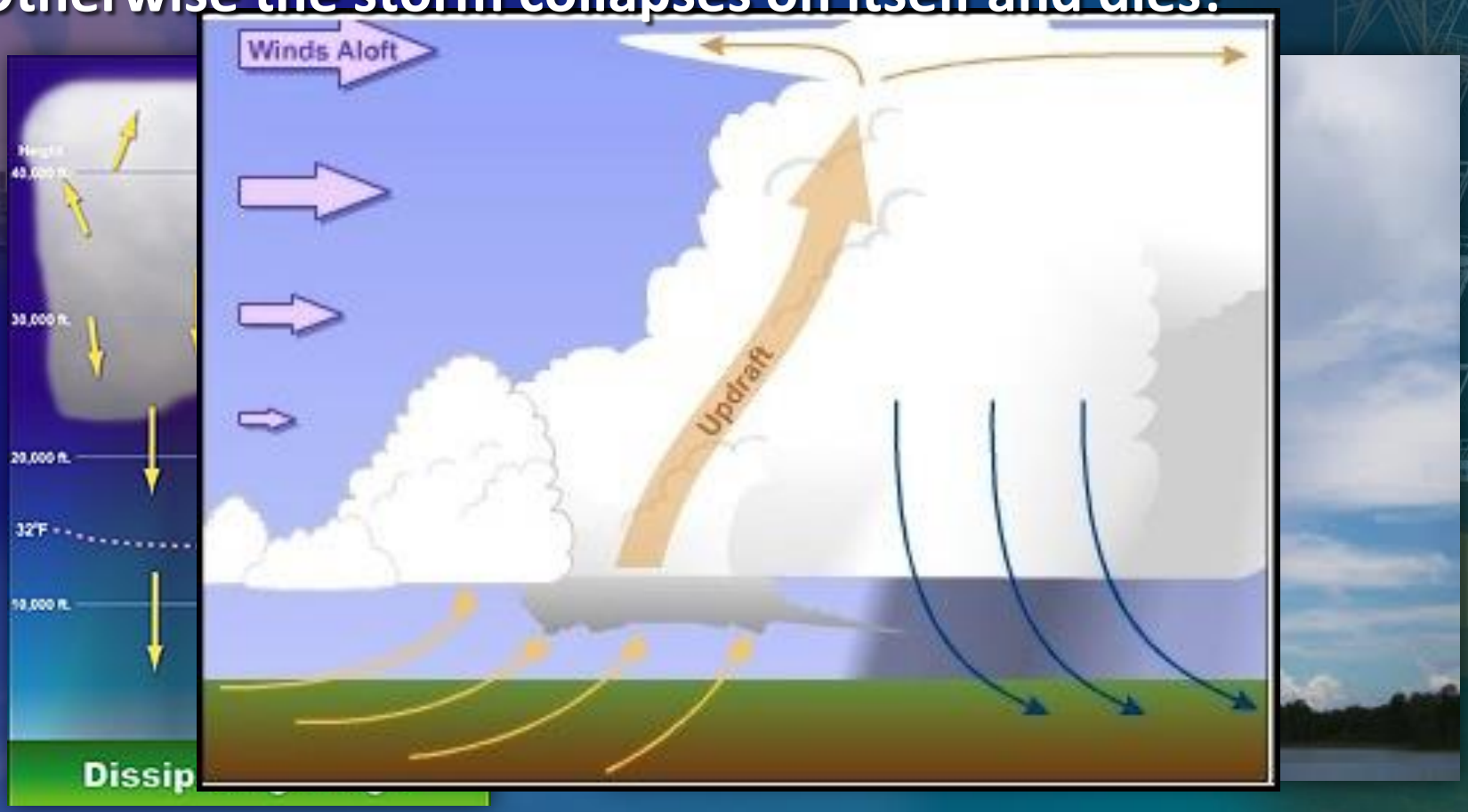
Importance of Wind Shear

- For a thunderstorm to survive, wind shear is needed to keep the updraft and downdraft separate.
- Can be described in terms of speed and direction



Importance of Wind Shear

- For a thunderstorm to survive, wind shear is needed to keep the updraft and downdraft separate.
- Otherwise the storm collapses on itself and dies!



Types of Thunderstorms

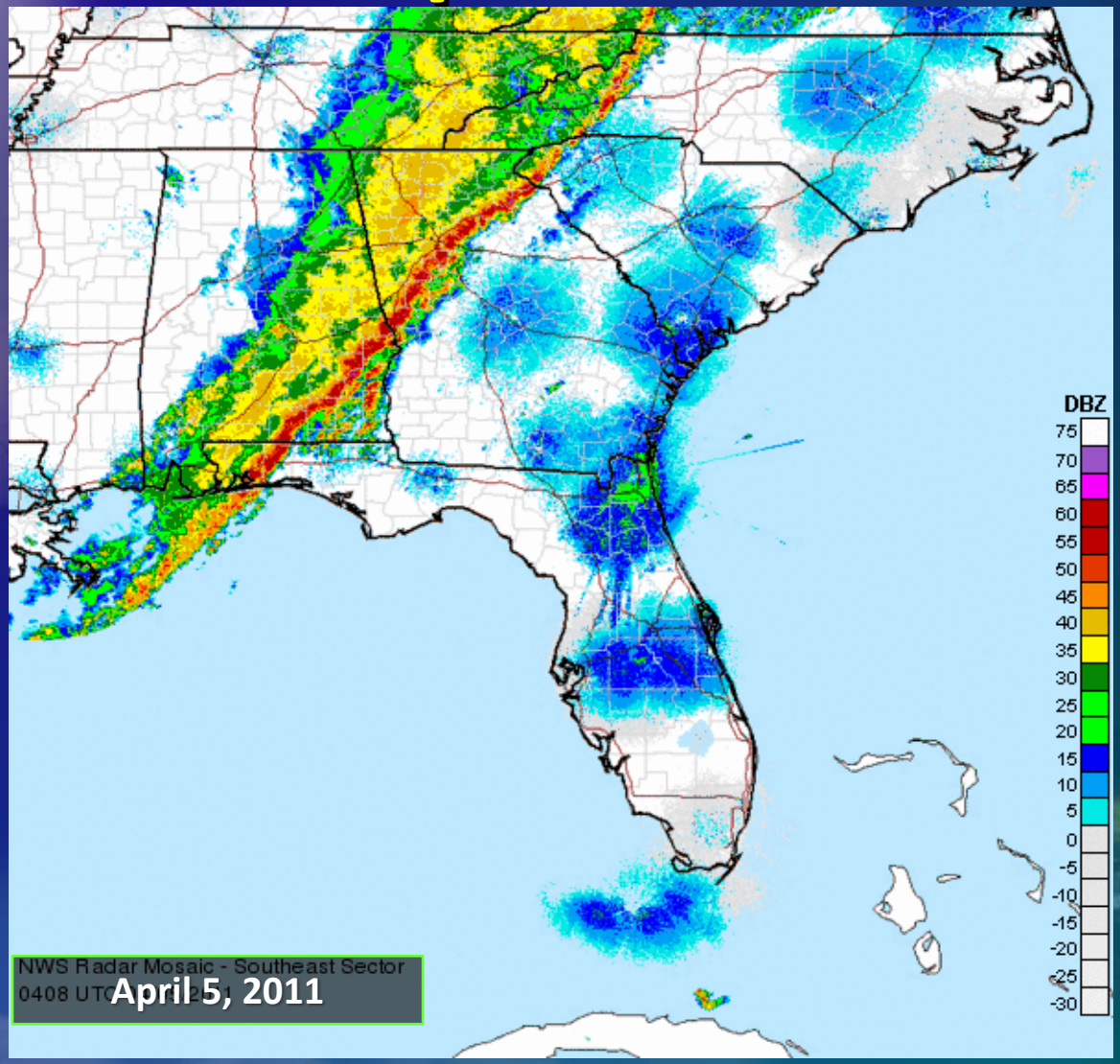
Single cell

Multi-cell

Squall Line

Supercell

Squall Line


DBZ
75
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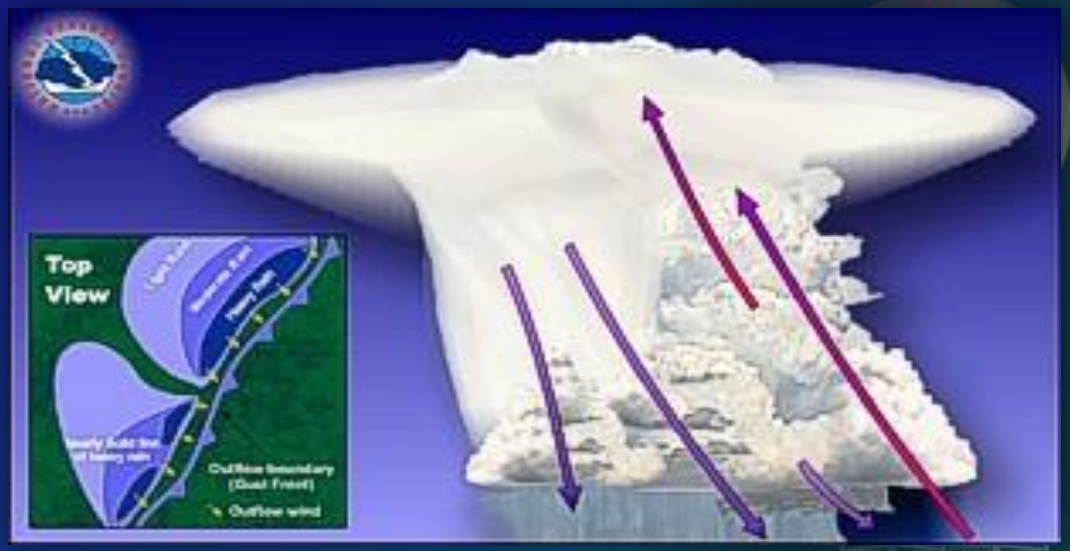
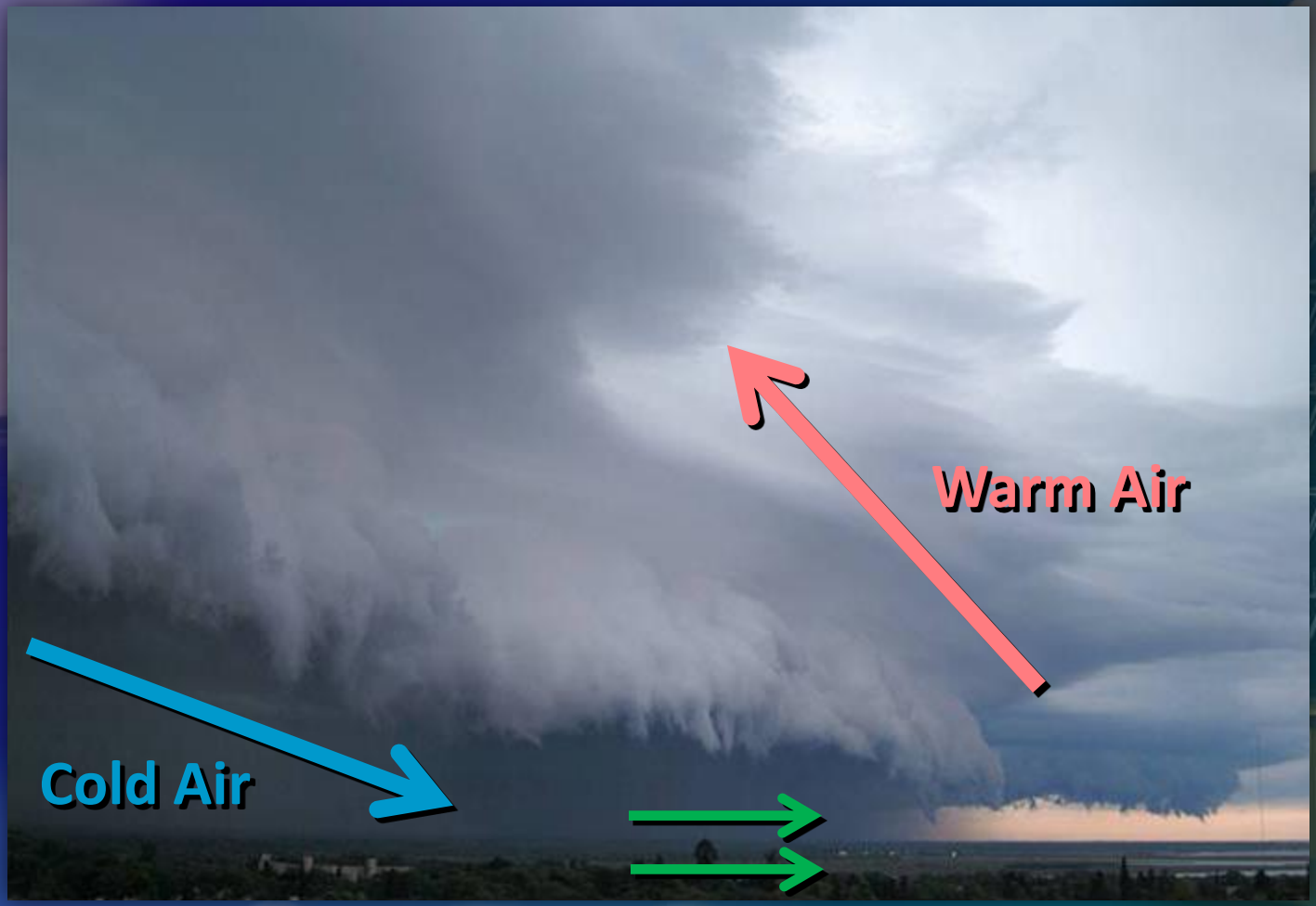
-25
-30
NWS Radar Mosaic - Southeast Sector
0408 UTC
April 5, 2011

