Spotter Concepts

John De Block

Warning Coordination Meteorologist

SKYWARN

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service – Birmingham, AL

Presentation Topics

- National Weather Service overview, mission, and products
- Severe weather climatology
- Why we need spotters
- What to report
- Thunderstorm types – Single, multicell, supercell
- Thunderstorm components – wall clouds, funnel clouds, land spouts, shelf clouds,
- Thunderstorm phenomena look alike

Who is the National Weather Service?

- A Federal Agency under the Department of Commerce
- A branch of the National Oceanic and Atmospheric Administration (NOAA)
- 122 *LOCAL* forecast offices
- Annual budget of approximately $900 Million, or less than $3.00 per U.S. Citizen
- About 5,000 employees nationwide
- The only entity to issue *OFFICIAL* severe weather watches and warnings

Why are we here?

PROTECT LIFE AND PROPERTY

helping *you* make informed decisions

Surviving Severe Weather

What are the two most important factors in preventing loss of life and property from the effects of severe weather???

- Awareness
- Preparation

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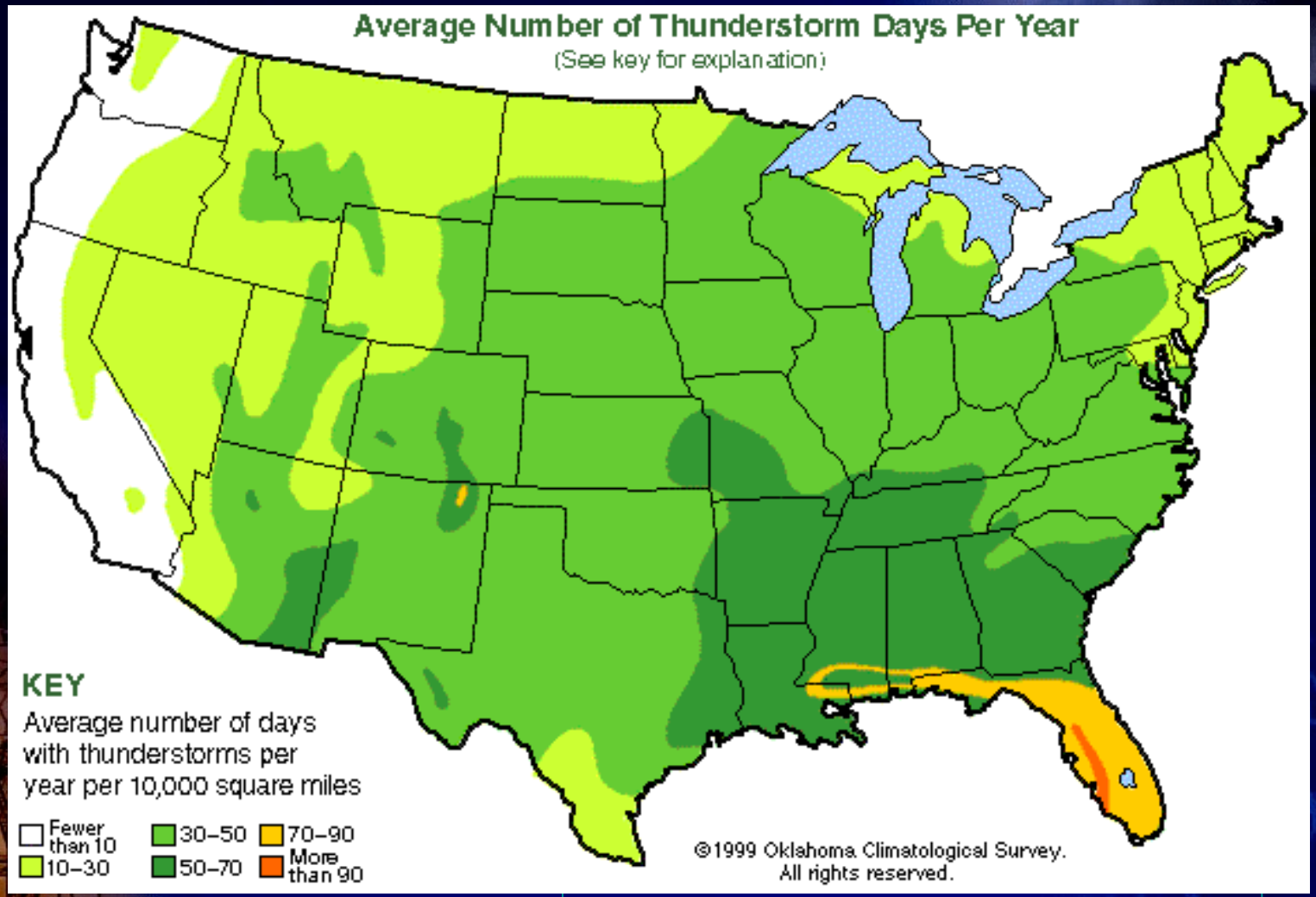
Alabama's Climatology

- We live in one of the most active weather areas in the world!
  - tornadoes, hurricanes, floods, droughts, and even snow/ice on rare occasions
- One of the wettest places in U.S.
  - 50 to 60 inches of rainfall on average each year
- Hot humid summers and mild wet winters

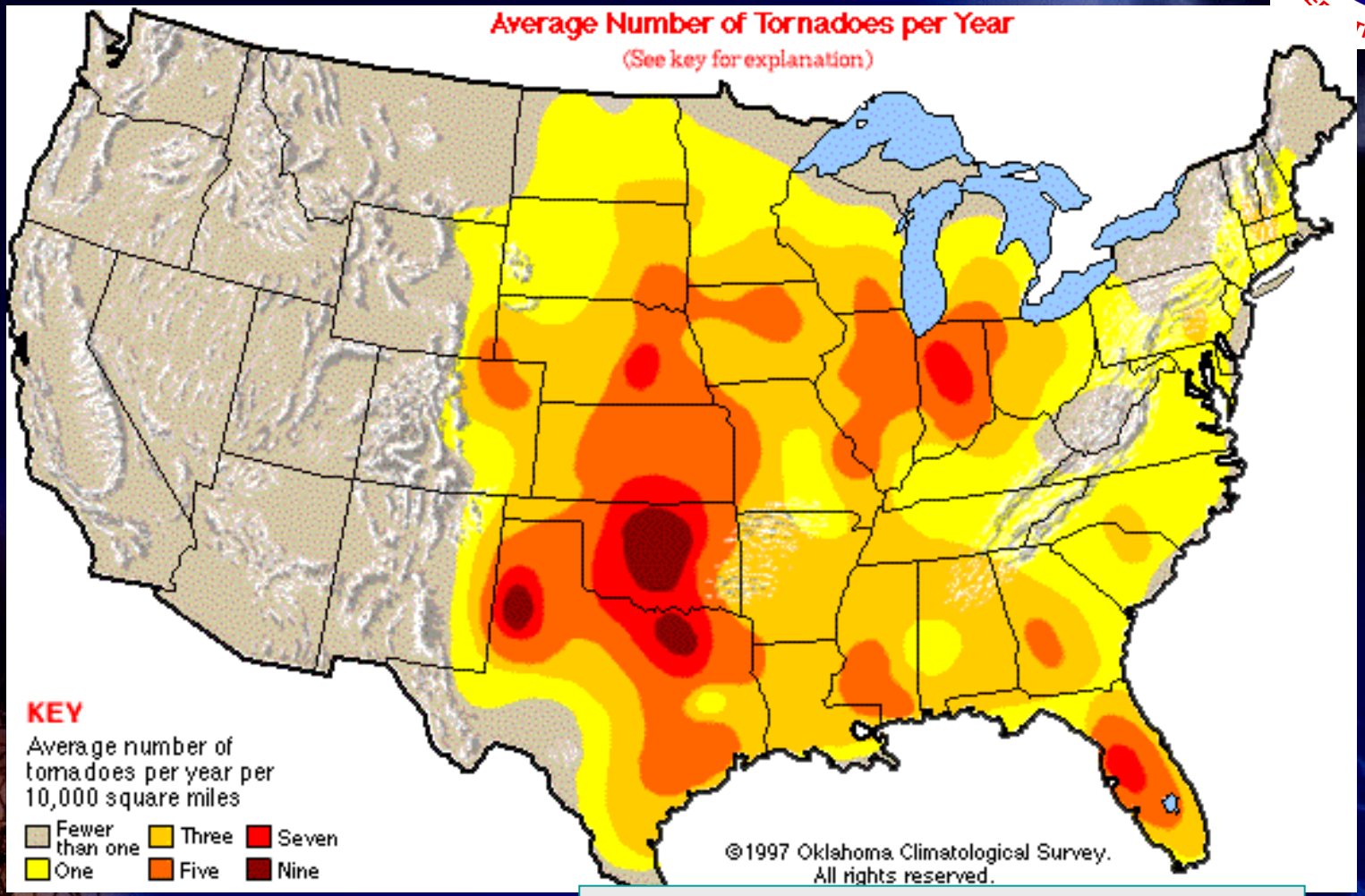
Just how much severe weather do we receive?