Squall Line

- Primary threat is damaging winds
- Often accompanied by a shelf cloud



Shelf Cloud

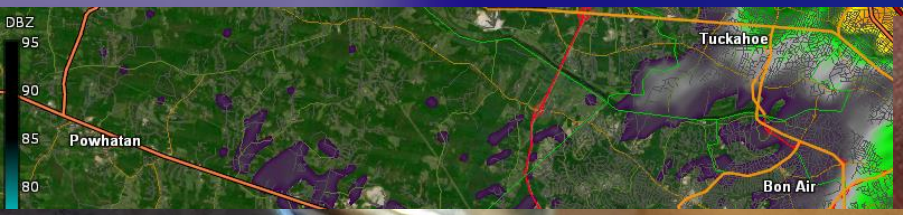


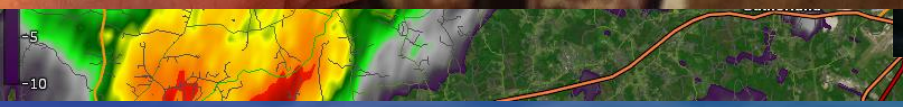
Strong winds often accompany the passage of a shelf cloud.

Squall Line and Gust Front

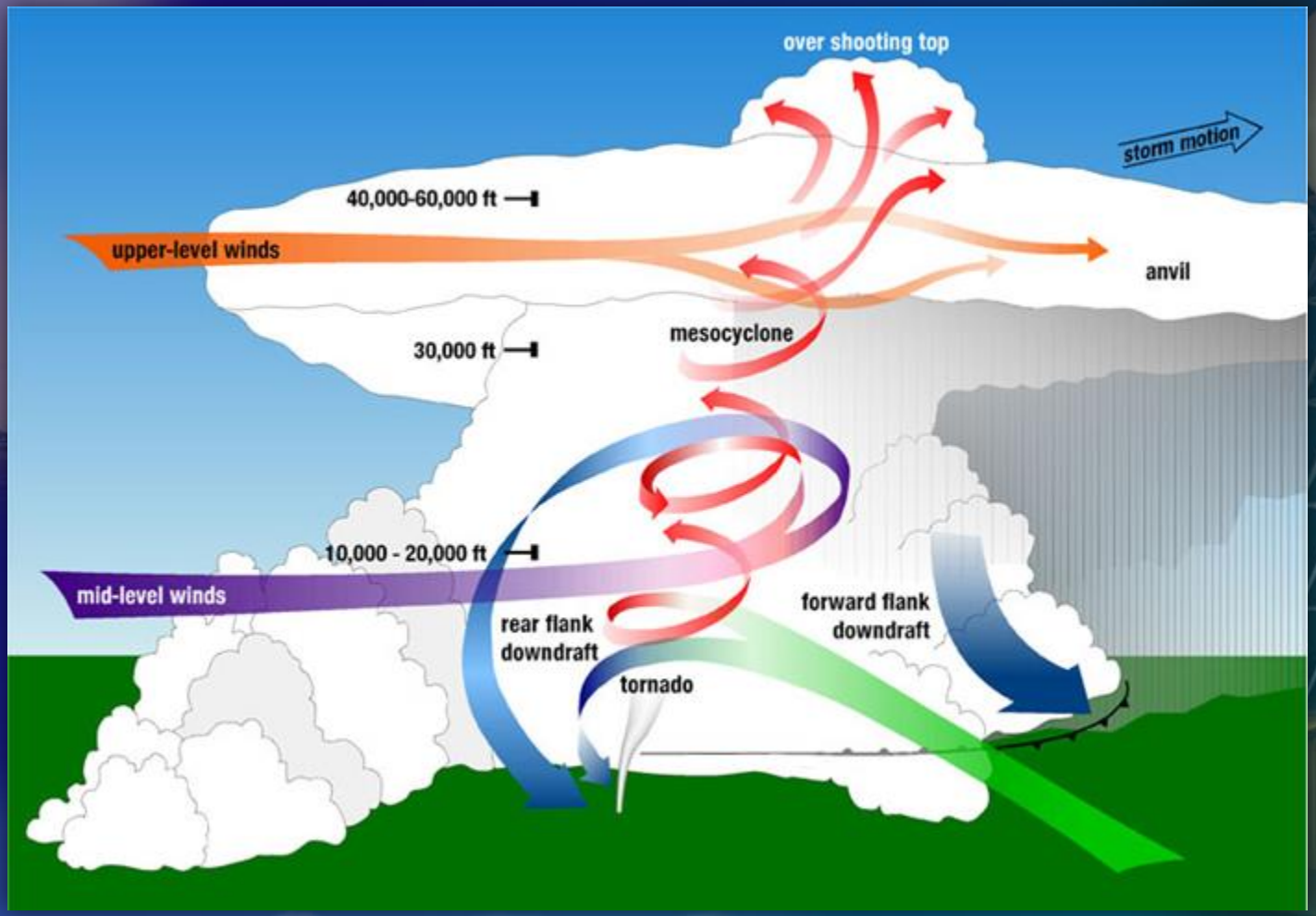
Shelf cloud forms with strong winds and rain-cooled air following closely behind

Supercell Thunderstorms



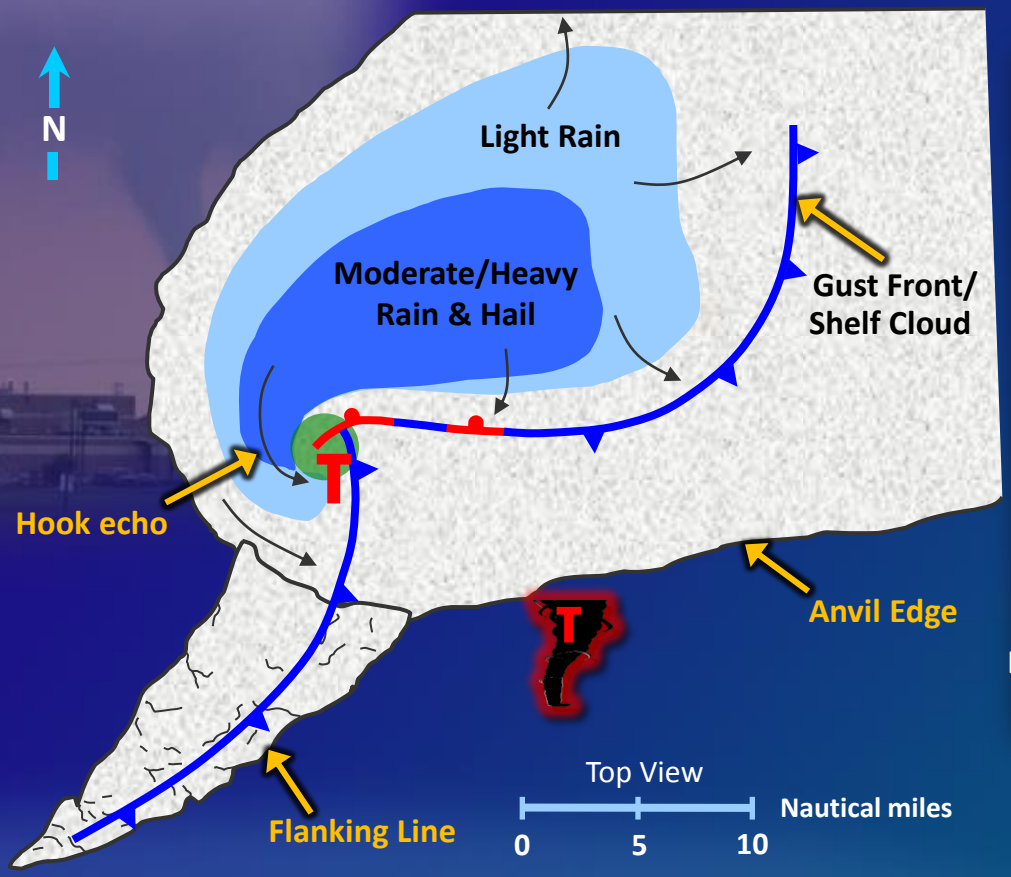


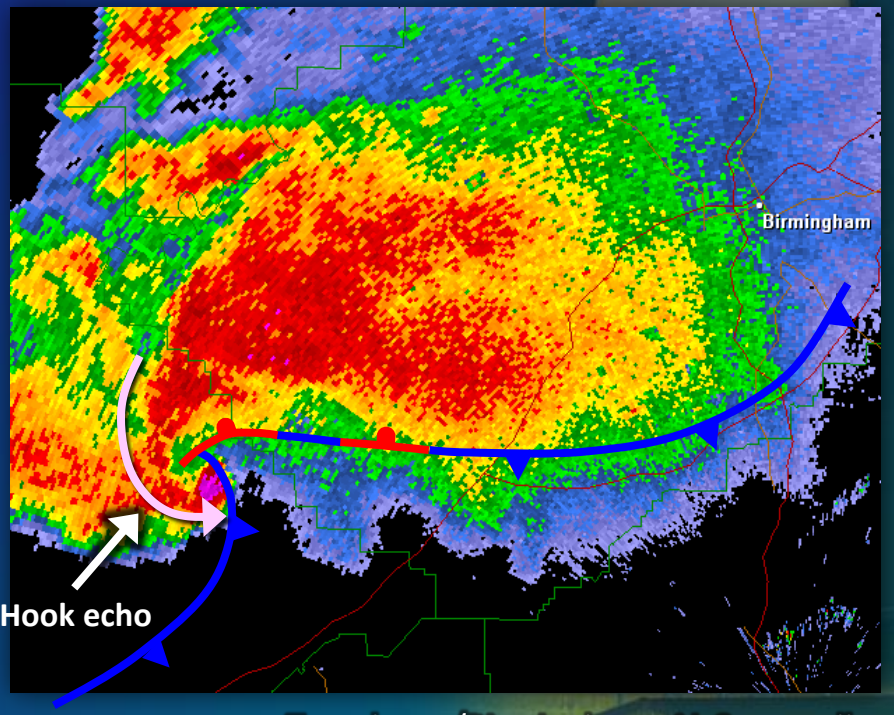
Supercell Thunderstorms



Supercell thunderstorms are most likely to produce severe weather.

Classic Supercell Schematic





Tuscaloosa/Birmingham, AL Supercell
April 27, 2011

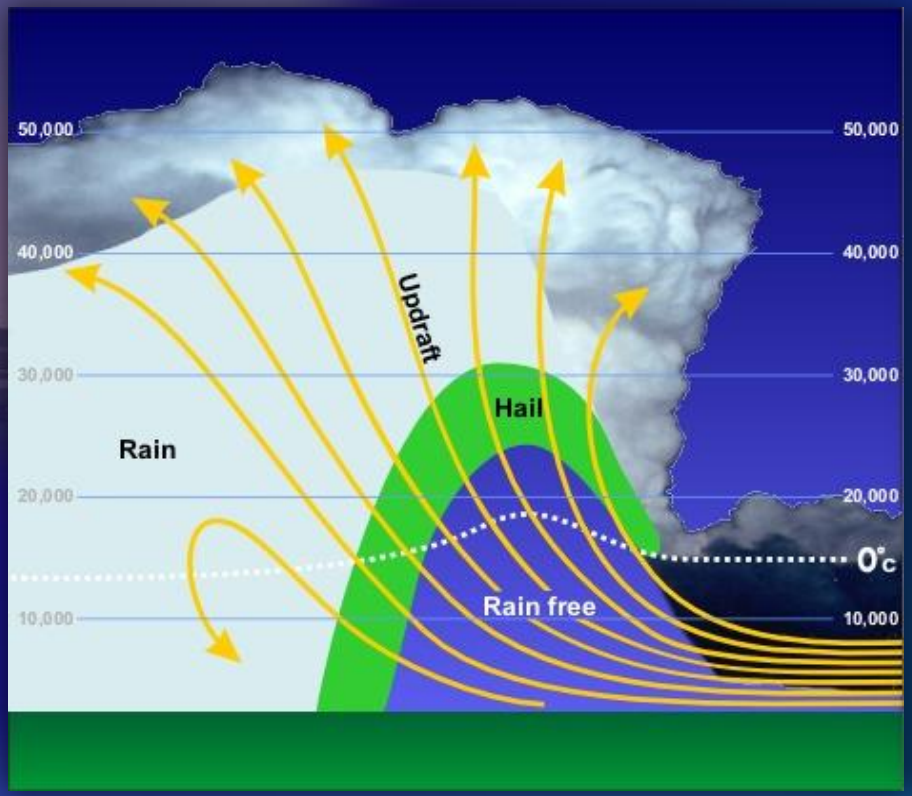
Tornado usually occurs near the "weak echo region."
Where in relation to storm is the safest/best place to spot?

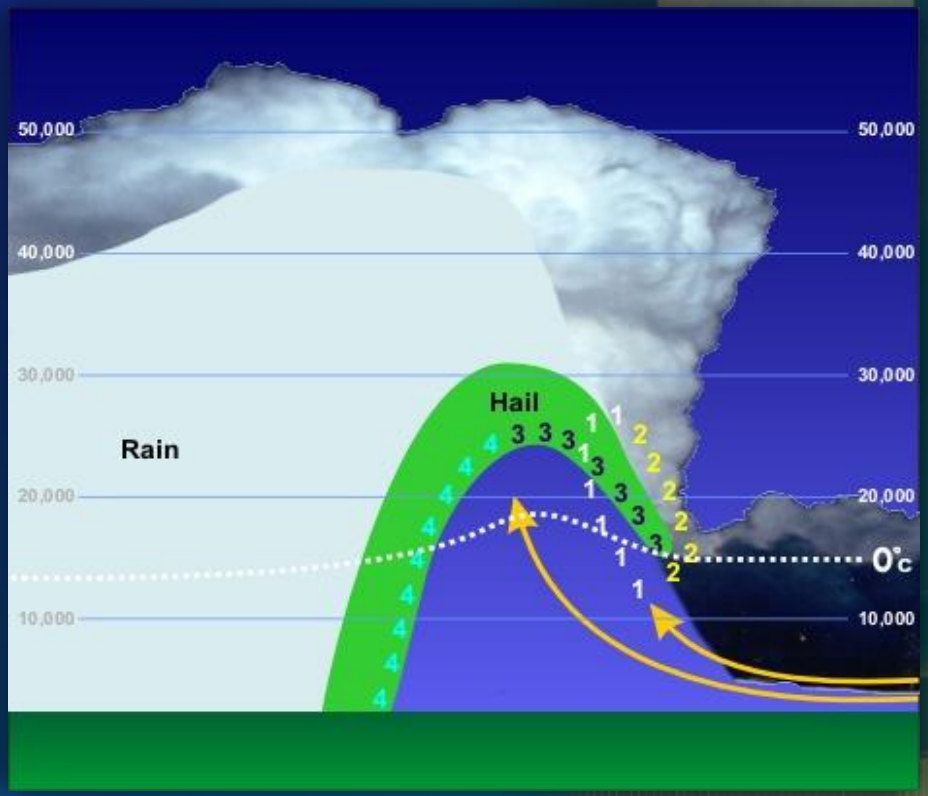
Severe Thunderstorm Definition

Severe Thunderstorm - A storm which produces:

- *≥ 1” hail - and / or -*
- *≥ 58 mph gusts*

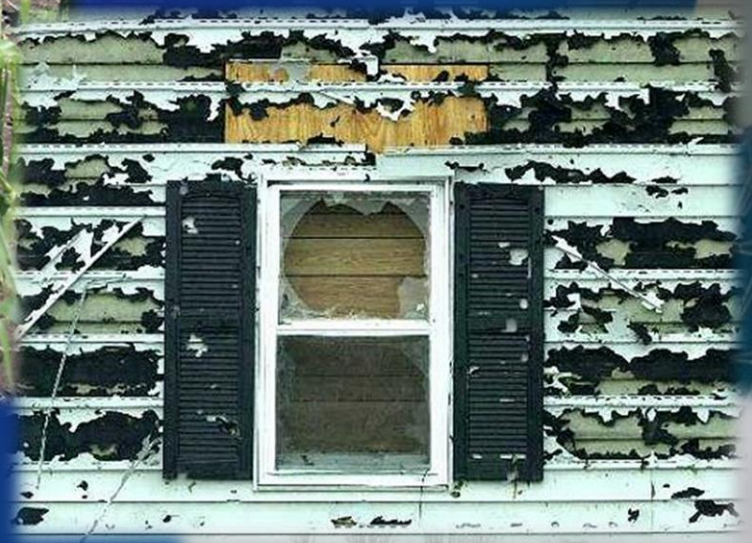
Hail





Stronger updraft → Bigger hail

Dangers of Hail

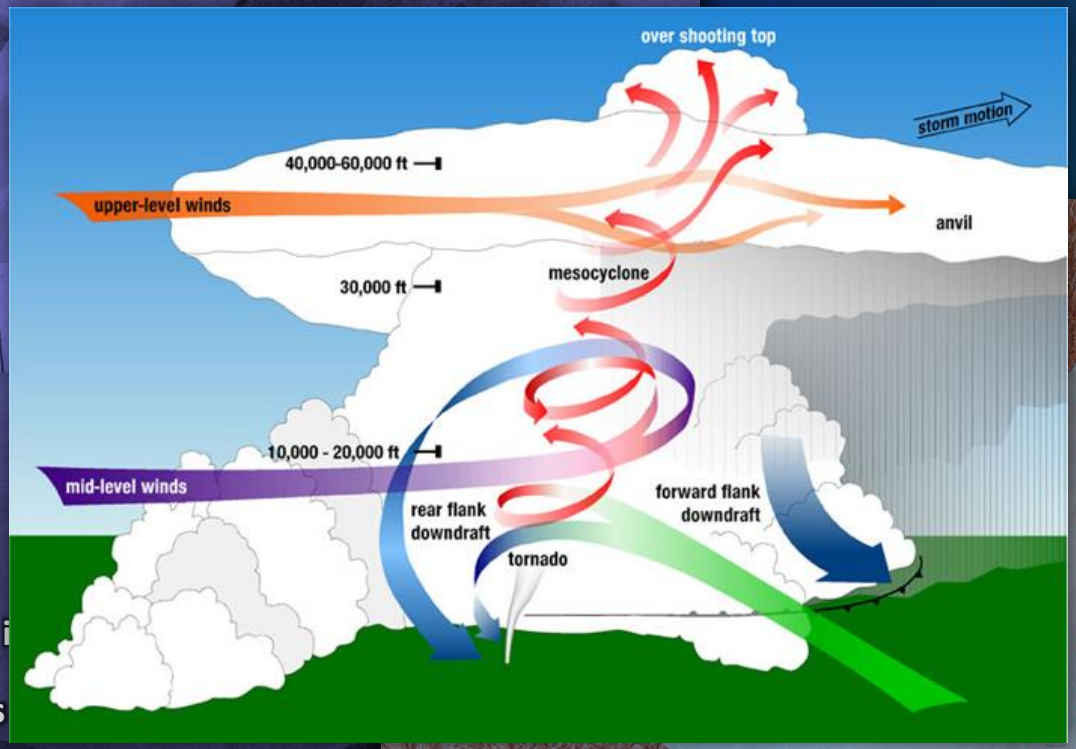


Hail can damage vehicles, crops, and structures and can also lead to hazardous driving conditions.

Dangers of Hail

Hail is also dangerous to humans!

Rotating Updrafts Can Produce Very Large Hail!



Diameter: 8.0 inches

Circumference: 18.625 i

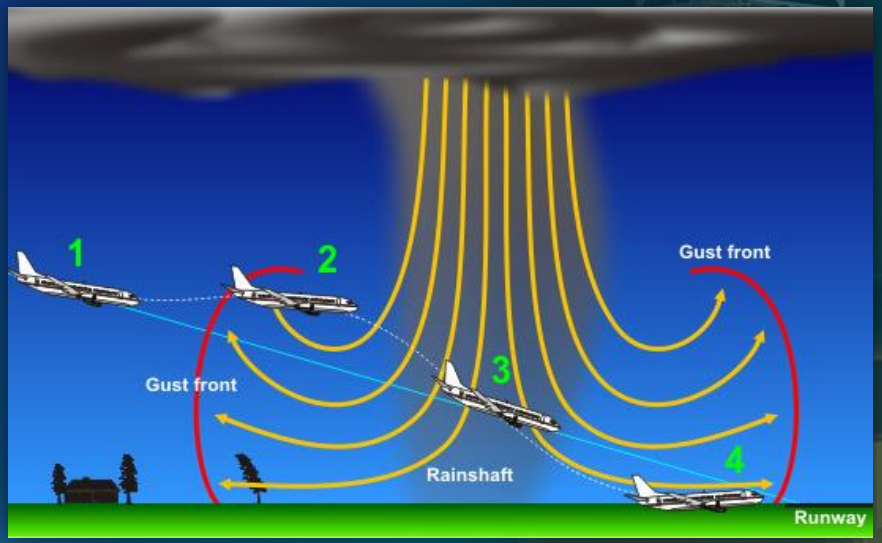
Weight: 1.9375 pounds

Vivian, SD
July 23, 2010

Damaging Wind

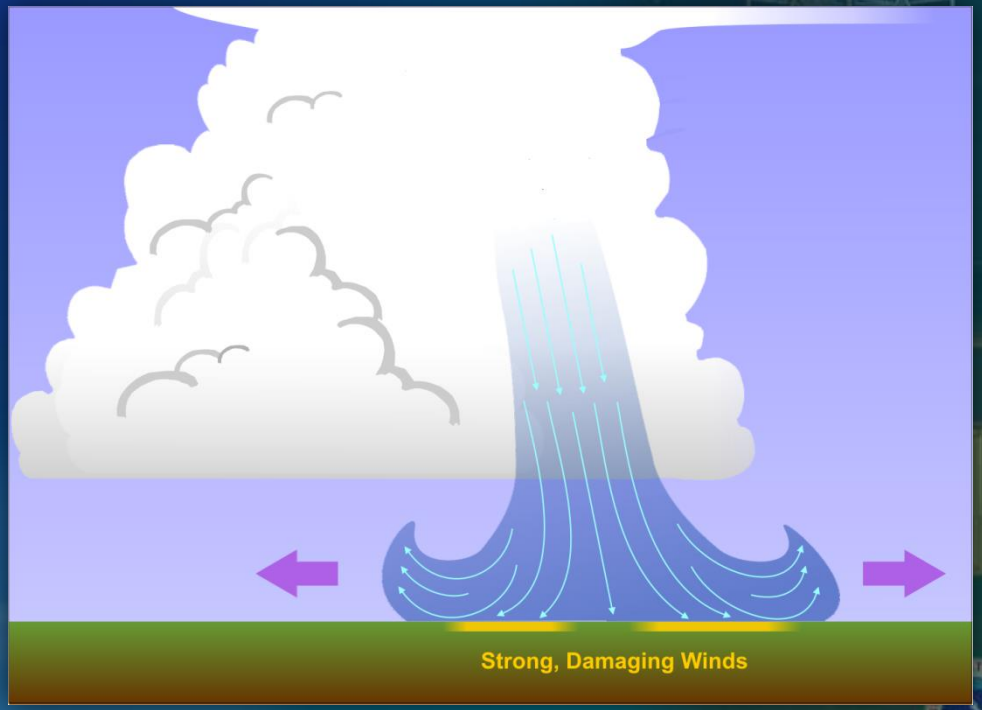
Straight Line Wind

- Refers to damaging wind not directly associated with tornadic circulation
- Result of the outflow from a thunderstorm, due to:
  - Downbursts
  - Squall Lines (gust fronts)