Thunderstorm Climatology



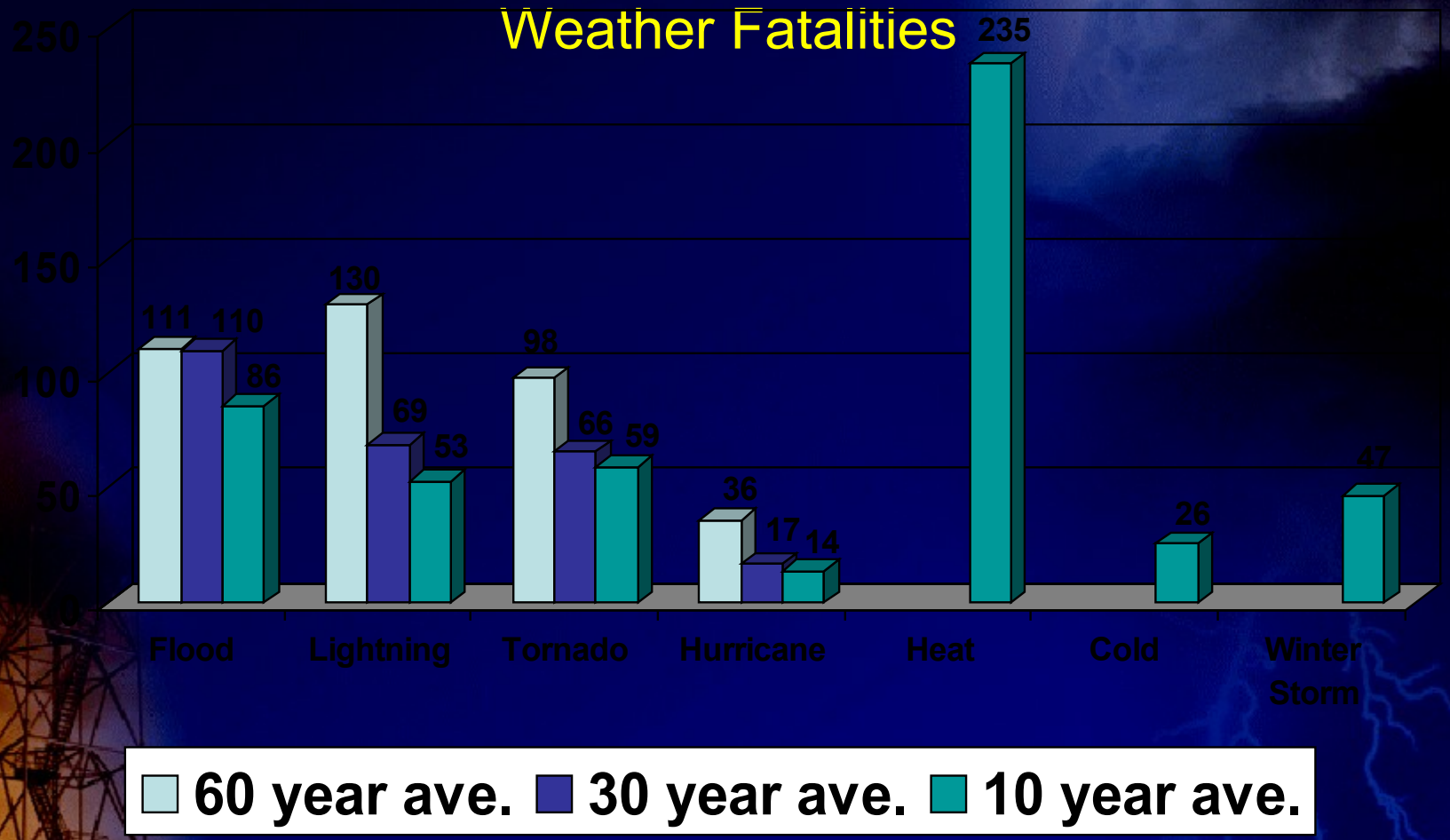
Oklahoma Climatological Survey http

Tornado Alley

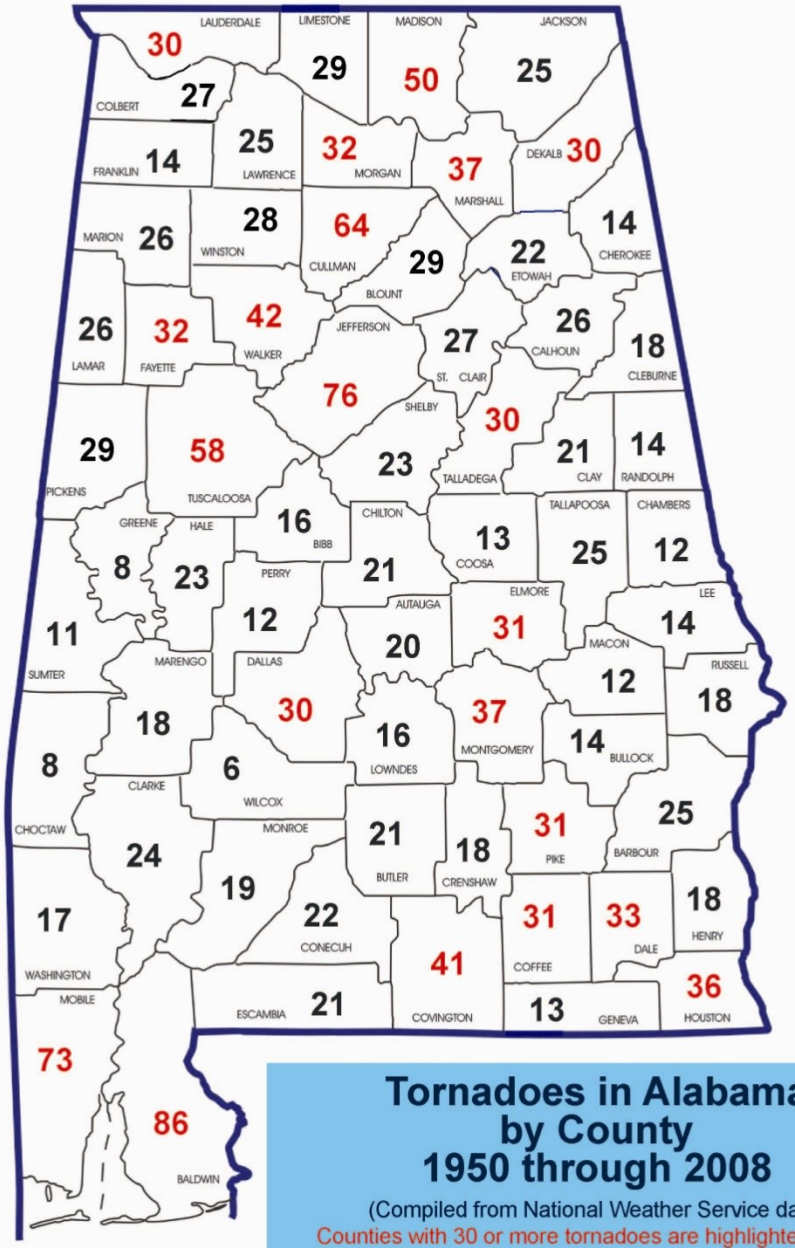


Oklahoma Climatological Survey http

U.S. Weather Fatalities Per Year



Tornadoes by County in Alabama

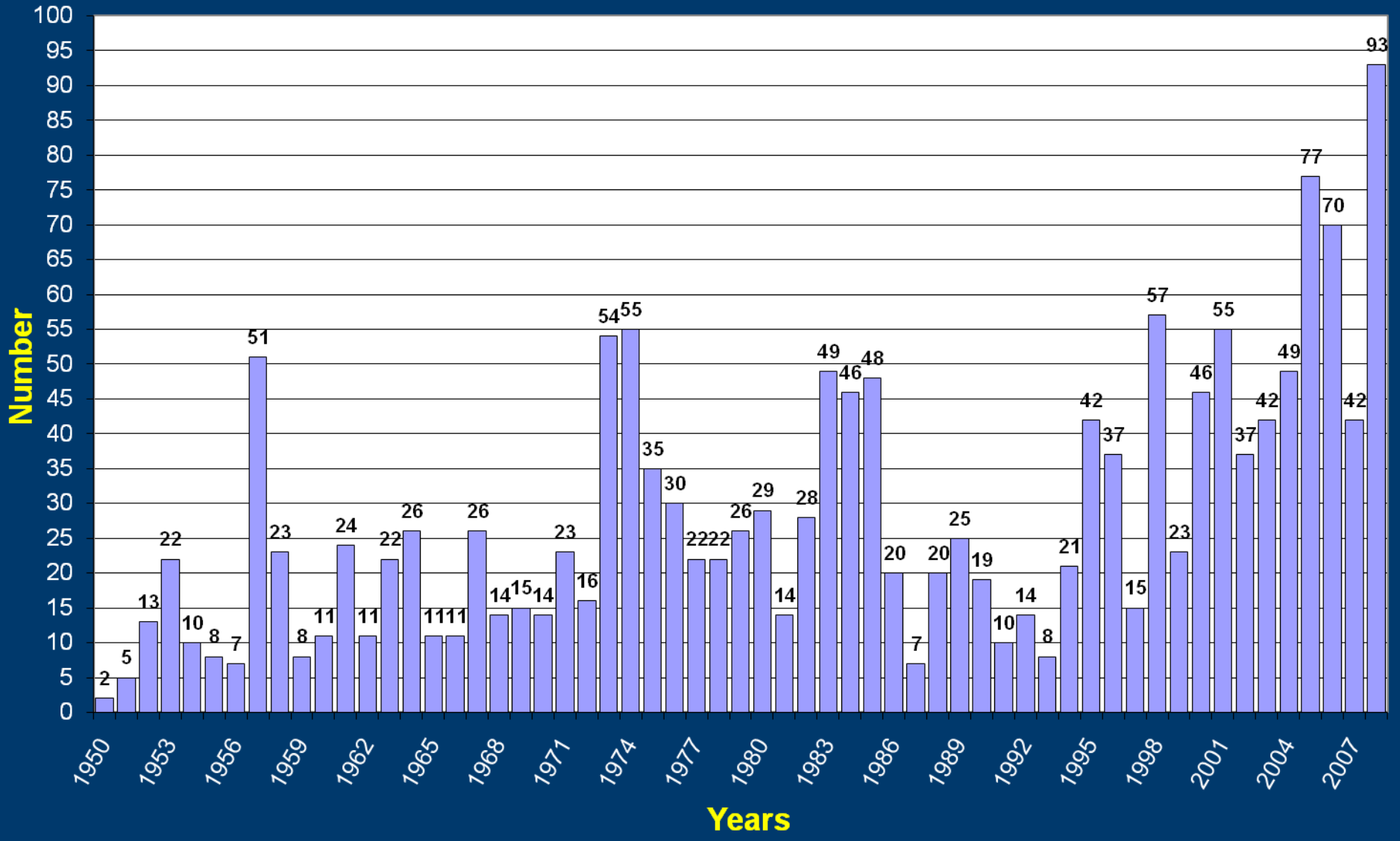


Tornadoes in Alabama by County 1950 through 2008

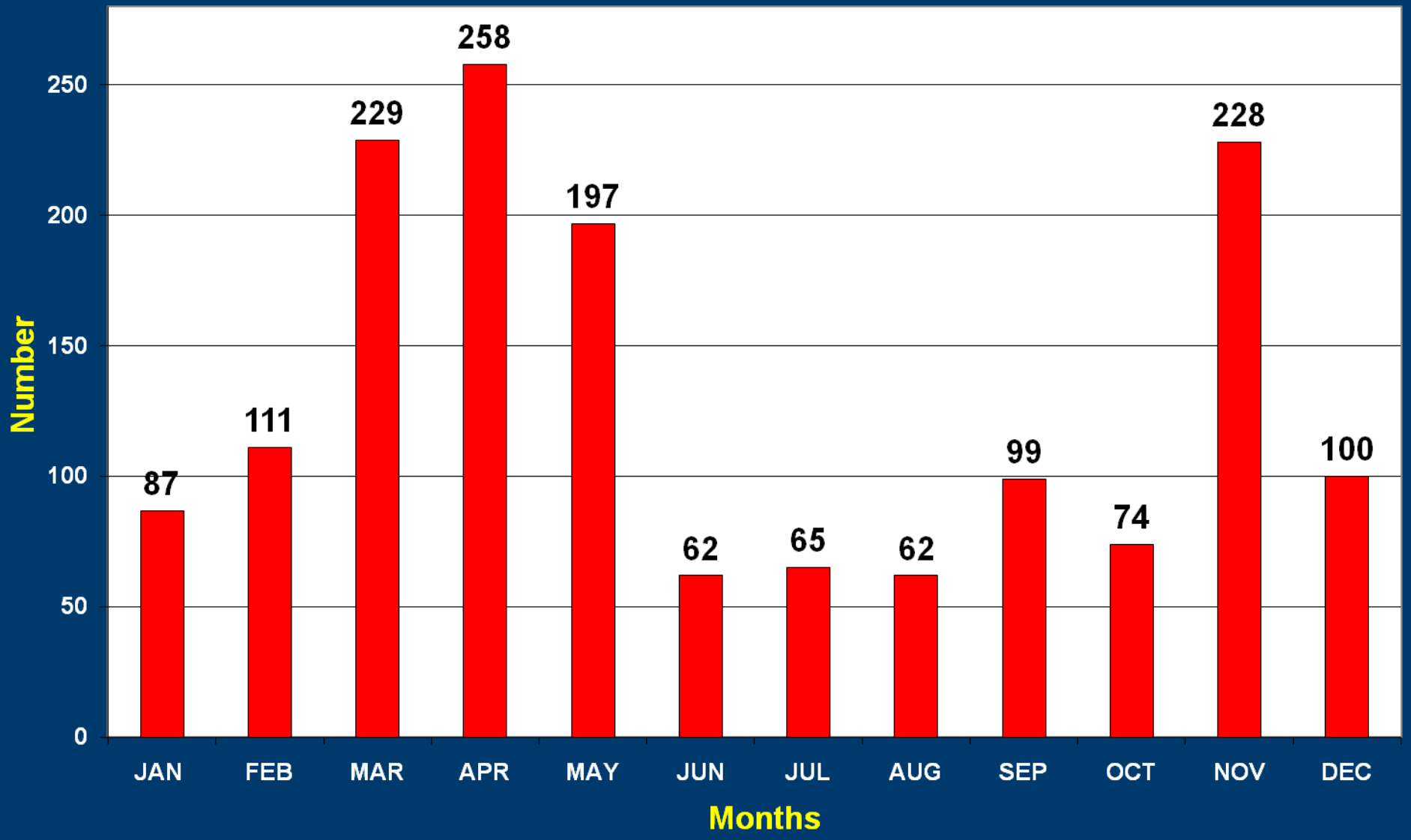
(Compiled from National Weather Service data)

Counties with 30 or more tornadoes are highlighted in red.

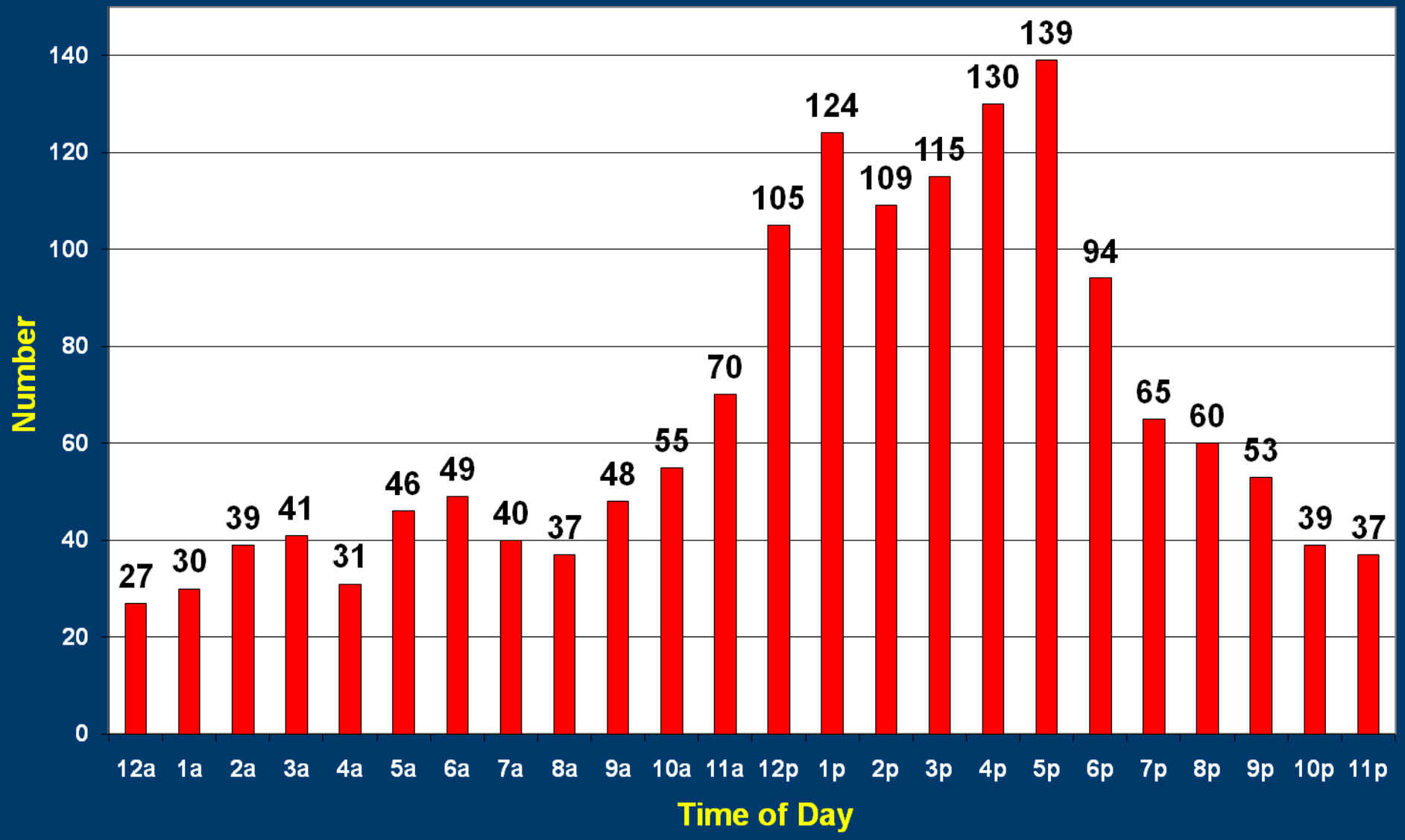
Alabama Tornado Count By Year
1950-2008



Tornadoes By Month
1950-2008



Tornadoes By Hour
1950-2008



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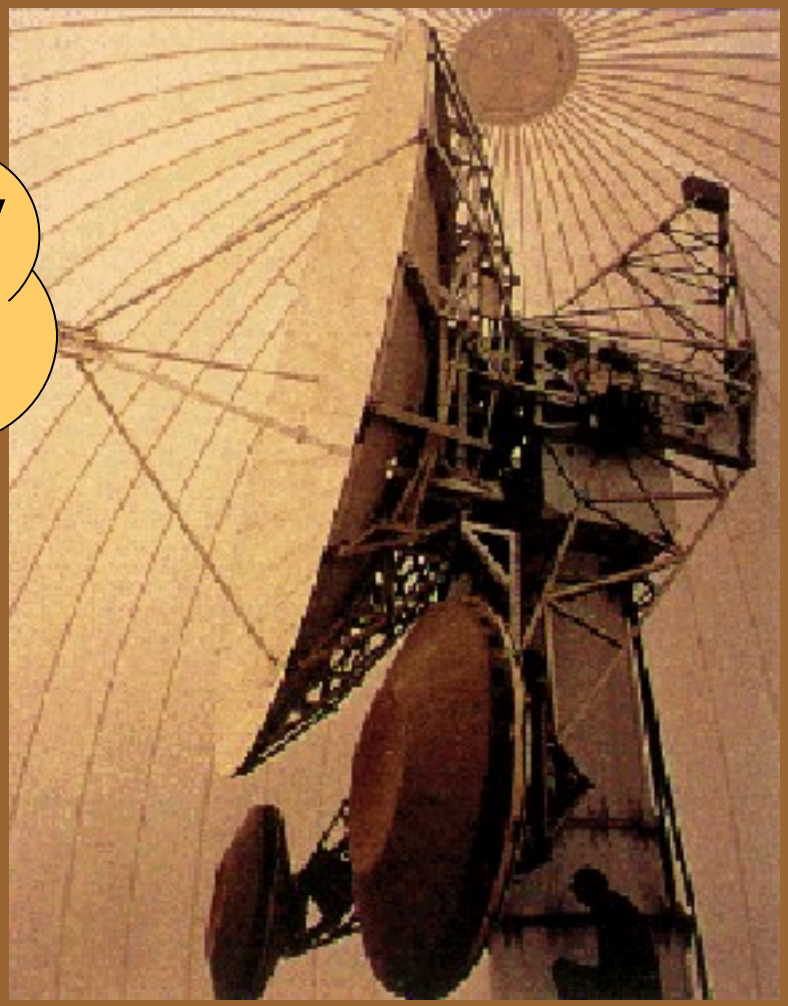
- Thunderstorm phenomena look alike
- Radar Perspective

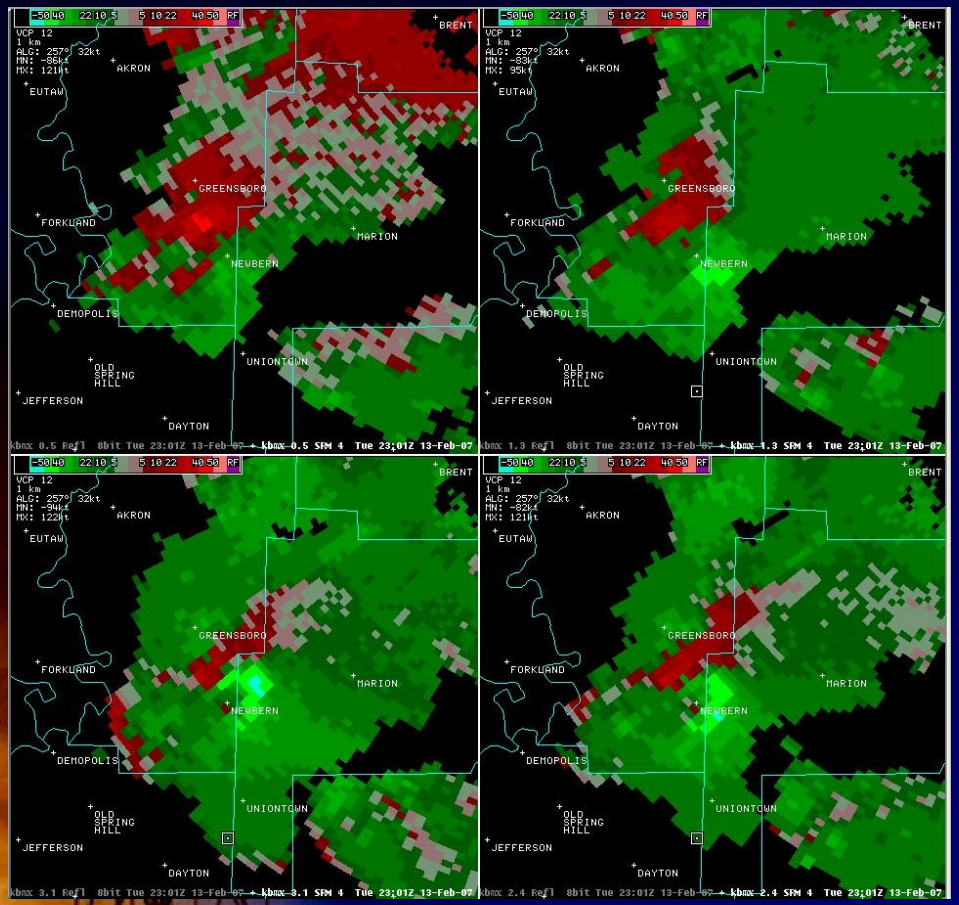
With all those fancy gadgets, why does the NWS need weather spotters?