Downburst

- Area of strong winds produced within downdraft of a thunderstorm
- Typically affect small areas (usually < 5 miles in diameter)
- Can have wind speeds of 50 to 100 MPH



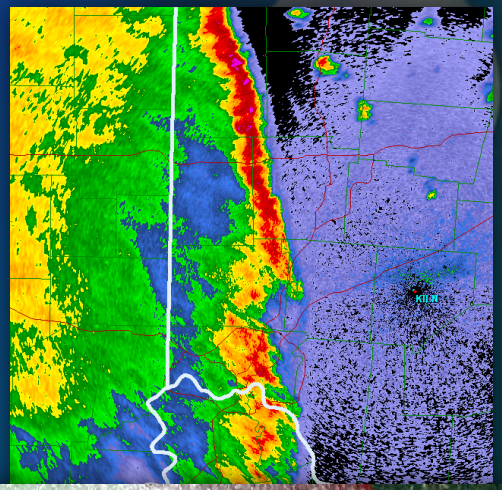
Downburst

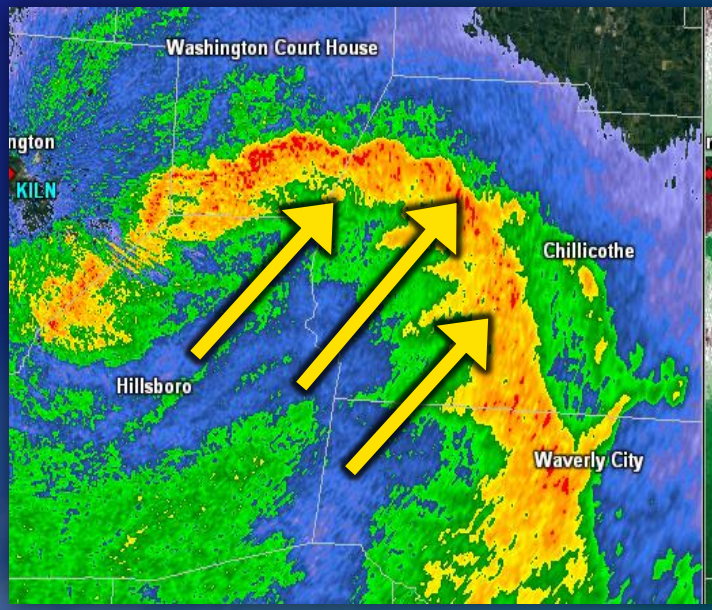
The precipitation core (rain and hail) is displaced from the updraft and crashes to the ground.

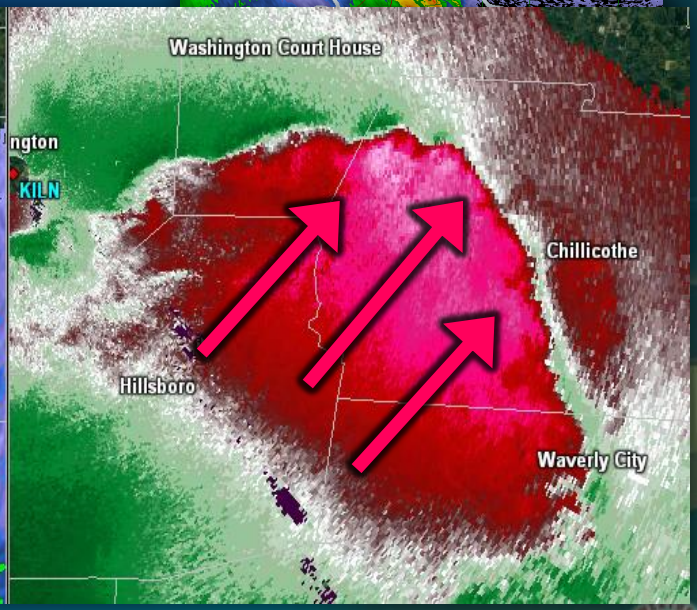
Downburst Damage

Squall Line Winds

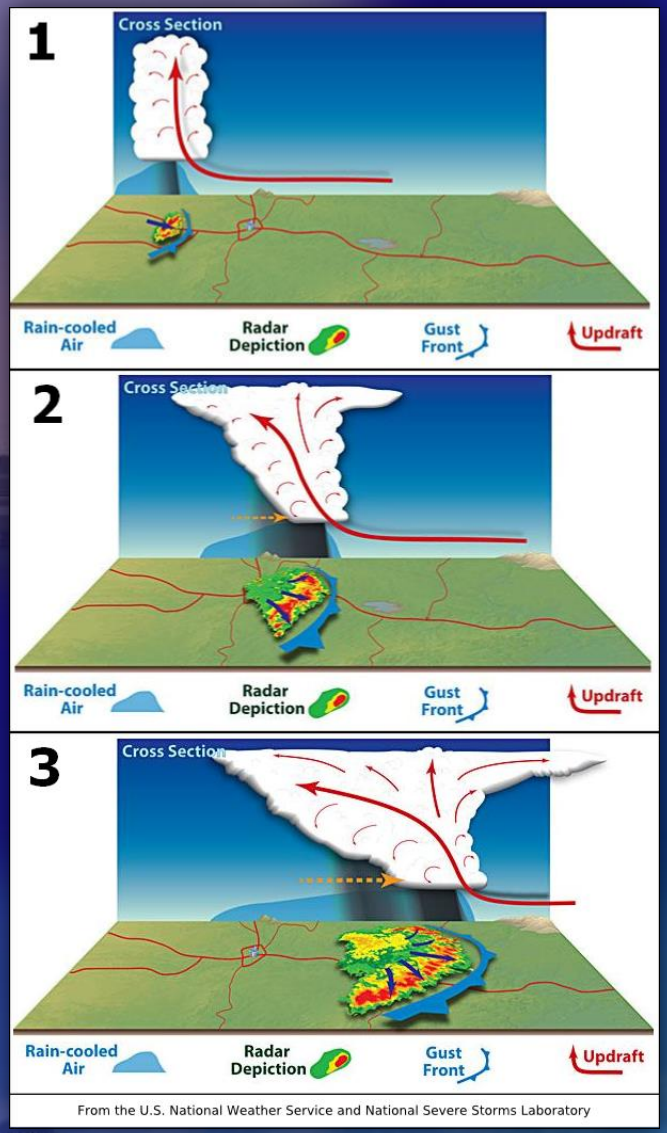
- Squall lines move quickly and can produce damaging winds over a very large area.
- If gust front advances too far ahead of storms, winds will gradually weaken.
- Bow echo: area of enhanced winds, more significant damage

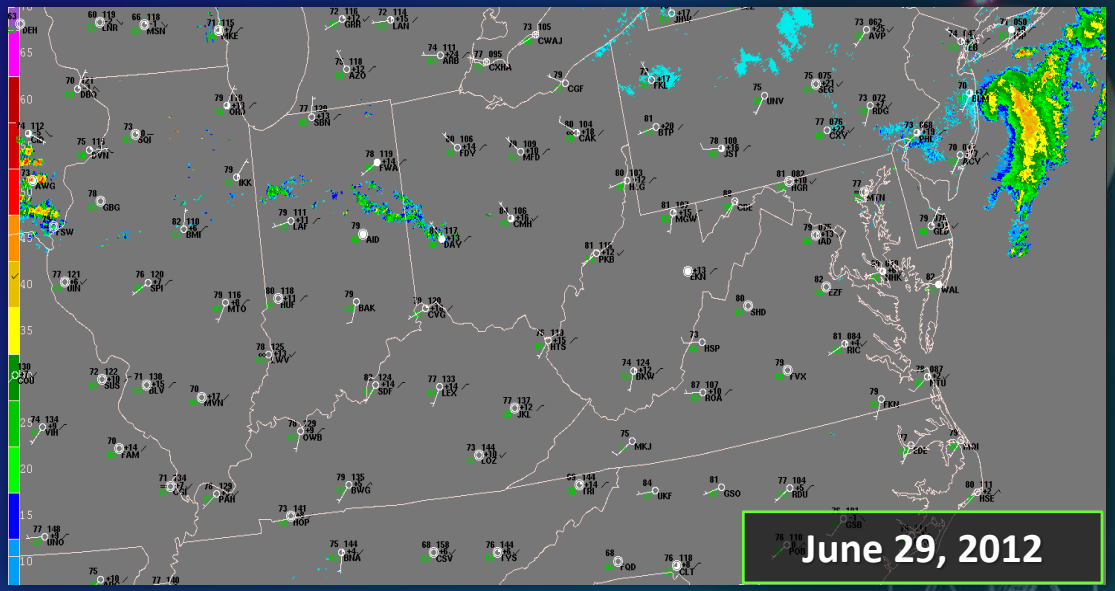






Derecho





- Long-lived, organized thunderstorm complex w/a damage swath ≥ 240 miles
- Forms in unusually warm, moist air mass
- Widespread wind damage

Brief Review…

Which of the following is ***not*** true of radar?

A. *Usually can't detect what's happening near the ground*

B. *Resolution decreases with distance*

C. *NWS relies solely on radar data when deciding to issue a warning*

D. *Doppler radar can provide estimate of wind speeds inside thunderstorms*

ANSWER: C

(That's why we're all here today!)

Flash Flooding

- The most severe and dangerous type of flooding!
  - Rapid rise of water onto dry areas
  - Rushing water over roads
  - Water entering main levels of homes and businesses
  - Dam breaks

The force of a flash flood can move cars or even houses!

Flash Flooding

- In very rare cases, the NWS can issue a Flash Flood Emergency
- This would only be used in situations with an extremely high risk to life and property.

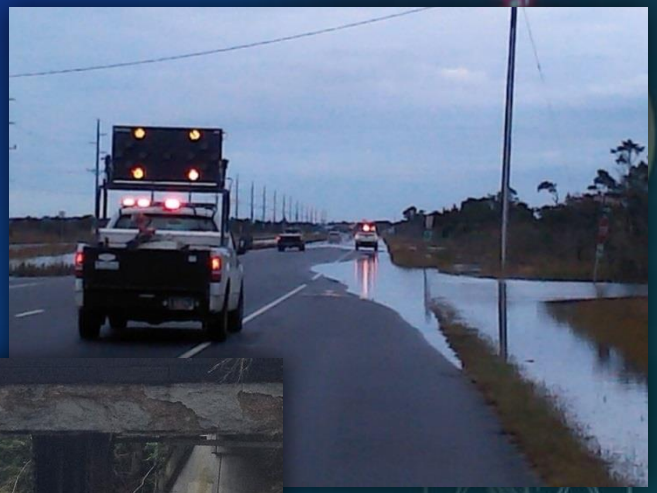
Lewis County, KY
July 2010

On July 20-21, 2010, Lewis and Mason Counties in Kentucky received about 9" of rain in 6 hours!

The Dangers of Driving Through a Flooded Roadway!

Urban/Small Stream Flooding

- May require **Flood Advisory**
  - ***Standing water*** *on road / streams out of banks*
  - *'Typical' flooding of* ***underpasses*** *or* ***flood-prone areas***
- Not usually life-threatening



Brief Review…

True or False?

When reporting flooding to the NWS, you should <u>always</u> specify whether the water is standing or rapidly moving.

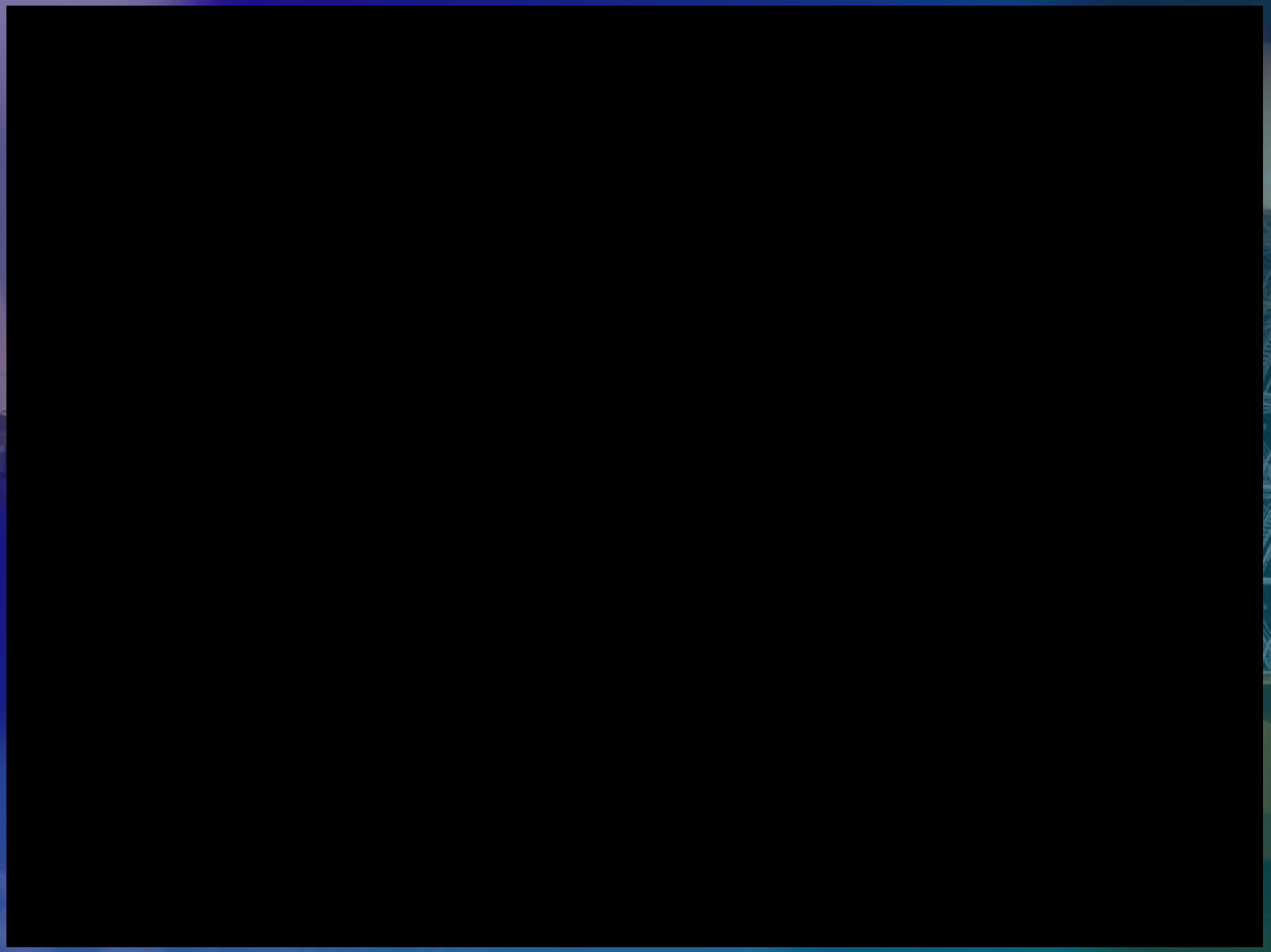
ANSWER: ***True!***

(also provide a depth estimate, if possible)

10 Minute Break

Up next … Tornadoes

Part 2 - Tornadoes



Video montage of tornadoes produced by Andy Latto. Audio produced by Andy Hatzos.

Enhanced Fujita Scale

Rating	Winds	Damage	Examples
EF0	Up to 85 mph	Minor	 
EF1	86-110 mph	Moderate	 
EF2	111-135 mph	Considerable	 

Enhanced Fujita Scale

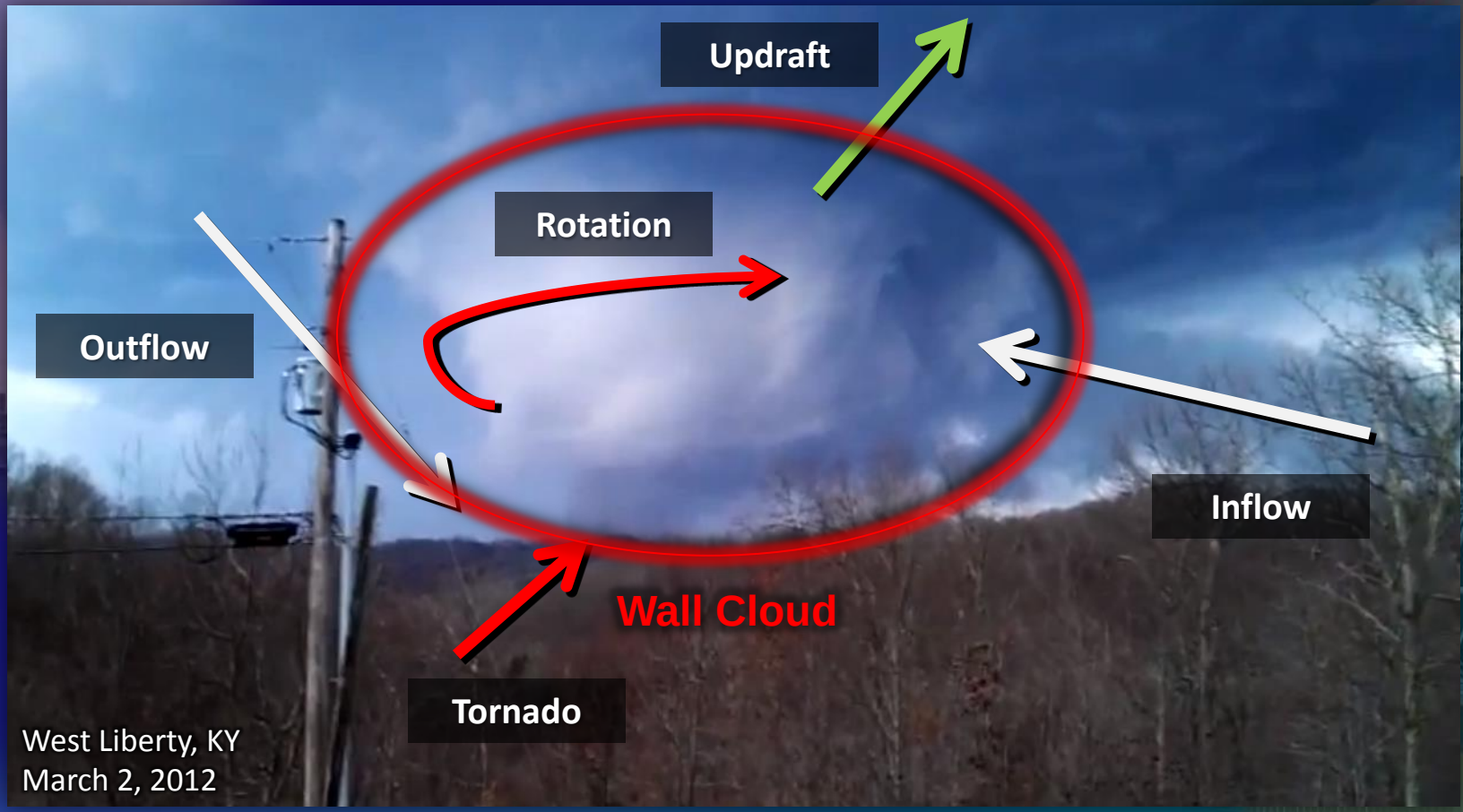
Rating	Winds	Damage	Examples
EF3	136-165 mph	Severe	 
EF4	166-200 mph	Extreme	 
EF5	> 200 mph	Incredible	 

What Is A Wall Cloud?

Josh Weitzel
Palestine, OH
August 2009

- Isolated lowering of cloud base, usually at base of updraft
- Updraft ingests rain-cooled air, which condenses into cloud ***pointing toward rain***
- ***Rotating*** wall cloud implies a rotating updraft
- Updraft + rotation = ***watch for tornado!***

Wall Cloud / Supercell Diagram



The wall cloud is the base of the updraft.
If the wall cloud is rotating, so is the updraft!

Wall Cloud / Supercell Diagram

The wall cloud is the base of the updraft.
If the wall cloud is rotating, so is the updraft!

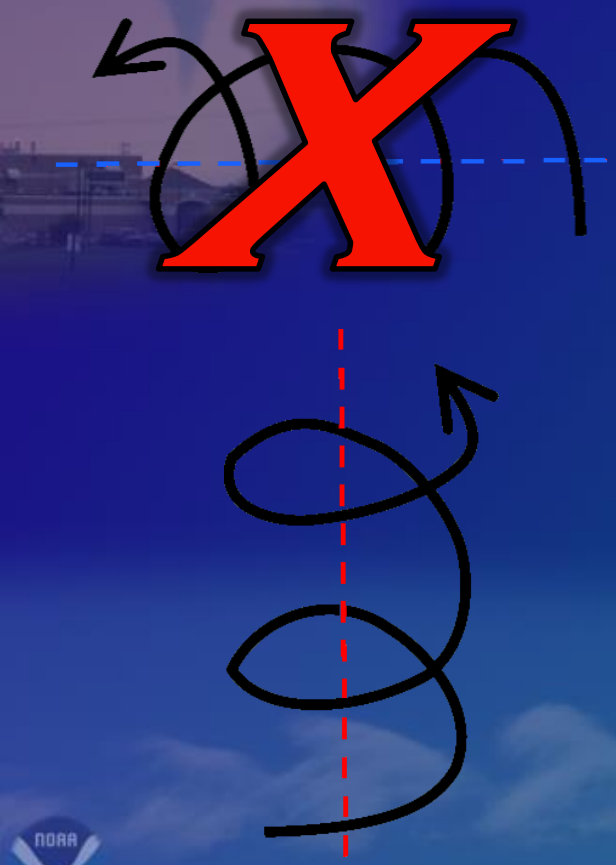
Keys to Spotting Wall Clouds

- #1) Sustained Upward Motion
- #2) ---------

- Is the feature persistent?
- Is it attached to the storm base?