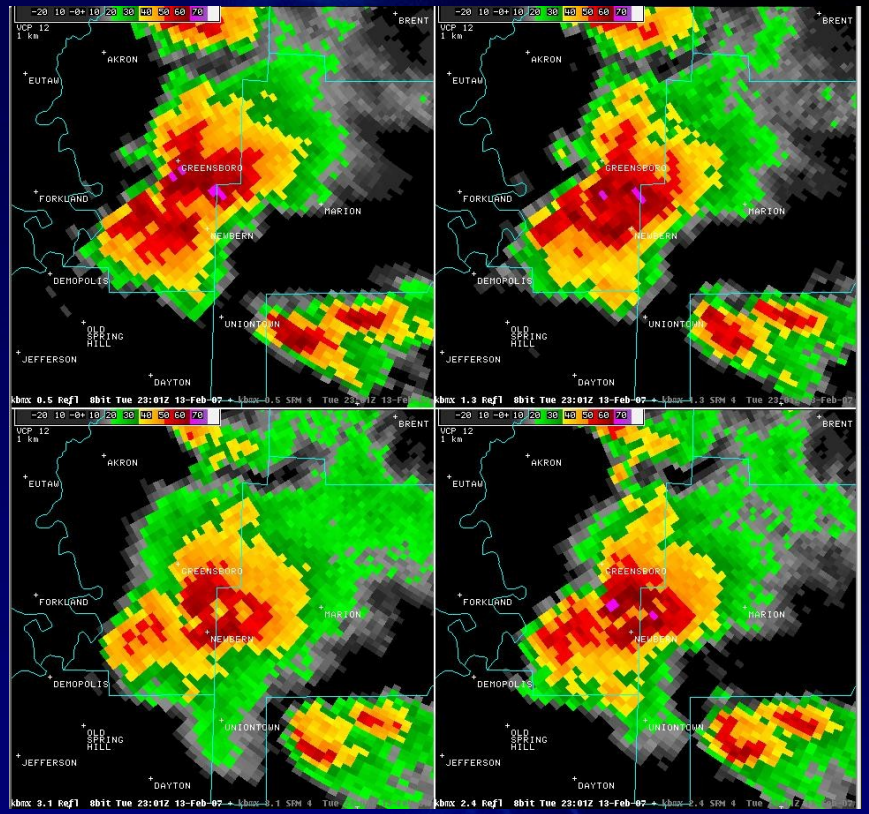


A word of caution- the next few slides may get a bit technical. Don’t worry if you do not understand all the concepts presented.

Don’t get frustrated

Why Are Storm Spotters Important?

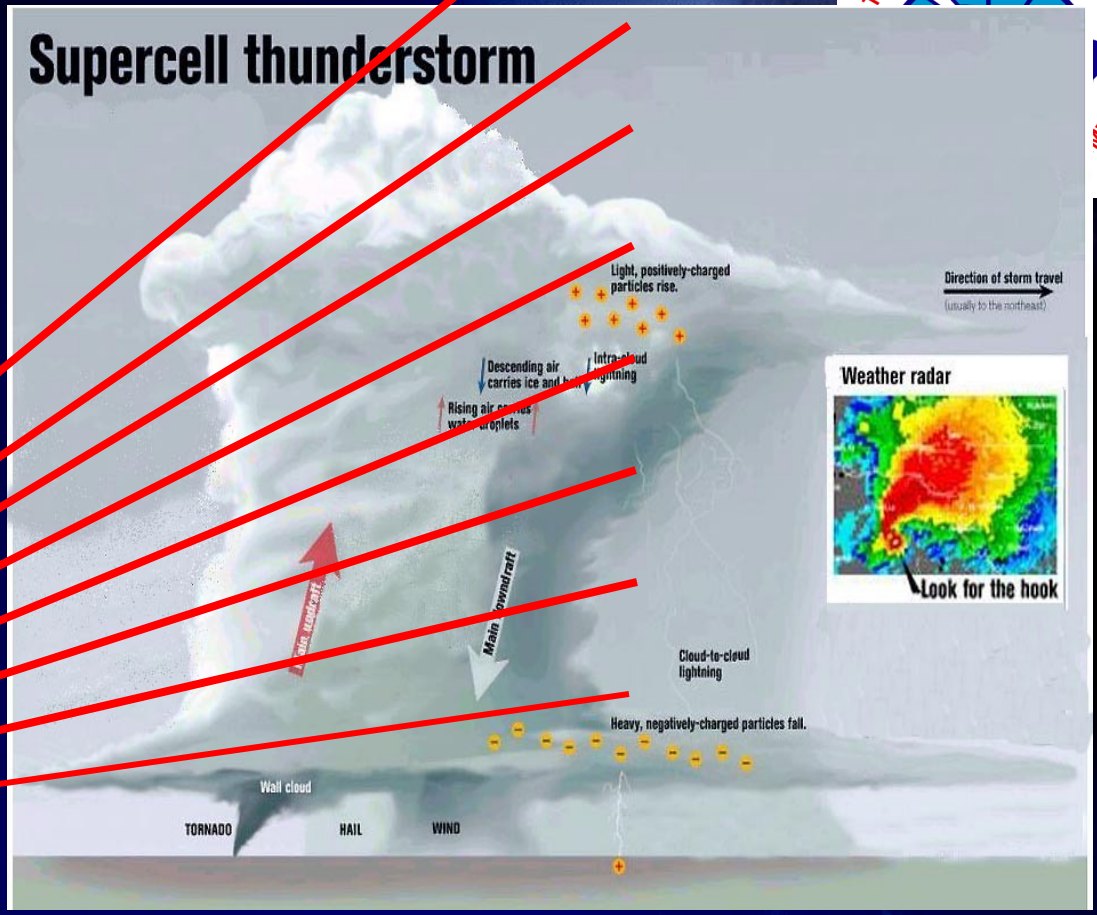




Doppler radar imagery from Newbern Tornado, February 13, 2007

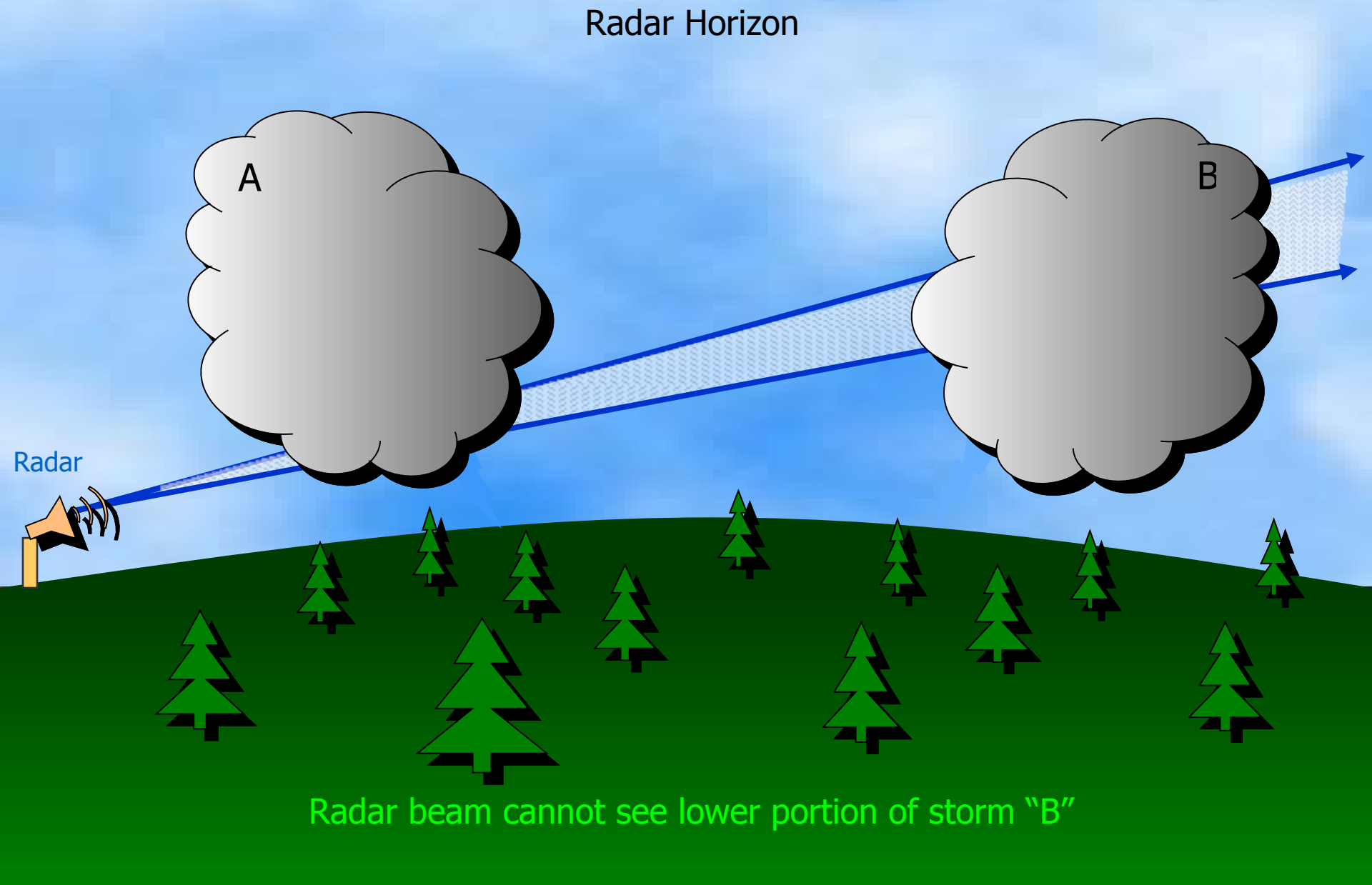
Why we need spotters

- *Radar limitations* (beam height & resolution…effective resolution decreases with distance...radars do not see tornadoes)
- GROUND TRUTH!
- Very high percent of *weak tornadoes* (radar signatures less defined)
- *Real-time verification* (adds credibility, enhances public response, and improves warning accuracy)
- Reports used and included in warnings, adding credibility

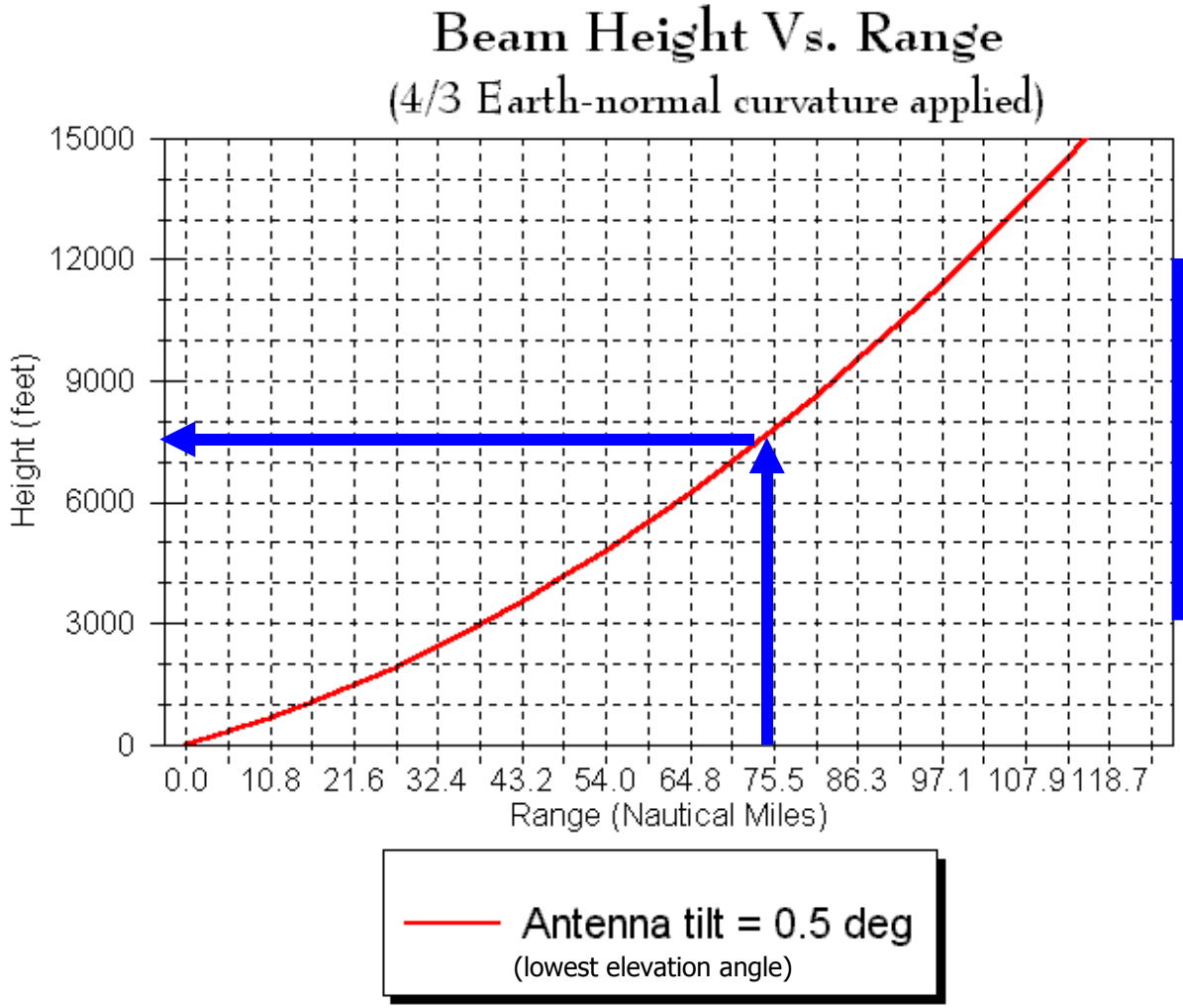


STORMS ARE 3-DIMENSIONAL

Why we need spotters



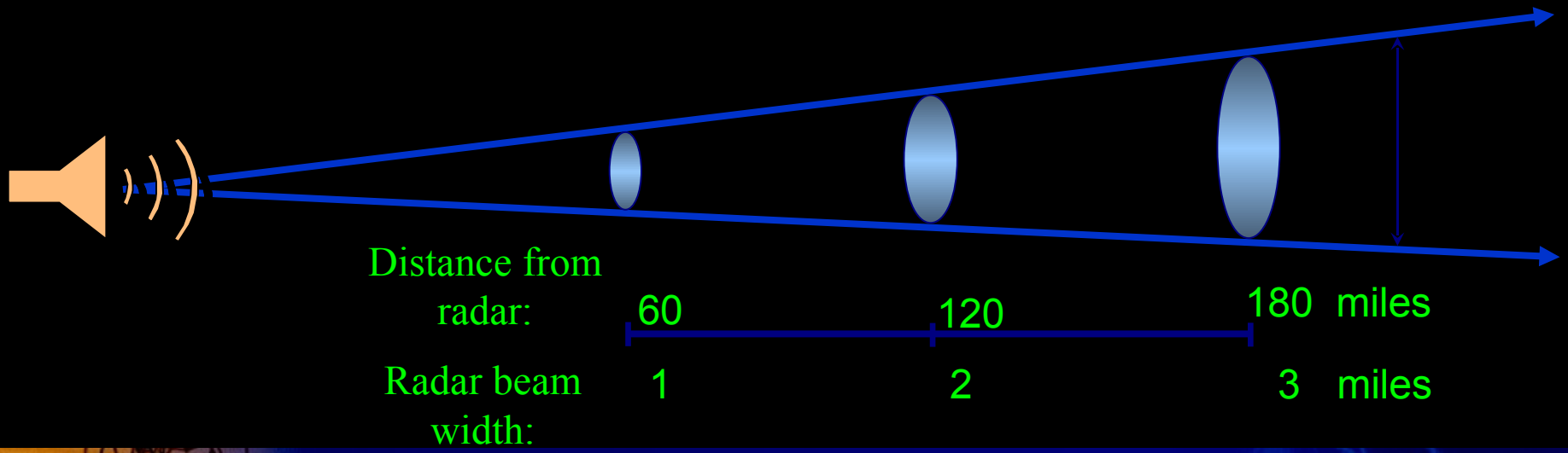
Why we need spotters



At a distance of 75 miles, the radar is looking 7,600 feet above the ground.