Keys to Spotting Wall Clouds

- #1) Sustained Upward Motion
- #2) Vertical Axis of Rotation



Shelf Clouds vs. Wall Clouds

Shelf Clouds…

Slope away from precipitation

Indicate downdraft/outflow

Wall Clouds…

Slope toward precipitation

Indicate updraft/inflow

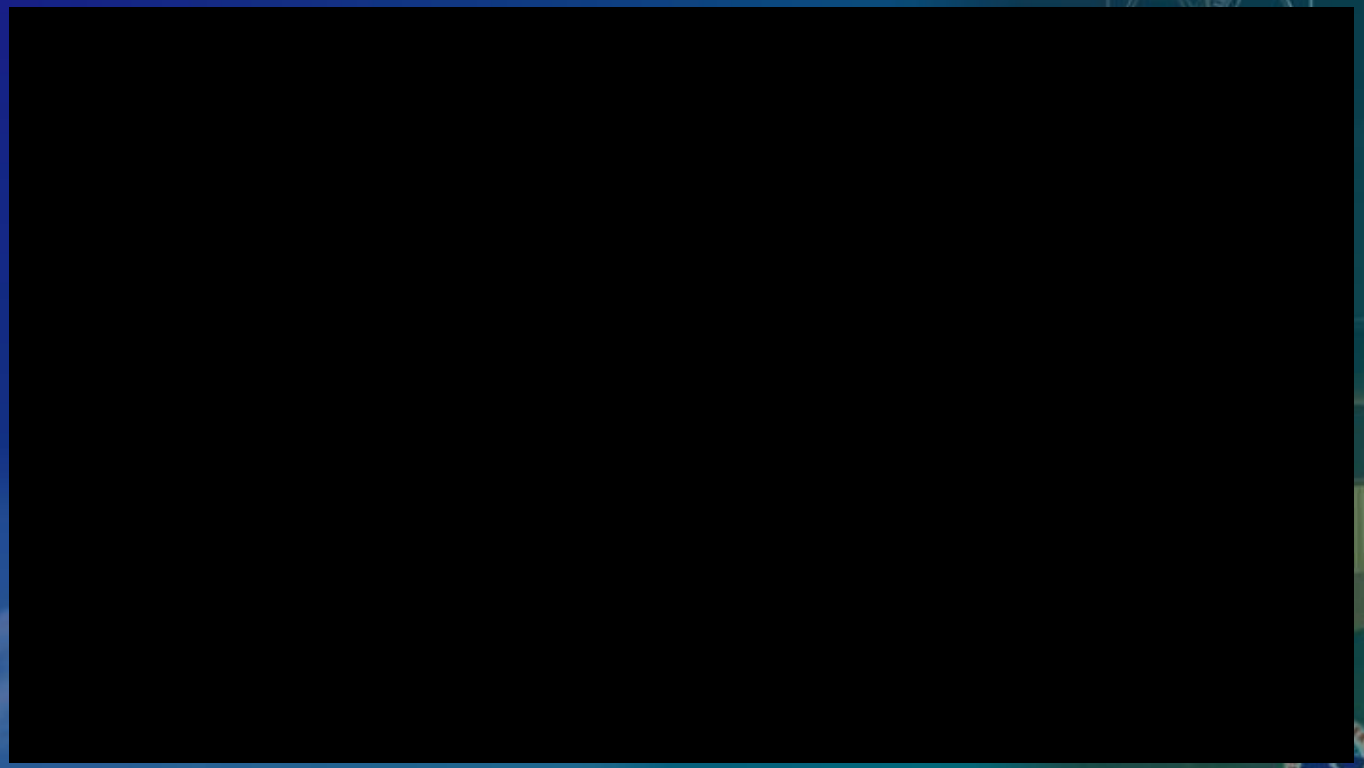
Funnel Cloud

- **Rotating** funnel-shaped cloud extending downward from thunderstorm base (often from wall cloud)
- *Always* attached to cloud base
- Does *not* reach the ground

- Exhibits rapid rotation and may be **laminar** or **smooth** in appearance (Striations)

Tornado

- **Rapidly rotating** column of air in contact with **cloud base** and **ground**
- Not all have visible funnel clouds; ***look for dirt/debris swirling near ground***
- Always exhibit rapid rotation if spotted from up close



Spotting Tornadoes

- Smoothed funnel appearance implies rotation
- Laminar feature is likely a funnel cloud or tornado
- Some tornadoes are extremely skinny or “rope” like

Spotting Tornadoes

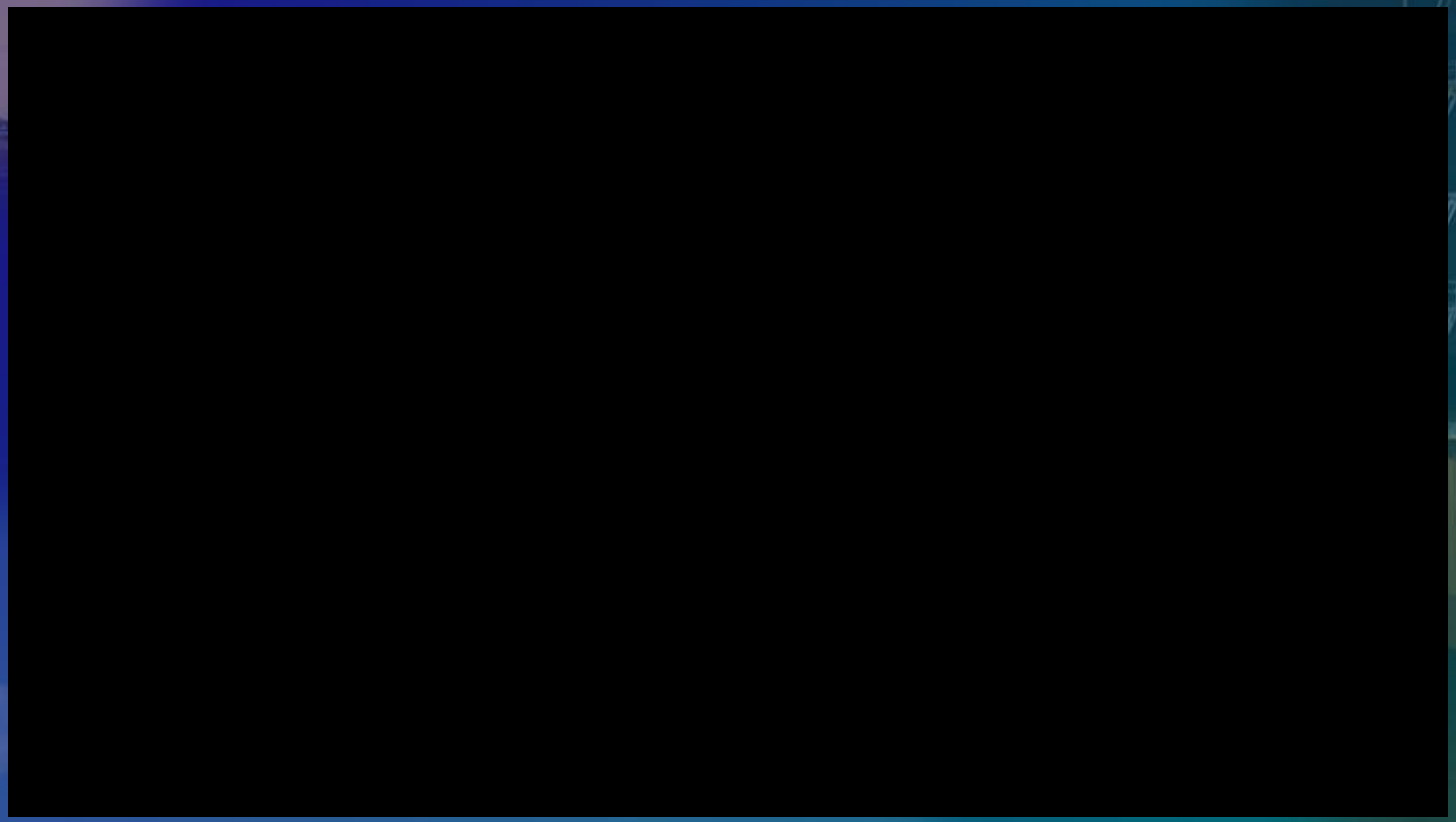
- Some funnel clouds and tornadoes are more ragged
- Always look for vertical motion and rotation!

Spotting Tornadoes

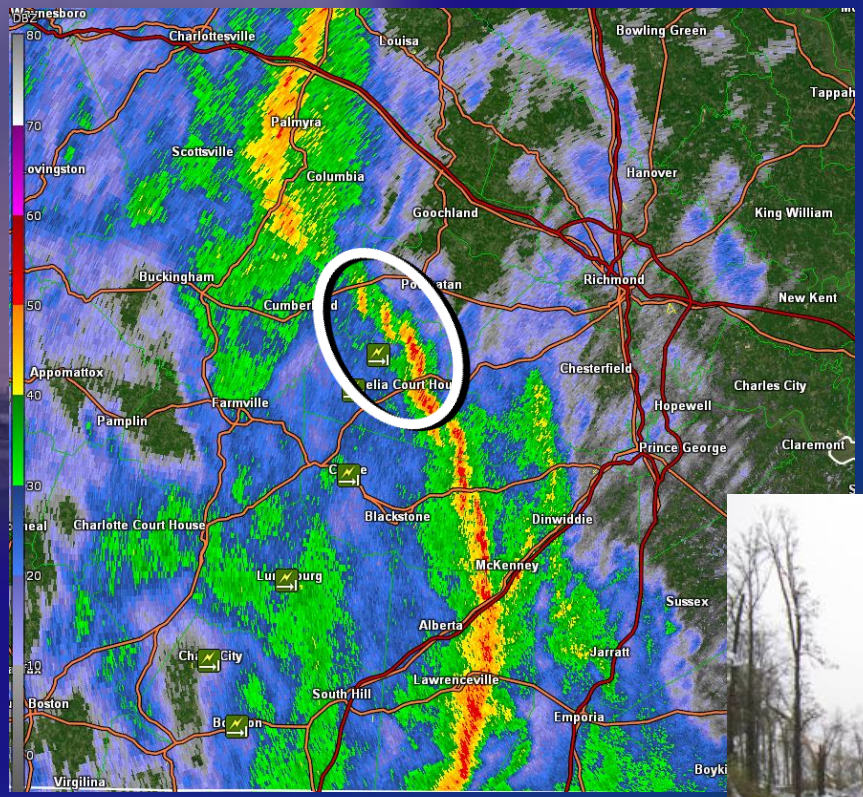
If a ragged cloud does not exhibit rotation and upward motion, it is not a funnel cloud or tornado!

Spotting Tornadoes

- **Rapid rotation** and **rapid upward motion** originating from the ground indicates a tornado!
- If rotation can't be detected, look for rapid changes in shape.



Squall Lines and Tornadoes

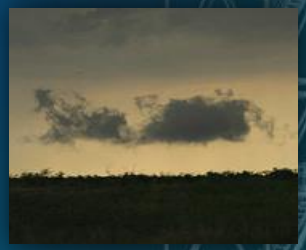


- Squall line tornadoes are usually weak and short-lived, but in rare cases can be EF2-EF3.
- These tornadoes move very quickly, and are frequently rain-wrapped. Because of this, they are virtually impossible to spot.

Rain-Wrapped Tornadoes

Uncertainties When Spotting

What do you do when it's not clear cut?



Report it!

??

Do not report it!

REPORT IT ANYWAY!

Better safe than sorry!

Reporting In Uncertain Situations

- Report what you see. Give specific details!
- Do not make assumptions!