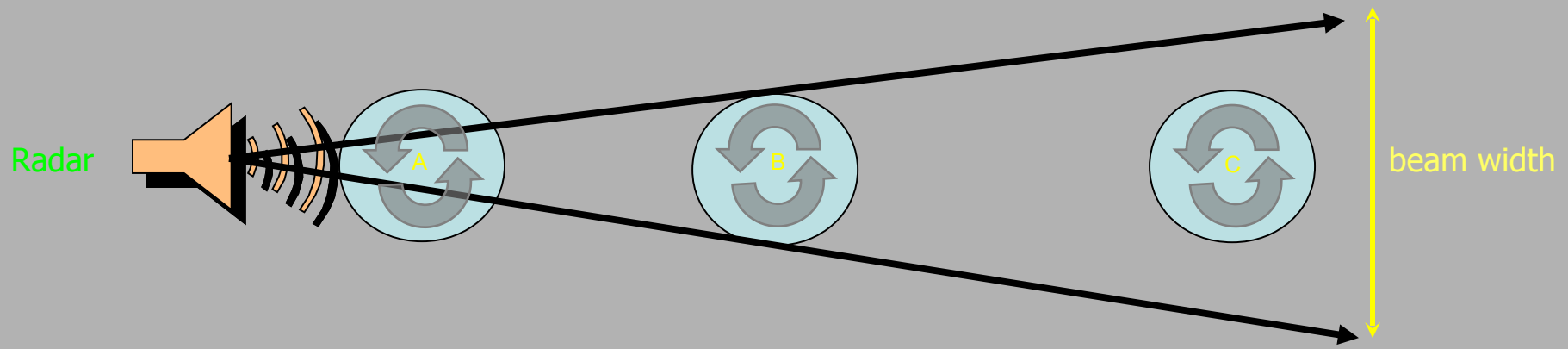
Why we need spotters

Beam width vs. range



Why we need spotters

Distance vs. effective resolution



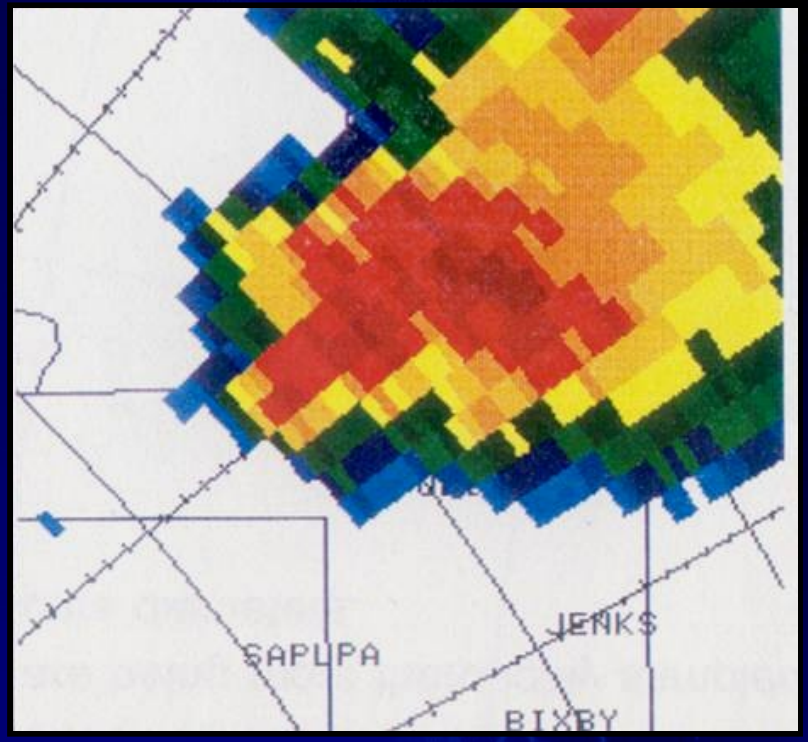
Aspect Ratio Problem

View from above

Why we need spotters

Beam width vs. effective resolution

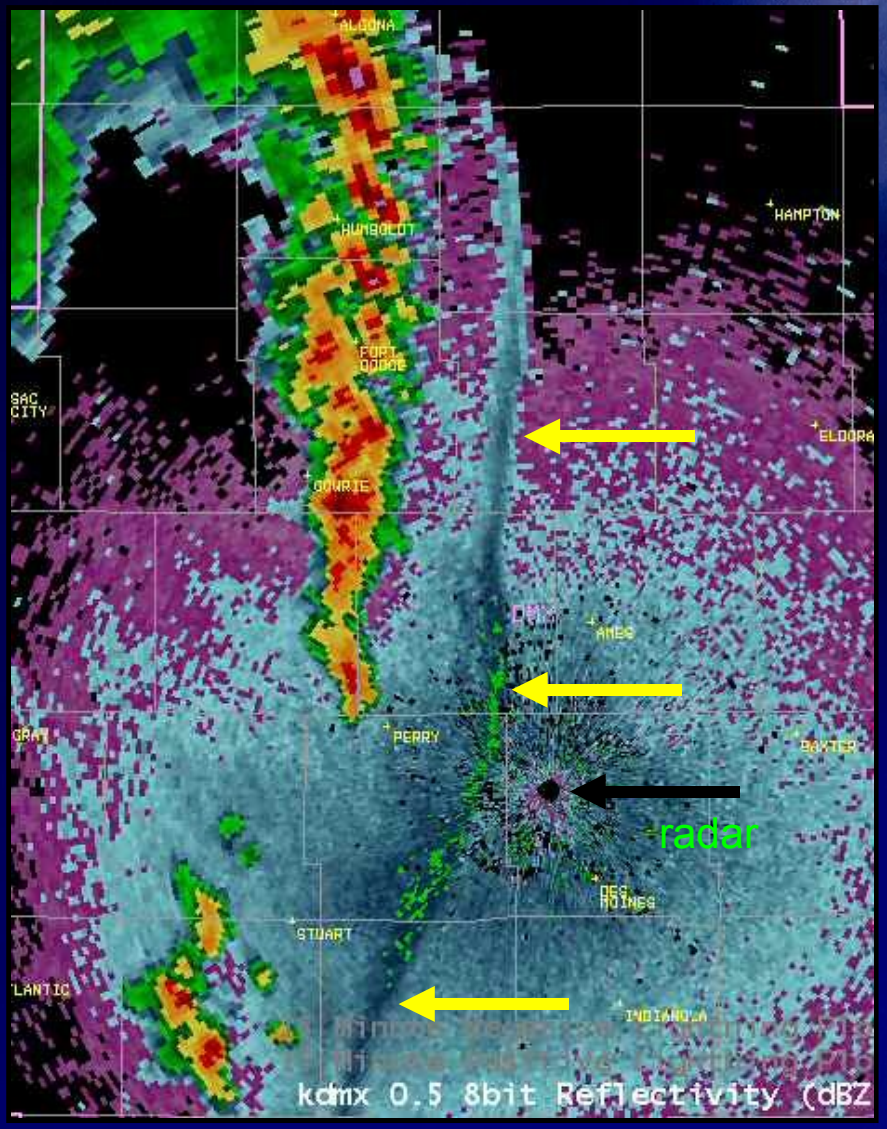
Storm 20 miles from radar



Same storm 80 miles from radar

Why we need spotters

Distance vs. height



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Important Definitions

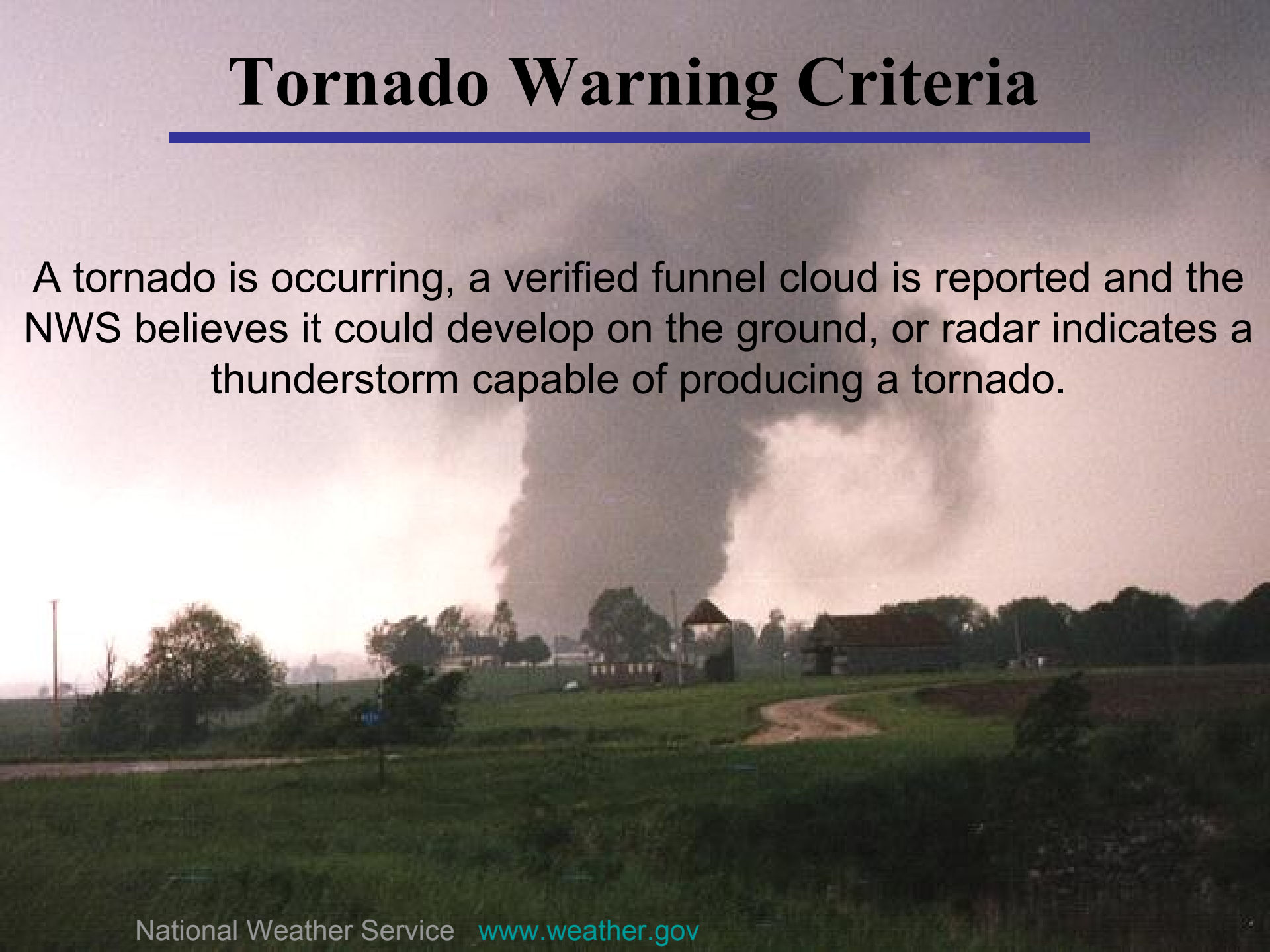
- **Watch - Atmospheric conditions are favorable (or could become favorable) for the development of thunderstorms which could produce severe weather – remain alert.**

- **Warning - Severe weather has occurred or is likely to occur – take protective action.**

WATCH THE SKY!

TAKE ACTION!!!

Tornado Warning Criteria



A tornado is occurring, a verified funnel cloud is reported and the NWS believes it could develop on the ground, or radar indicates a thunderstorm capable of producing a tornado.

Severe Thunderstorm Criteria

You Tell me!

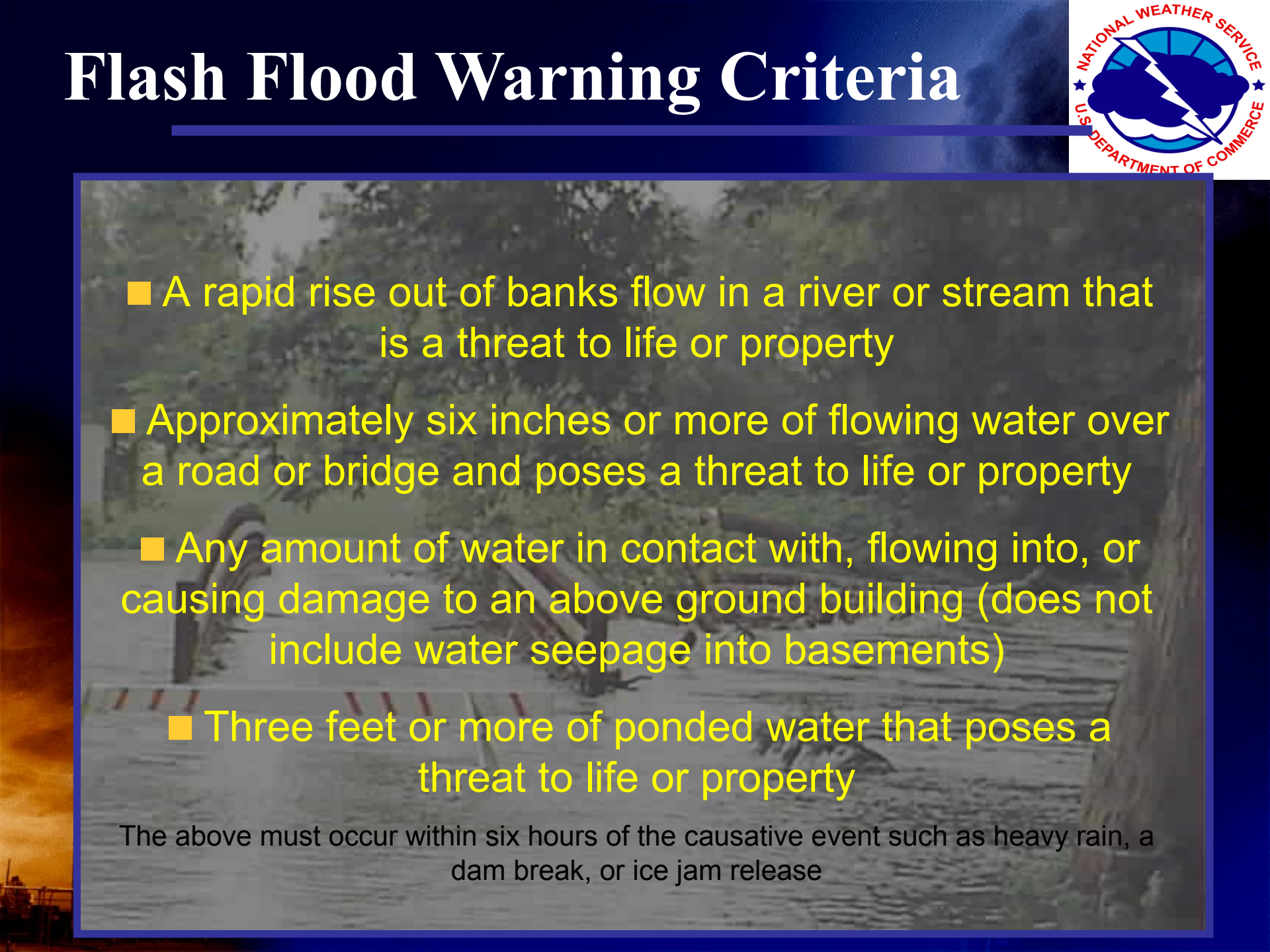
wind 58 mph or greater

Copyright Chuck Palmer

3/4 inch or larger hail

Courtesy KCCI

Flash Flood Warning Criteria



- A rapid rise out of banks flow in a river or stream that is a threat to life or property
- Approximately six inches or more of flowing water over a road or bridge and poses a threat to life or property
- Any amount of water in contact with, flowing into, or causing damage to an above ground building (does not include water seepage into basements)
- Three feet or more of ponded water that poses a threat to life or property

The above must occur within six hours of the causative event such as heavy rain, a dam break, or ice jam release

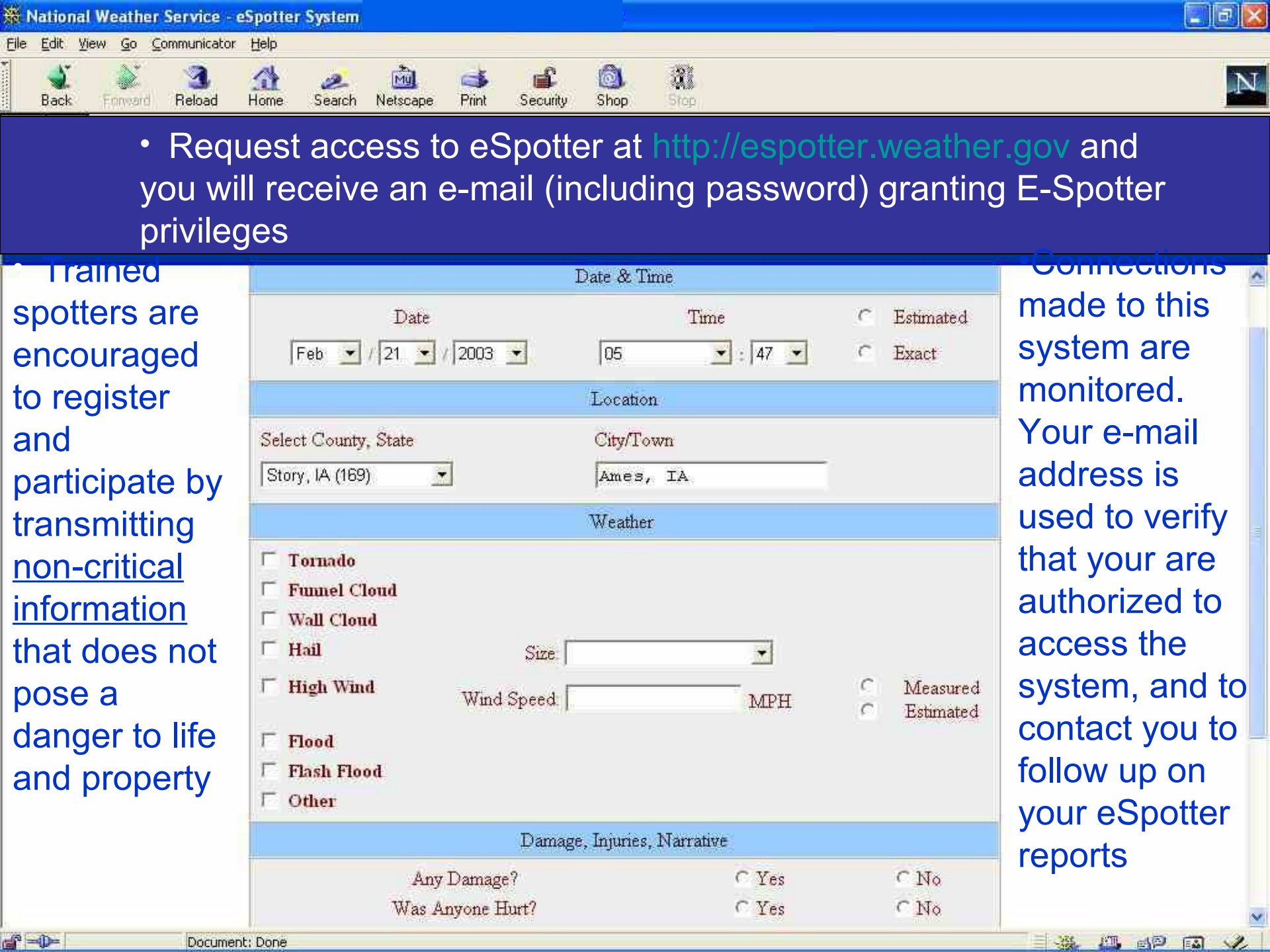
Spotter Groups

- County Emergency Management – Law enforcement, fire departments, trained volunteers
- NWS Skywarn Spotters – www.skywarn.org
- Amateur Radio - www.arrl.org
- Others – media, surface observations, storm chasers

Your storm report can also be sent to the NWS via the Internet.

- Request access to eSpotter at http://espotter.weather.gov and you will receive an e-mail (including password) granting E-Spotter privileges

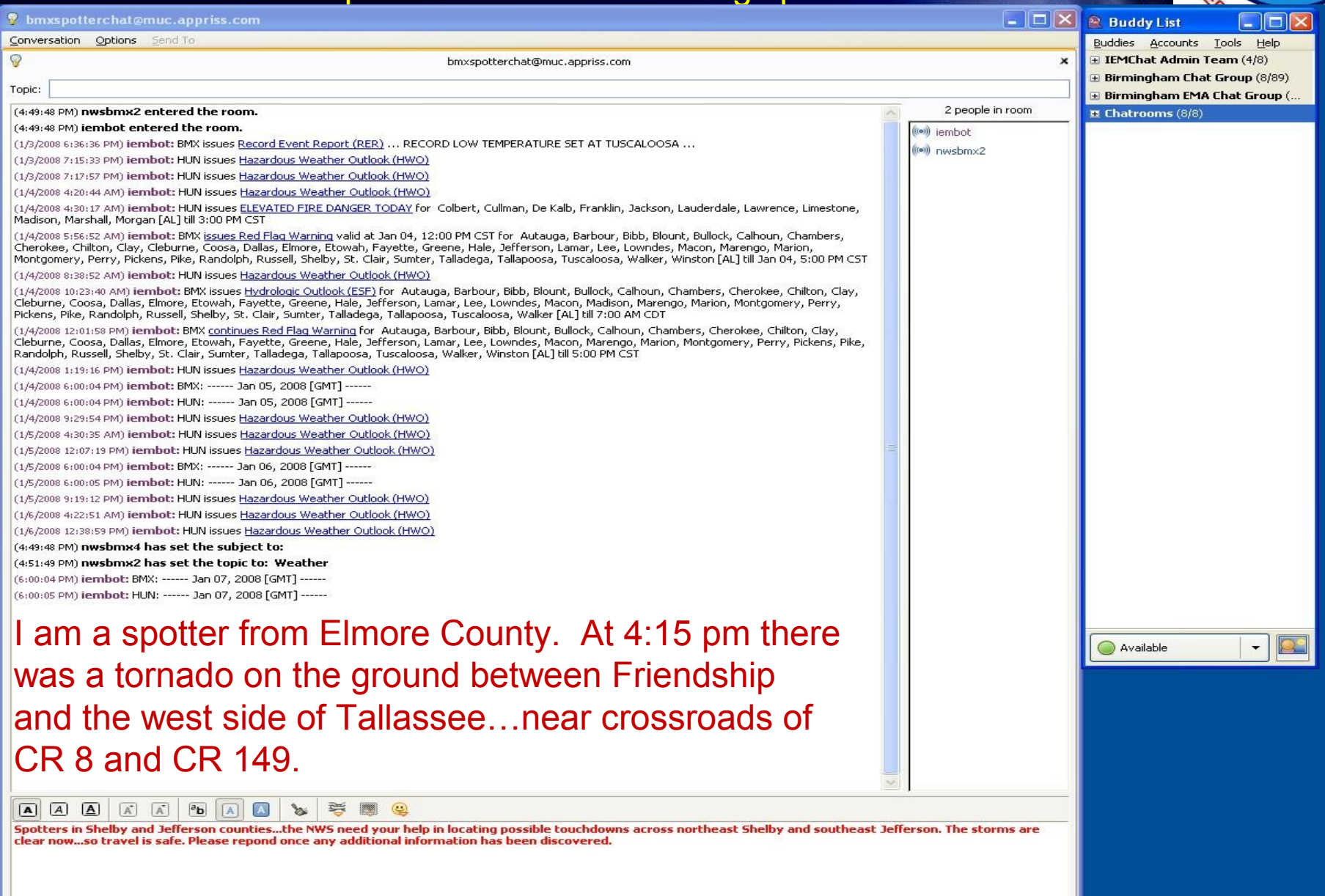
- Trained spotters are encouraged to register and participate by transmitting non-critical information that does not pose a danger to life and property



- Connections made to this system are monitored. Your e-mail address is used to verify that your are authorized to access the system, and to contact you to follow up on your eSpotter reports

BMX SPOTTER CHAT

Secure, internet-based chat, monitored by ALERT.
http://www.alert-alabama.org/spotterchat



The Effective Spotter Report

- Storm Spotter Line: 1-800-856-0758
- Your local Emergency Management Office
- Amateur radio
  - Skywarn Net – K4NWS
  - BMX Spotter Chat (NEW!)
- Call local law enforcement / 911 service
- Email damage report at a later time (even if a week or more later) to: JOHN.DEBLOCK@NOAA.GOV

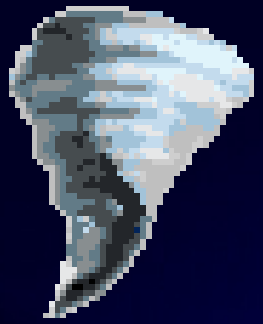
* MOST IMPORTANT!!! BE AWARE OF YOUR SURROUNINGS AND BE READY TO GET TO A PLACE OF SAFETY QUICKLY!!!

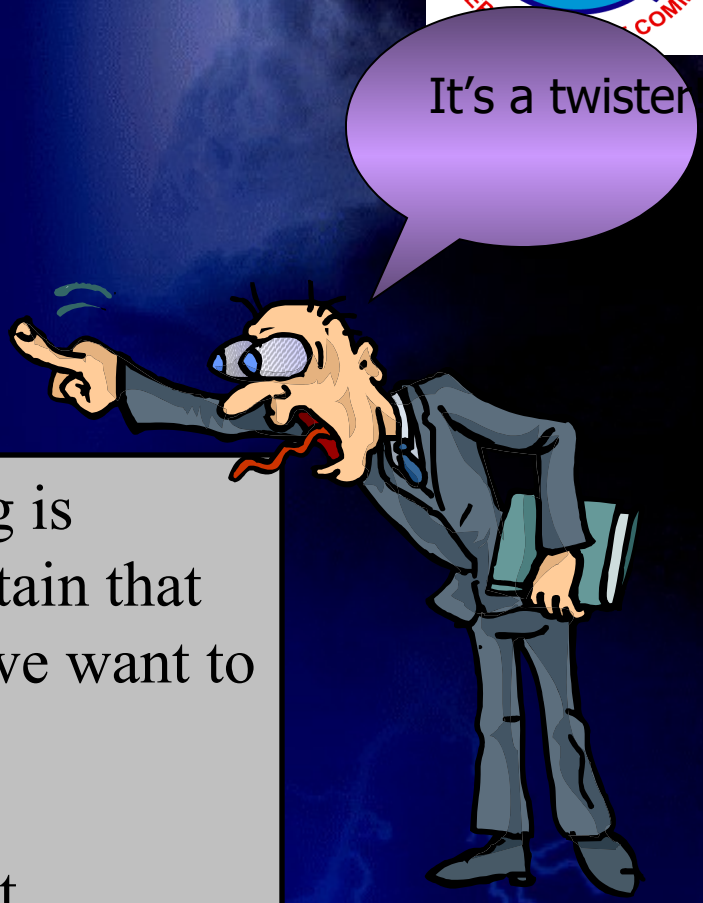
The Effective Spotter Report

- Keep it brief
- Identify yourself as a NWS trained storm spotter
- Tell us WHO, WHAT, WHEN, AND WHERE
- Example:

MY NAME IS STORM MAN AND I AM A TRAINED STORM SPOTTER IN CALERA , ALABAMA, LOCATED IN SOUTHERN SHELBY COUNTY. AT 500 PM, I SPOTTED A TORNADO ON THE GROUND JUST SOUTH OF COUNTY ROAD 87, THAT JUST CROSSED INTERSTATE 65. NUMEROUS CARS HAVE BEEN DAMAGED, ALONG WITH POWERLINES AND NUMEROUS TREES DOWN, NEAR THIS COUNTY ROAD. MY GPS COORDINATES ARE…

The Effective Spotter Report





Do not assume that if a warning is issued, the NWS knows for certain that severe weather has occurred. (we want to hear from you!)

Never assume your report is not important.

Do not exaggerate your report!

What To Report

Tornado, Funnel Cloud, or Wall Cloud

Copyright Eric O'Connor

What To Report

Strong or Damaging Wind

Copyright Chuck Palmer

Estimating Wind Speed

25-31 mph - large branches in motion

32-38 mph – whole trees in motion

39-54 mph – twigs break off, wind impedes walking

55-72 mph – damage to chimneys and TV antennas, large branches broken and some trees uprooted

73-112 mph – removes shingles, windows broken, trailer houses overturned, trees uprooted

113+ mph – roofs torn off, weak buildings and trailer houses destroyed, large trees uprooted

Estimating Wind Speed

THE "SET" EFFECT.....

Storm spotters must also keep in mind that during a severe weather event, Stress, Excitement, and Tension levels are running high. This is called the "SET" effect, and it can alter your logic and reasoning abilities. Because of its presence, it is often very easy to over-estimate wind speeds.

A wind gust of 40 MPH during a fair weather day will not cause any great concern, but this same wind speed when experienced during a thunderstorm may seem like 60 MPH gust because of the SET effect.

When in doubt about your estimate, re-think it and try to remain calm and objective as possible. Use the table in the previous slide as a guide. Your goal is to pass real time observations with accuracy, speed, and professionalism.