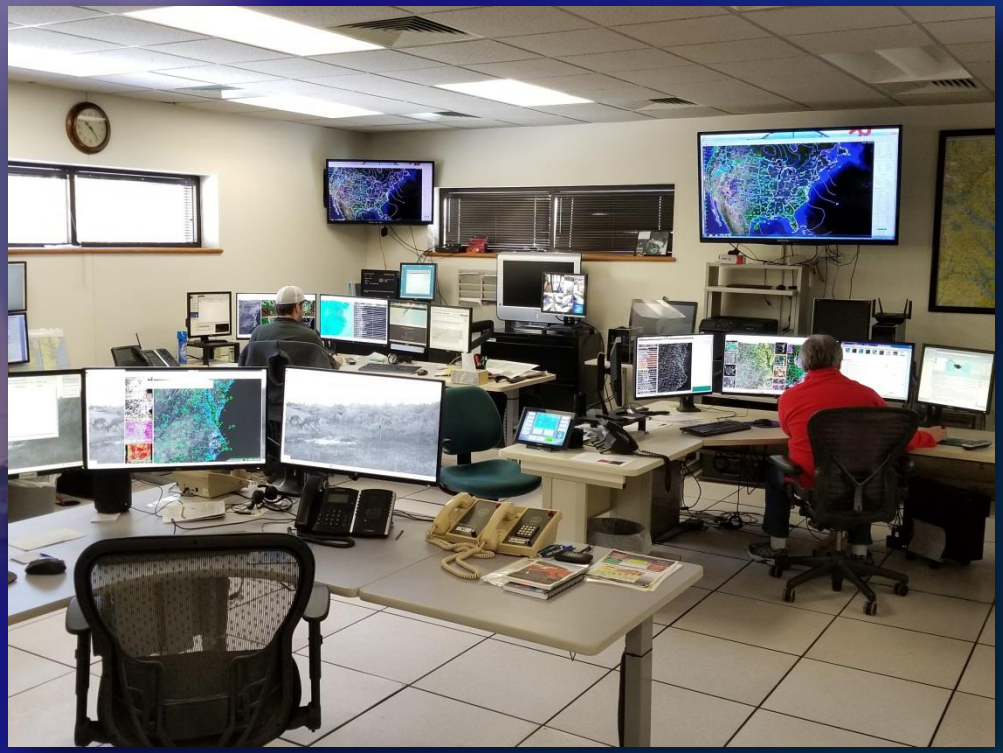
~~*"I see a funnel cloud."*~~

"I see a POSSIBLE funnel cloud because..."

- *Appendage attached to storm base*
- *Has lasted past 5 minutes*
- *Too far away to see movement or rotation*

NWS Wakefield Operations

NWS Wakefield Operations



Yes, we offer tours!

Check out the local programs tab at weather.gov/Wakefield for more information!

- *Normally staffed by 2 to 4 meteorologists*
- *Can increase to more than 10 during severe weather*
- *We may only have a few people answering phones, so time may be of the essence!*

How to Report – Logistics

- **Start with the basics…**
  - ***Identify yourself as a spotter (no need to memorize ID!)***
  - ***Your exact location***
    - ✓ 5 miles west of City A
    - ✓ Near intersection of Route X and Road Y
    - ✓ Latitude and longitude coordinates appreciated but not required
    - ✓ If observing a cloud feature, in what direction are you looking?
  - ***Exact time of event***
    - ✓ If ongoing or lengthy, provide start/end time
  - ***The weather event…***

What to Report

- Tornadoes, funnel clouds, wall clouds, or persistent rotation
- Hail ≥ ½ inch
- Tree(s) downed
- Large, healthy limb(s) downed (≥ 3” diameter)
- Any other thunderstorm or flood related damage
- ≥ 1” rain measured in an hour
- Water covering roads or other flooding
- **Do not report lightning!**

If you report something significant, we’ll want your contact info.

What to Report - Hail

- Pea – 0.25”
- Half inch (minimum to report)
- Penny – 0.75”
- Quarter – 1.00”
- Half Dollar – 1.25”
- Golf Ball – 1.75”
- Tennis Ball – 2.50”
- Baseball – 2.75”
- Grapefruit – 4.00”
- Hail covering ground (ANY SIZE)
- Report ***largest*** stone size

What to Report - Wind

- Wind speed estimates can be difficult and are prone to error.
- Severe wind = damage!
- **Measured** wind speeds provide the most accurate information.
- Determining what kind of winds caused the damage can be tough!
- **Just report the type(s) of wind damage that you observe.**

Methods for Reporting

- ★ Phone – 757-899-2415 Severe Weather Reports Only
- ★ Amateur Radio
- Social Media – 

- Email – akq-report@noaa.gov
  - Use social media/email for pictures of damage, cloud features

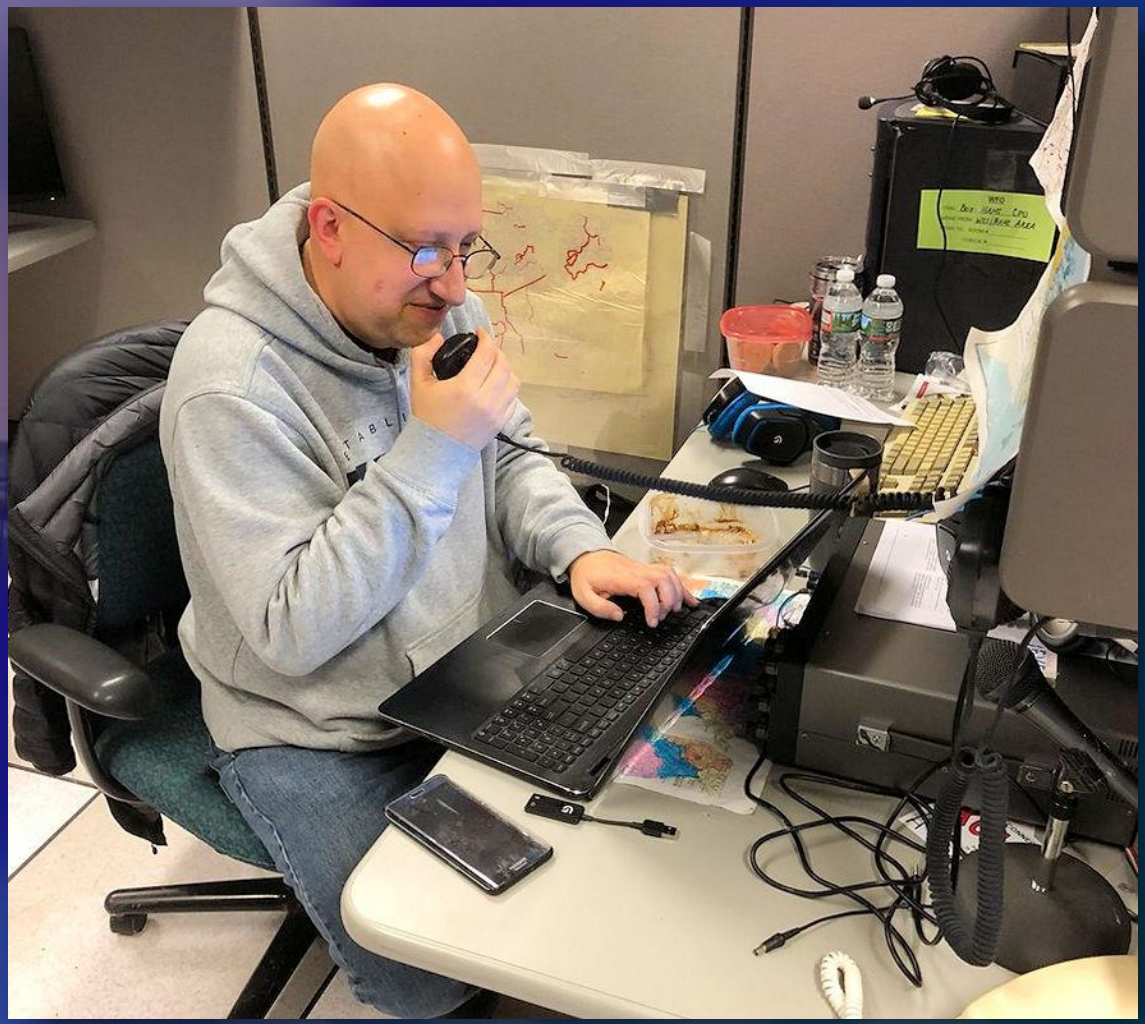
Urgent reports should always be communicated via first two methods!

We Need To Hear From You!

- Does lack of spotter reports mean conditions aren't that bad?
- We don't often call spotters for reports
  - *Issuing warnings takes precedence*
  - *Don't know your exact location at time of storm*

Spotters + NWS = saved lives!

Amateur Radio



http://www.wx4akq.org/

- One-stop shop for all things SKYWARN & Amateur Radio
- Net Control frequencies and contact points
- Details on local training and policy
- Training Resources

SKYWARN desk at NWS Wakefield, Virginia

A Picture's Worth a Thousand Words!

Maria Jaws
Virginia Beach, VA

Be sure to identify yourself as a trained spotter when posting on social media!

Photos and video can be sent to us via email: akq-report@noaa.gov

…or submitted to…

Kyle Greer
Hampton, VA

Jeff Burley
Chesterfield, VA

Brief Review…

How should this be reported?

A. *Tornado*
B. *Straight-line winds*
C. *Estimated 70 mph winds*
D. *A few trees snapped*
E. *Doesn't need to be reported*

ANSWER: D

(Just report what kind of damage you observe!)

Spotter Safety

- There is *no* magical bubble that protects your location.
- Never put yourself or anyone else in harm's way!
- Always know your position with regard to the storm.
- Do not try to spot at night.

Spotter Safety

- We do not recommend chasing.
- Seek shelter in a sturdy building away from windows.
- A basement provides the best protection.
- If a basement is not available, go to a small interior room on a building's lowest level.

Spotter Safety

- We do not recommend chasing.

Father and young son ride out Washington tornado in car

WASHINGTON — A self-described "storm-chaser," Todd Cannon found his role reversed Sunday.

The Washington tornado chased Cannon, along with his 6-year-old son. They were forced to hunker down and hold onto one another as Cannon's Nissan Xterra was rocked by the tornado and pounded by debris.

Wind-strewn objects pummeled the vehicle and smashed out rear windows.

"It was shaking," Cannon said. "I didn't think we were going to make it."

--PEKIN TIMES, Pekin, IL

Images courtesy NWS Lincoln, IL

Why a *Small Interior Room?*

EF4 – Millbury, OH

June 2010

EF2 – Adams County, OH

March 2012

Lightning Safety

- One of the leading causes of hazardous weather related deaths in the U.S.
- Safest place is home/business (due to plumbing and electrical structure)
- Automobile is next safest place
- *You have little to no protection if outdoors!*