What To Report

Hail

What To Report

What To Report

Hail

0.75” - Penny

0.88” - Nickel

1.00” - Quarter

1.25” – Half Dollar

1.50” – Ping Pong Ball

1.75” - Golf Ball

2.50” - Tennis Ball

2.75”– Baseball

4.00”- Grapefruit

4.50” - Softball

What To Report

Any Storm Damage

What To Report

Urban Flooding

What To Report

Rural Flooding

What To Report

Heavy Rain or High Water

What To Report

Past Water/Flood Damage

What To Report

Snowfall or Ice Amounts

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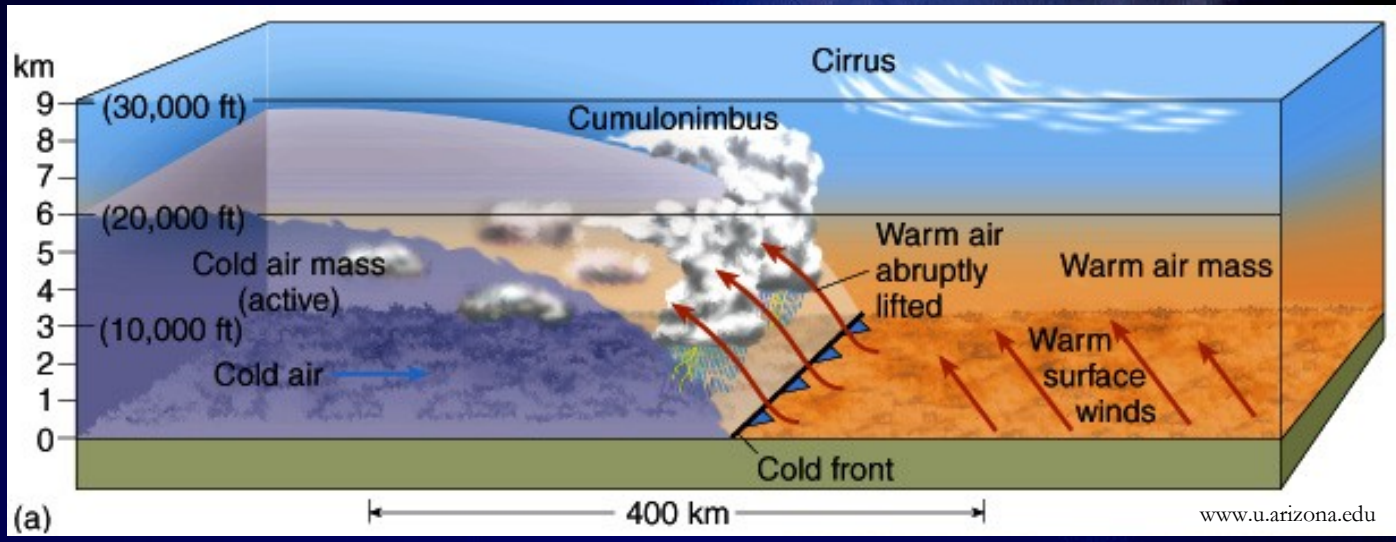
Ingredients for Thunderstorm Formation

- Lift
  - Cold front
  - Warm front
  - Gust front / outflow boundary
  - Terrain (upslope flow)
  - Warm air rising
- Low Level Moisture
- Instability

Fronts

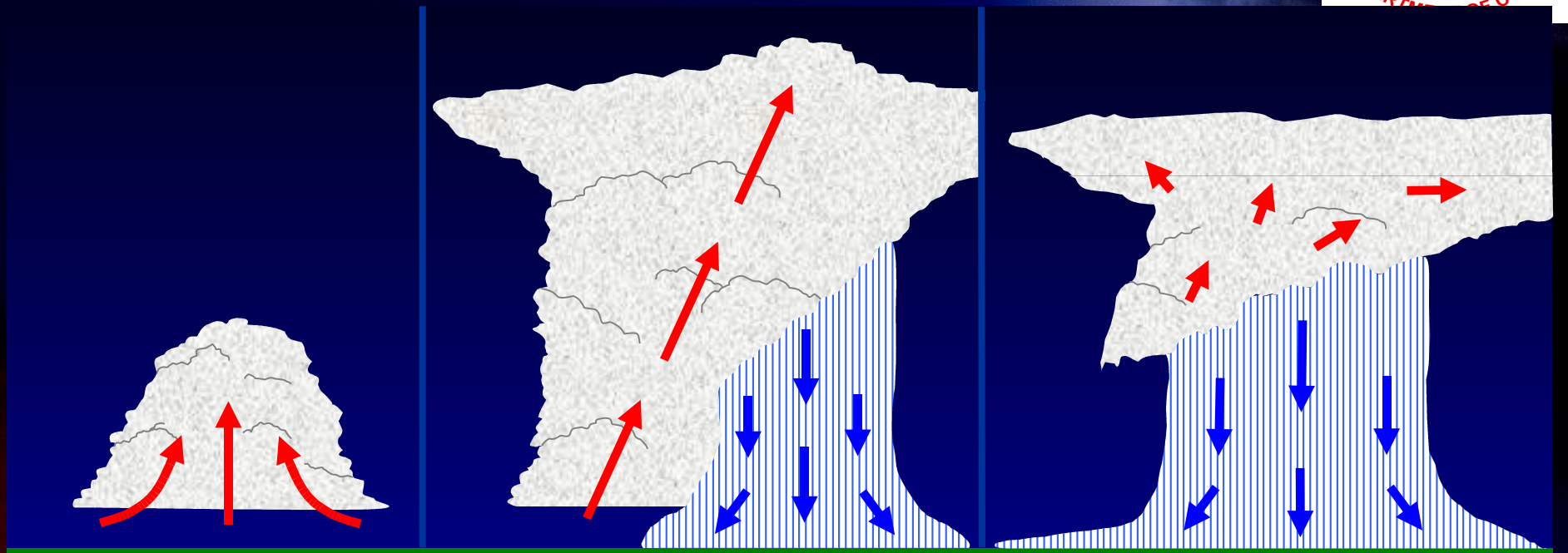
Sources of Lift

Cold Front



Warm Front

Thunderstorm Life Cycle



Cumulus Stage

Mature Stage

Dissipating Stage

Updraft Characteristics

-"Back" side of storm

-Cumulus tower

-Rainfree base

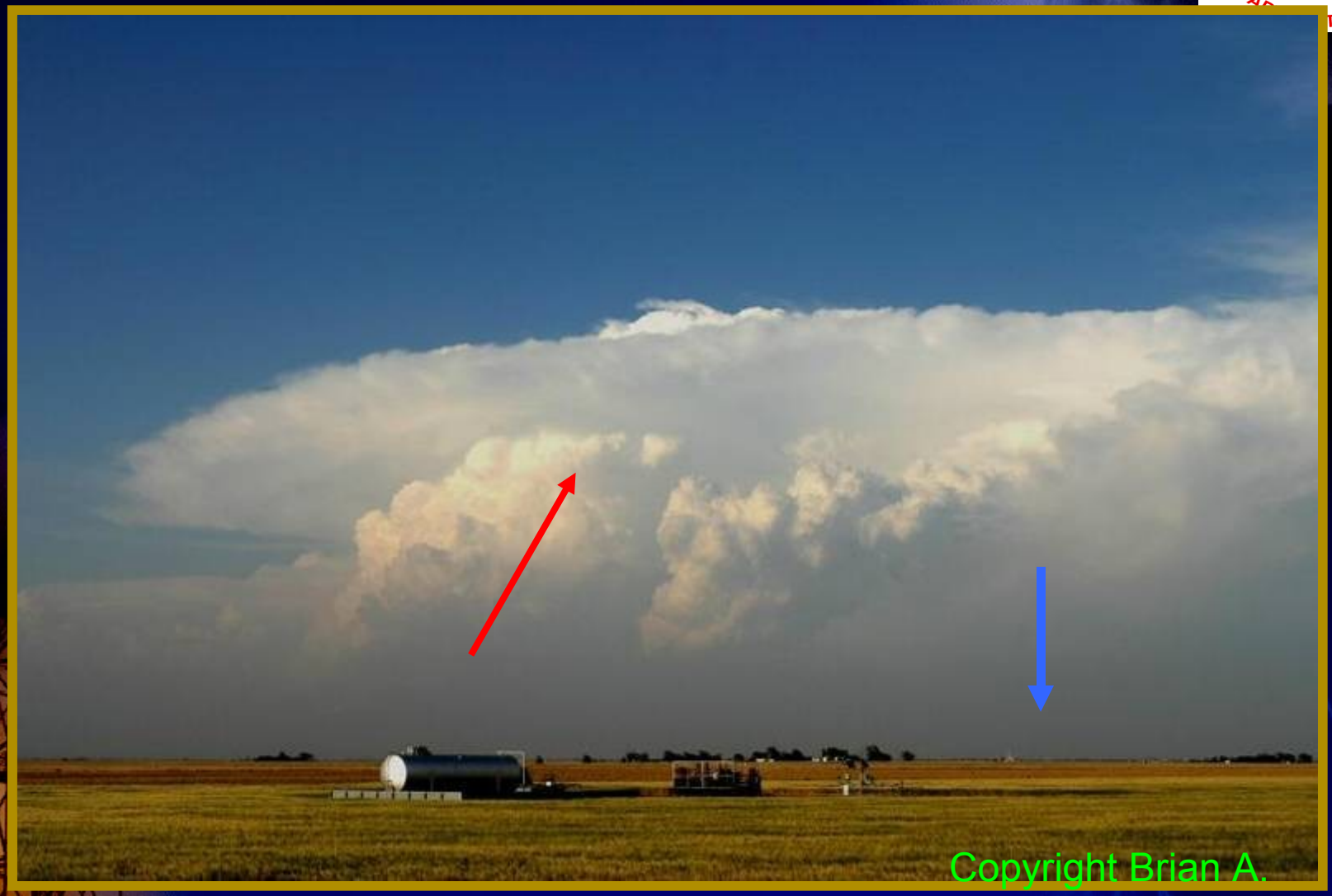
-Upward cloud motion

-Supercell has rotating updraft

Downdraft Characteristics

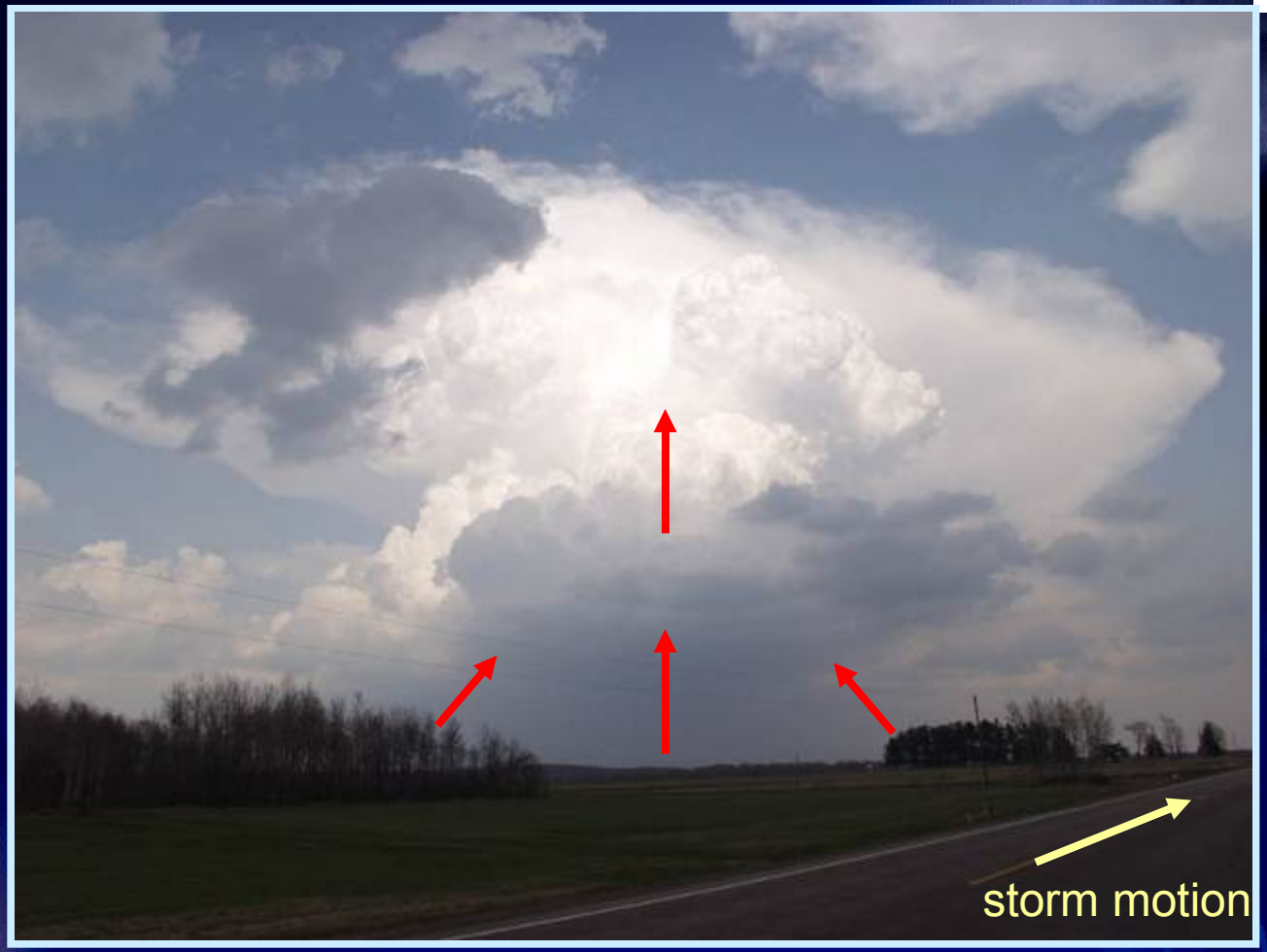
- "Front" side of storm
- Dark area of storm
- Rainfall region
- Downward motion
- Downburst/hail threat

Updraft/Downdraft

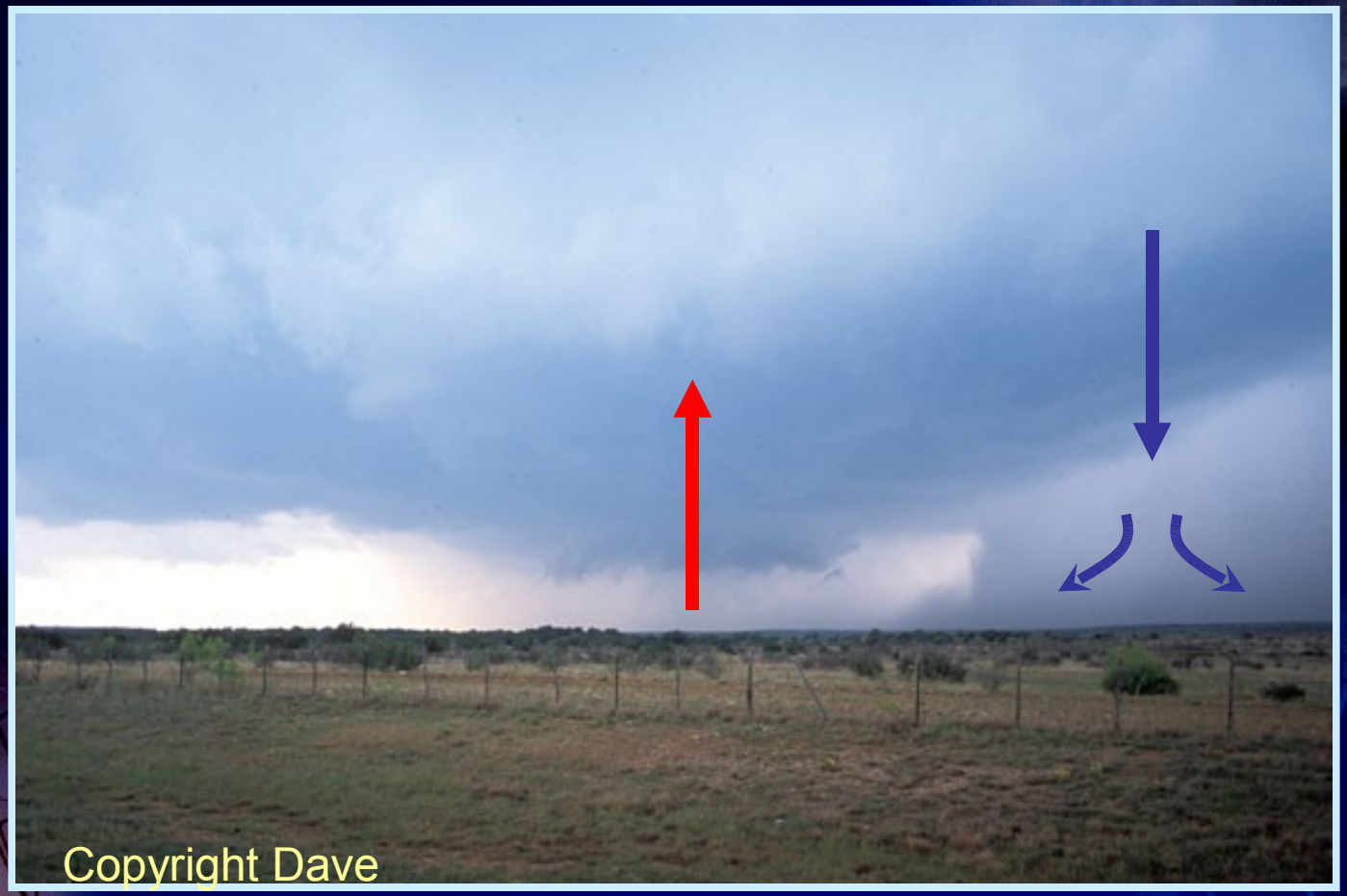


Copyright Brian A. Morganti

Updraft/Downdraft



Updraft/Downdraft



Copyright Dave Chapman

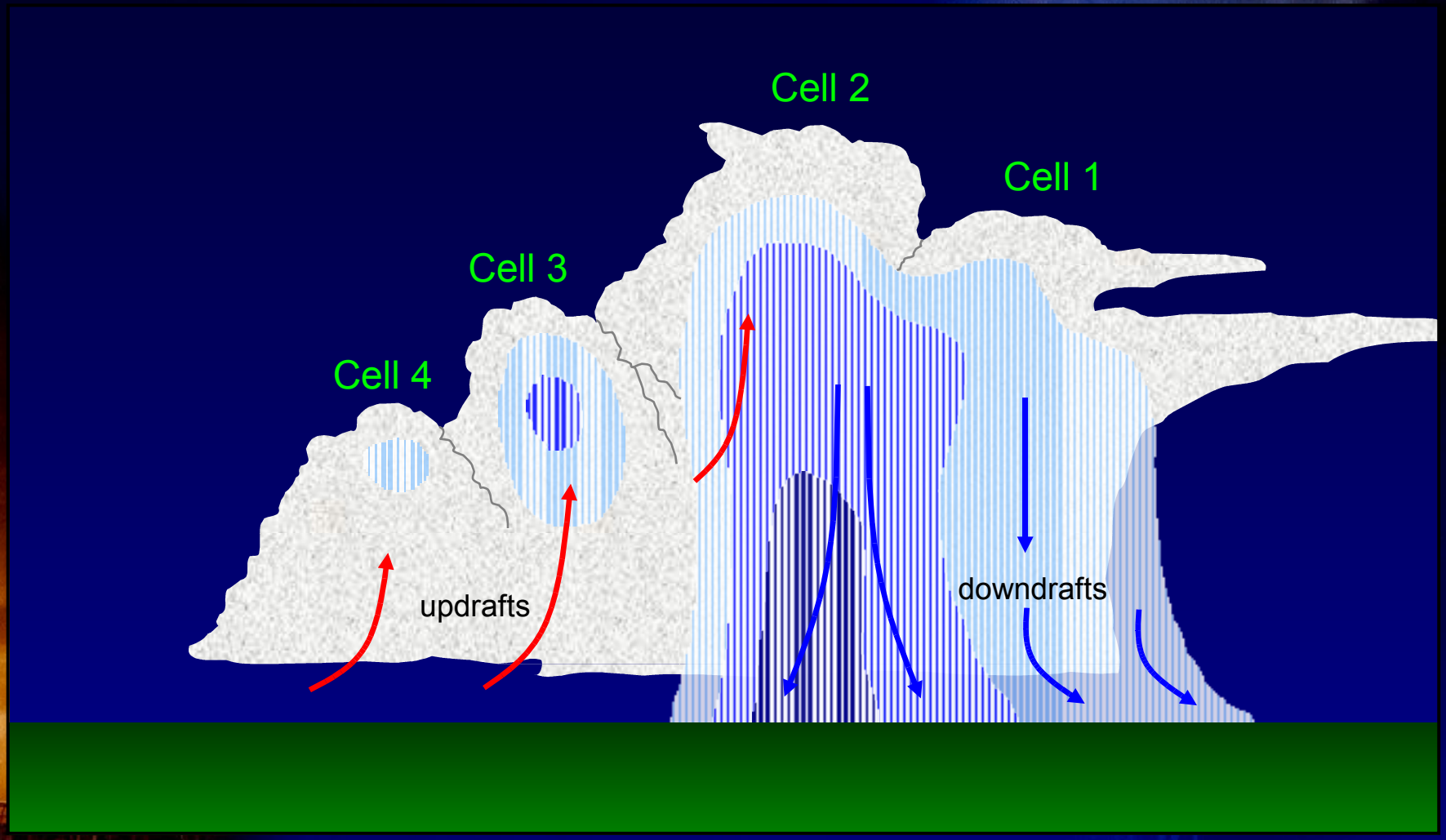
Upper Level Storm Strength Clues

Mid Level Storm Strength Clues

Common Thunderstorm Types

- Multicell - ordinary storms with low severe threat
- Squall line - line of storms with moderate wind threat
- Classic Supercell - rotating updraft with high severe threat
- Mini Supercell - small storm with rotating updraft, low wind/hail threat
- HP (high precipitation) Supercell - rotating updraft often times obscured by heavy rain, high severe threat

Multicell Thunderstorm



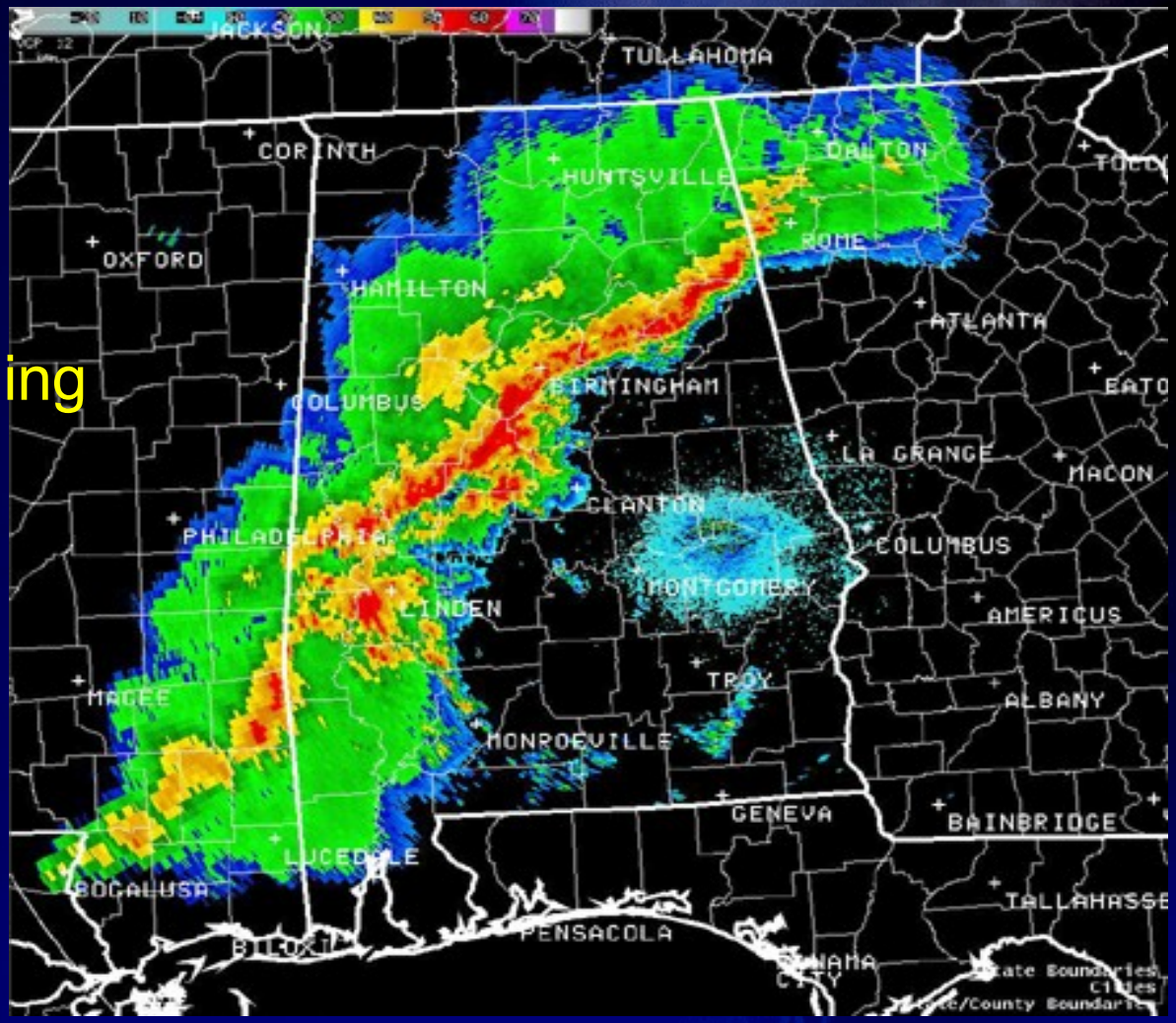
Side view

Multicell Thunderstorm

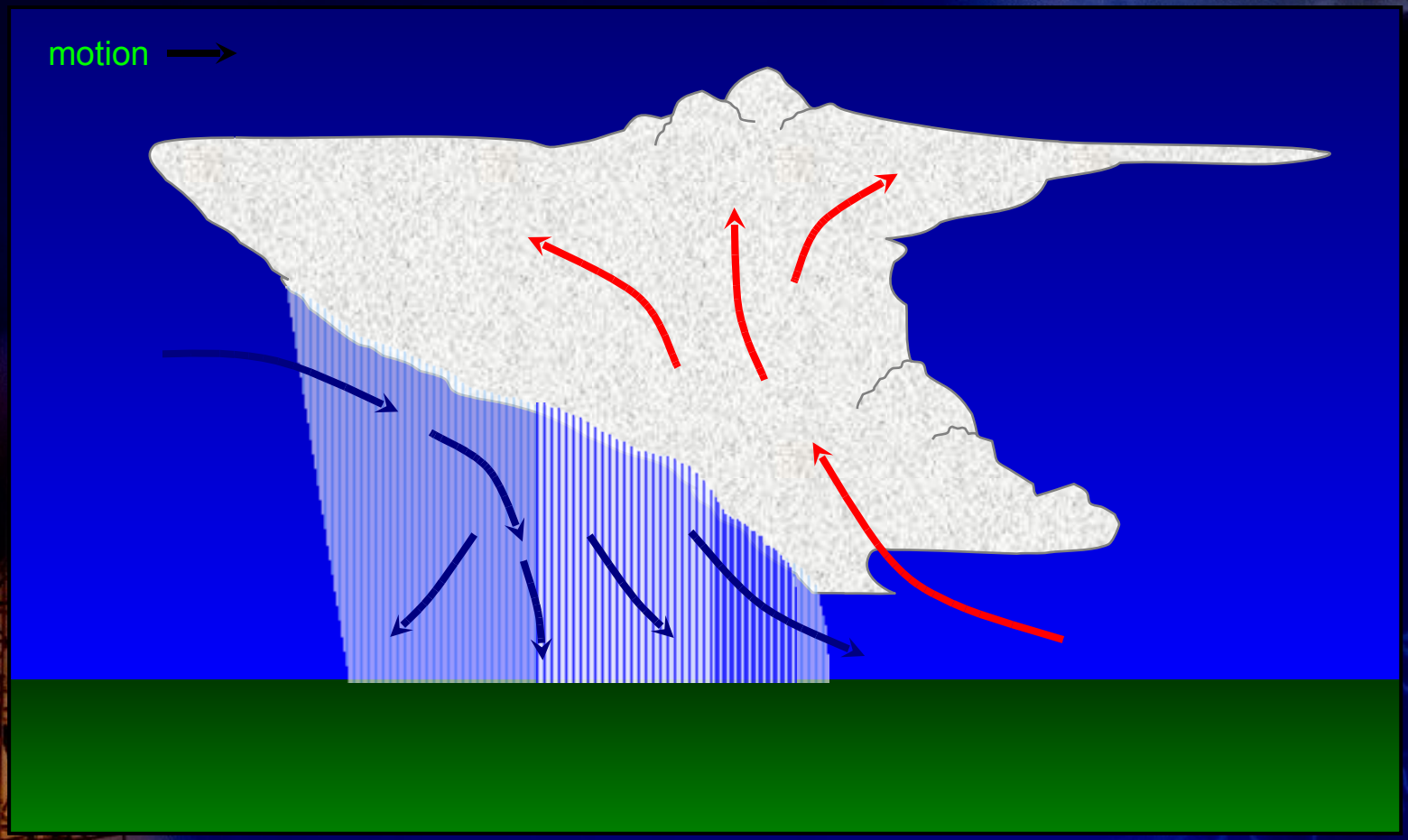
- Series of cells moving as one unit
- Most common type of storm

Multicell Line
(Squall Lines)

- Long line of storms
- Gust front at the leading edge

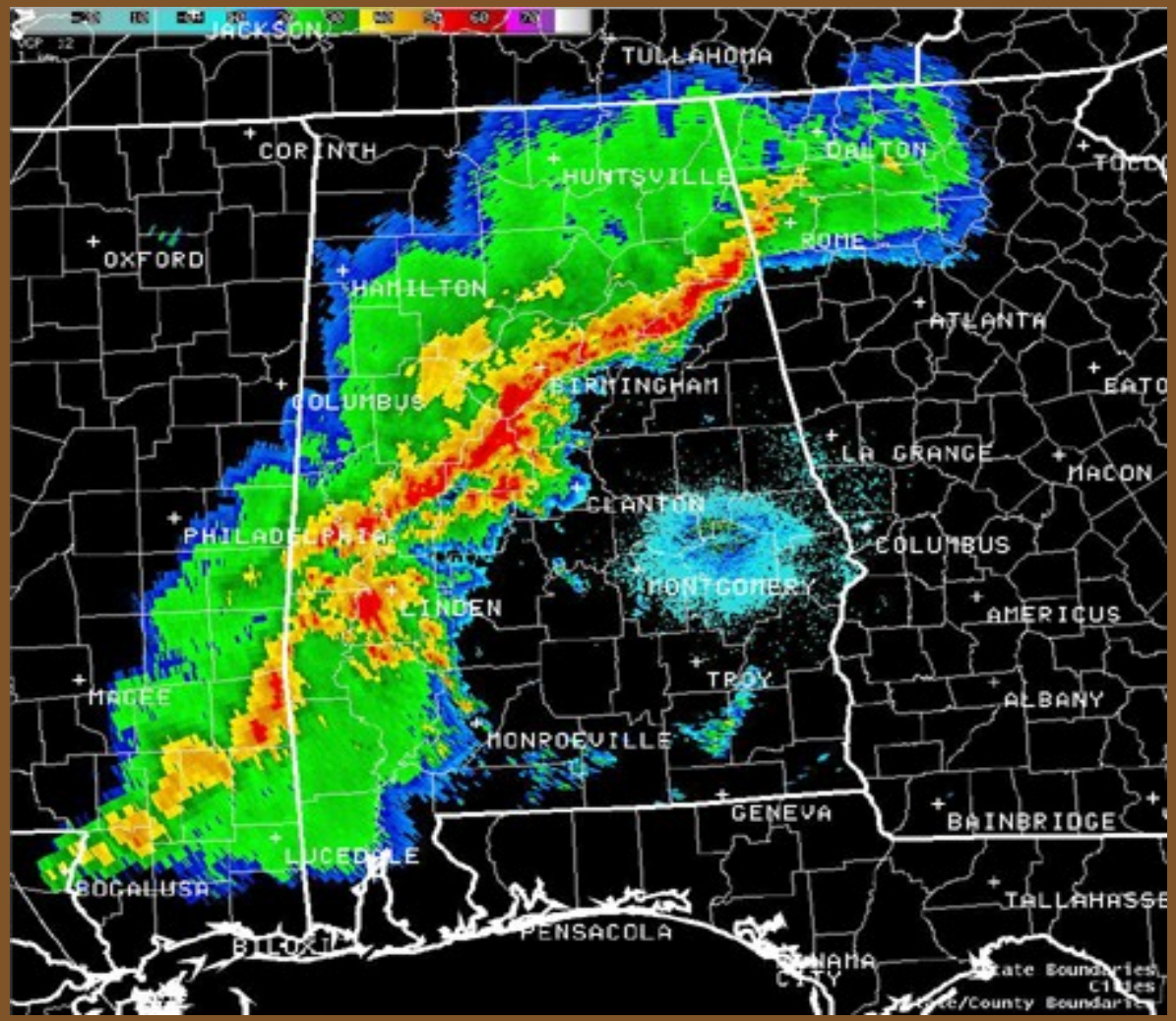


Squall Line



(Cross section)

Squall Line



THE “WORST IS FIRST”

WINDS OVER 58 MPH WILL BE FOLLOWED BY HEAVY RAIN.