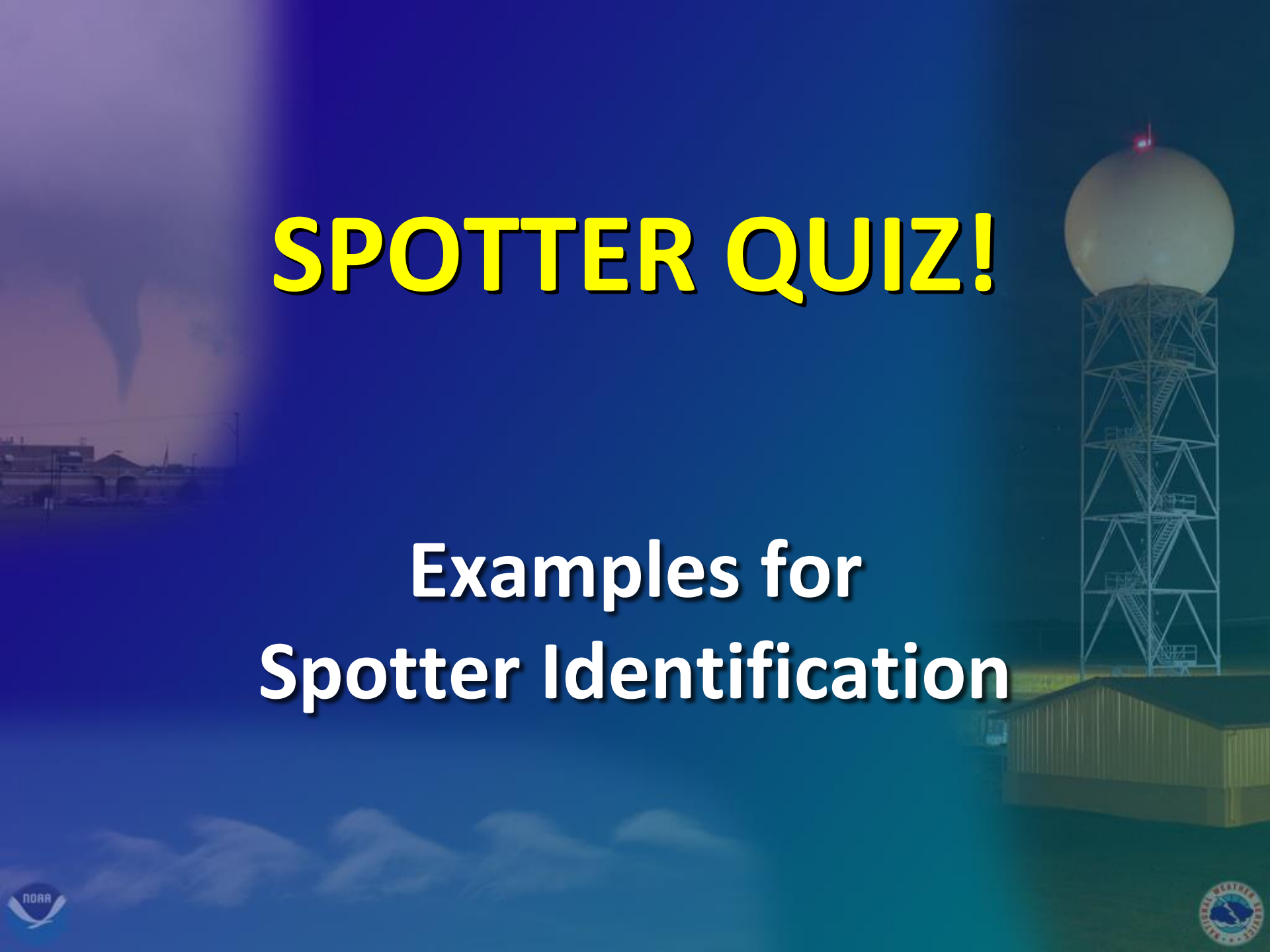

PLATAFORMA P8
12.May 2011 12:36:56

Lightning Safety

Turn Around Don't Drown!

Don't Drive Through Flooded Areas!

Be Especially Cautious at Night!


SPOTTER QUIZ!
Examples for
Spotter Identification

Should This Be Reported?

If so…as what?

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If so…as what?

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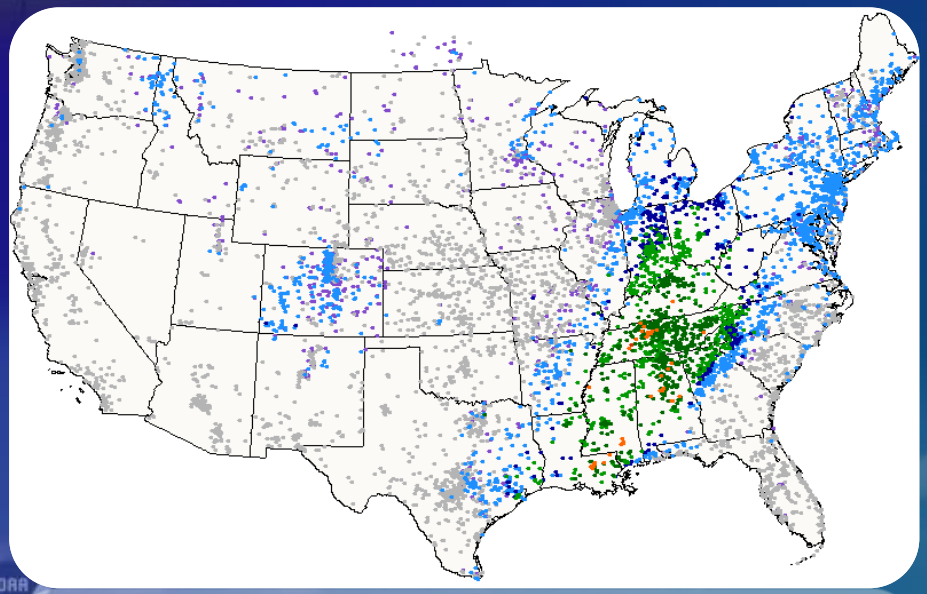
Should This Be Reported?

If so…as what?

CoCoRaHS

(Community Collaborative Rain, Hail, and Snow Network)

- Rain, snow, and hail reports easily entered on the internet
- Data used both real time in warning events and afterwards to help improve forecasts and verification, and for research purposes



www.CoCoRaHS.org

CWOP

(Citizen Weather Observer Program)

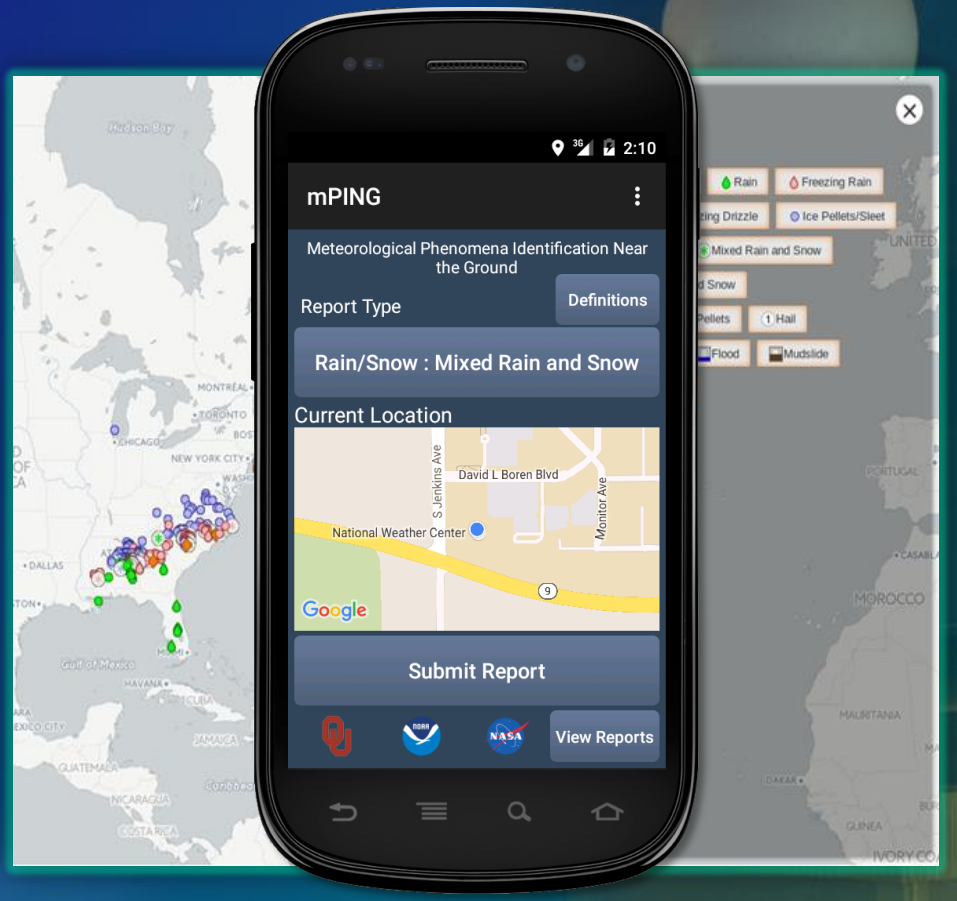
- Make your personal weather station data available to the NWS and rest of the world!
- Add your observations to the NWS data stream via the internet.
- Your data becomes available to NWS, local media, and everyone else!

wxqa.com

Download the mPING App!

(Meteorological Phenomena Identification Near the Ground)

- Easily submit anonymous, real-time weather reports to NWS from any location with your mobile device!
- Precip type, flooding, hail, wind damage, etc.
- Reports plotted on interactive map available for anyone to view



mping.nssl.noaa.gov

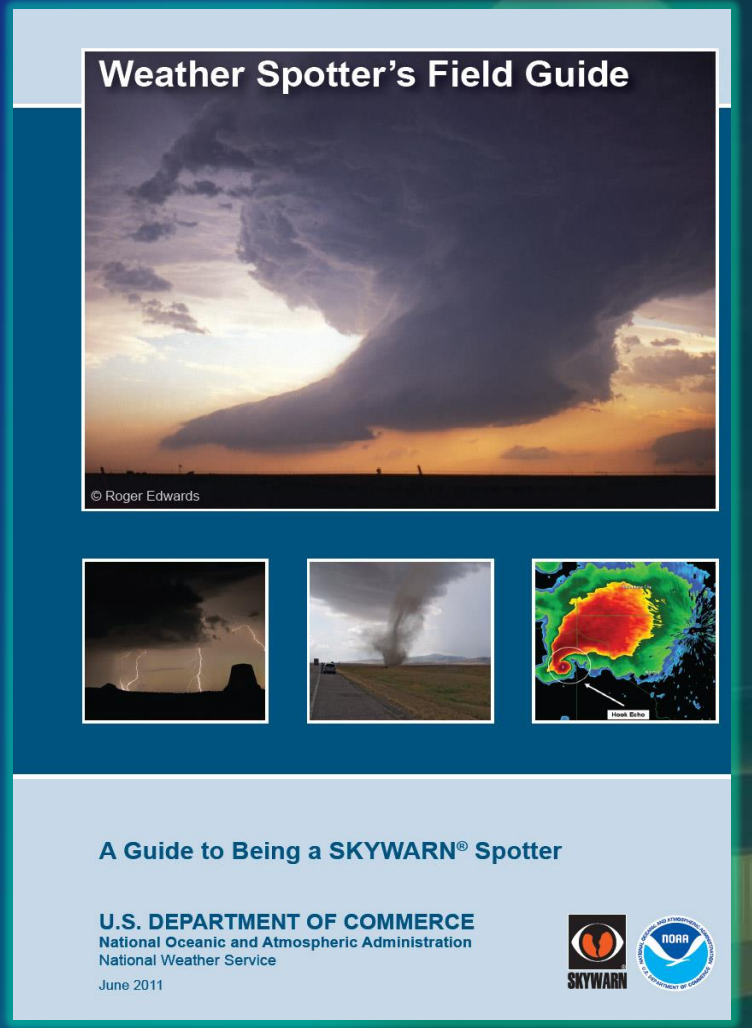
Download on the App Store

GET IT ON Google play

Publications

- Full-page Wakefield Spotter Guide contains summary of all the important topics covered in tonight's presentation
- Full-color Weather Spotter's Field Guide available via our spotter web page:

weather.gov/akq/skywarn



Easy to download onto your smart phone!

Spotter Card

- Spotter cards are available online, if you so desire
- To create a card, click the link on our spotter webpage
- Remember the code and enter exactly the same:

2018Skywarn

weather.gov/akq/skywarn

Spotter *Do's* and *Don'ts*

DO

- ✓ Understand the importance of your report
- ✓ Keep safety your #1 priority
- ✓ Express uncertainties and detail in your report

DON'T

- ▪ Assume the NWS already knows what a storm is doing
- ▪ Put yourself in harm's way
- ▪ Withhold a storm report because of uncertainty

Advanced Spotter Training

- Tuesday, April 24, 2018
- 6:00 PM
- Webb Center at Old Dominion University
  "Virginia Beach" and "Portsmouth" Rooms
  1526 W. 49th Street, Norfolk, VA
- Website info:
  weather.gov/akq/SKYWARN

Advanced Spotter Training Online

- Tuesday, April 24, 2018
- 6:00 PM
- Webb Center at Old Dominion University
  "Virginia Beach" and "Portsmouth" Rooms
  1526 W. 49th Street, Norfolk, VA
- Website info:
  weather.gov/akq/SKYWARN

Thank You For Attending

Remember…*we need to hear from you!*

Your service helps us save lives.

weather.gov/akq

mobile.weather.gov

Follow Us On Social Media:

NWSWakefieldVA

@NWSWakefieldVA