Squall Line

Copyright Jim Bishop

Break Time

Grab a snack or take a break.

Meet back here in 10 minutes!

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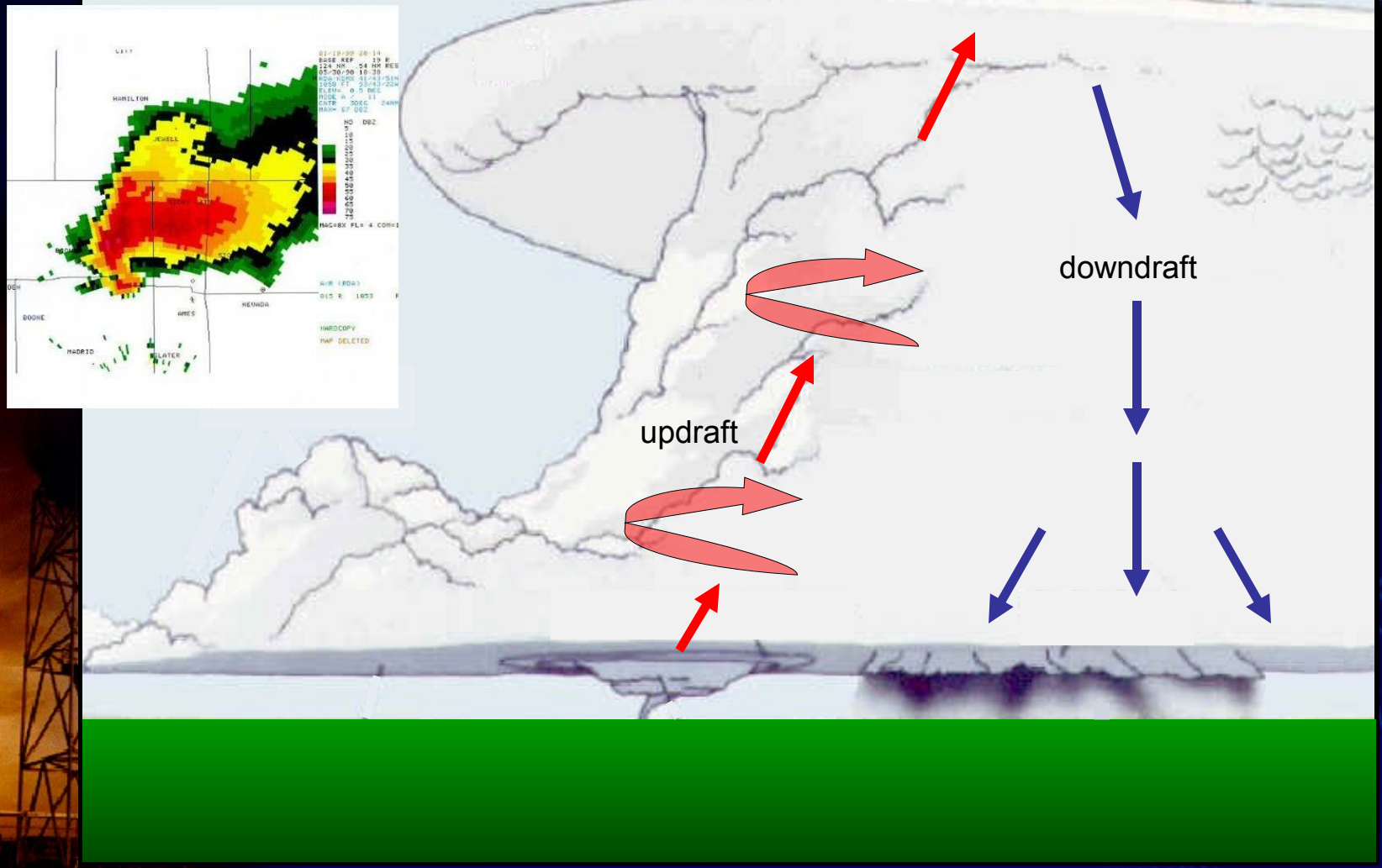
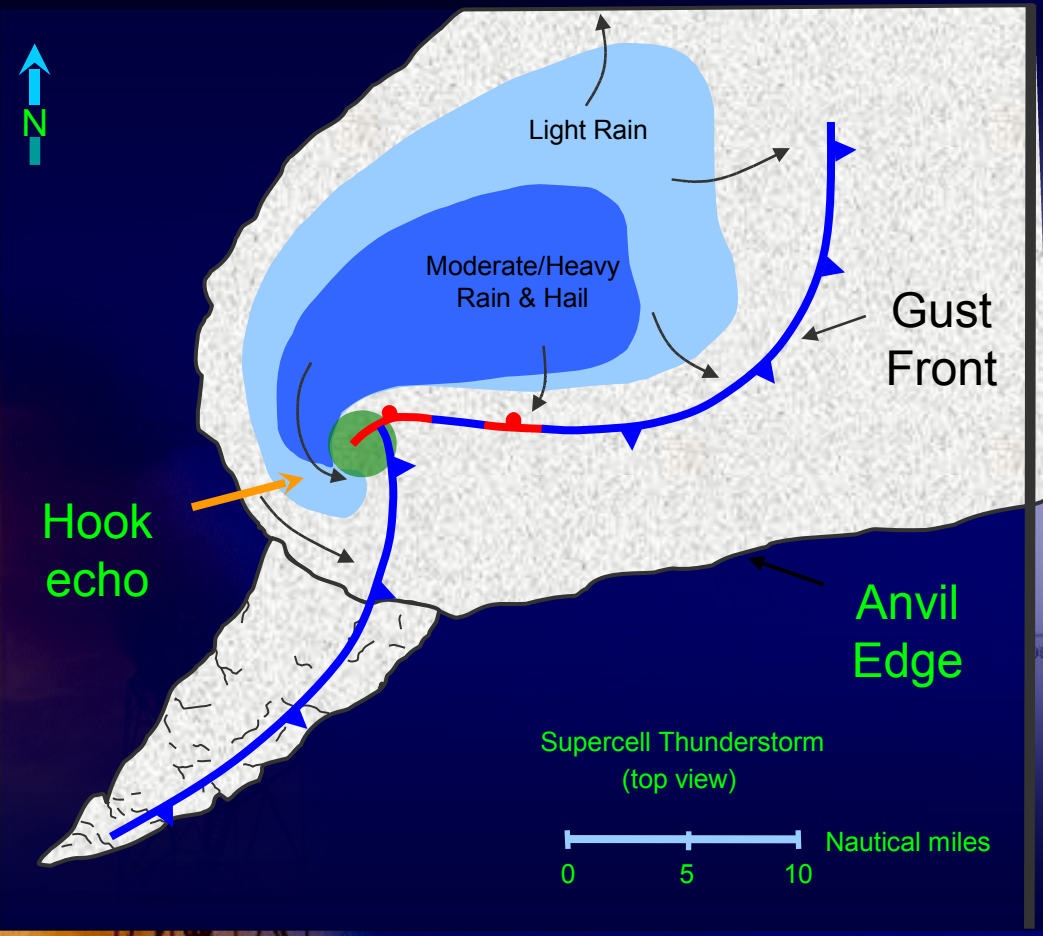
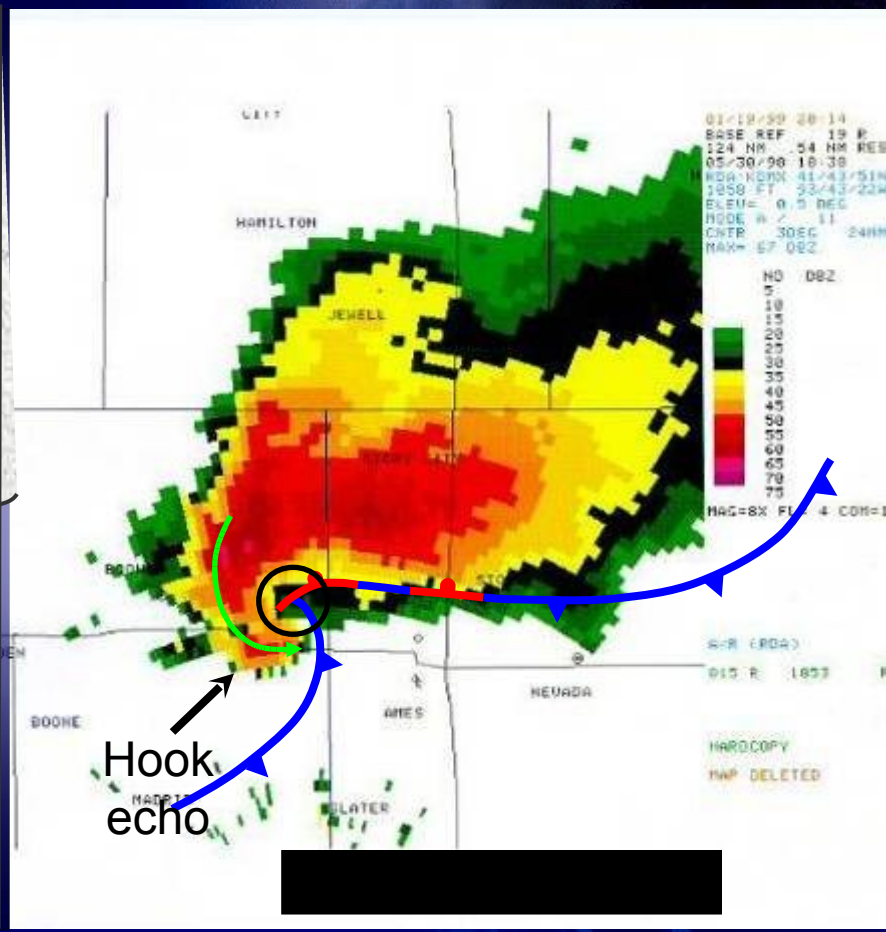
Supercell Structure & Appearance

Classic Supercell Thunderstorm

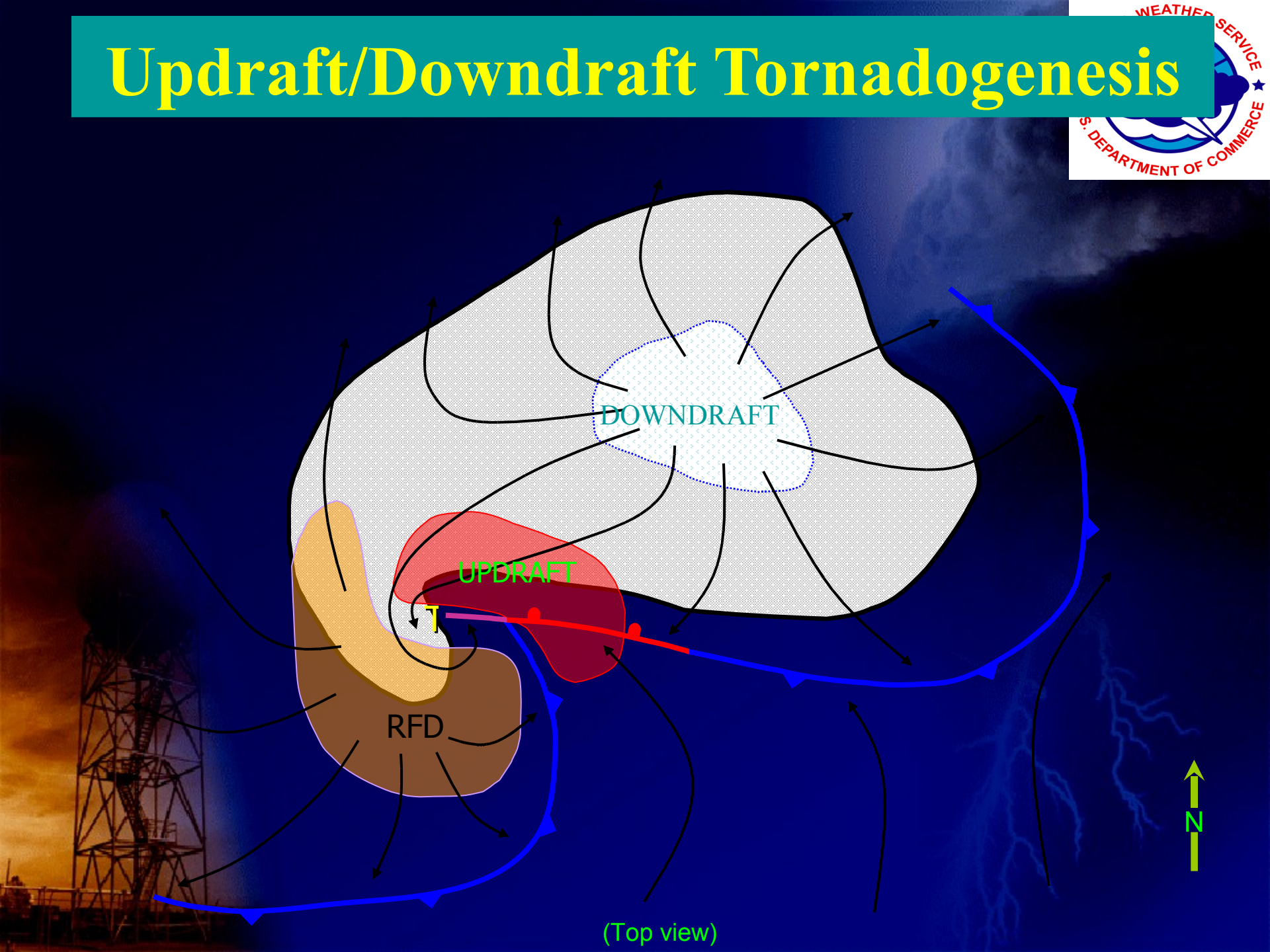


Classic Supercell Thunderstorm

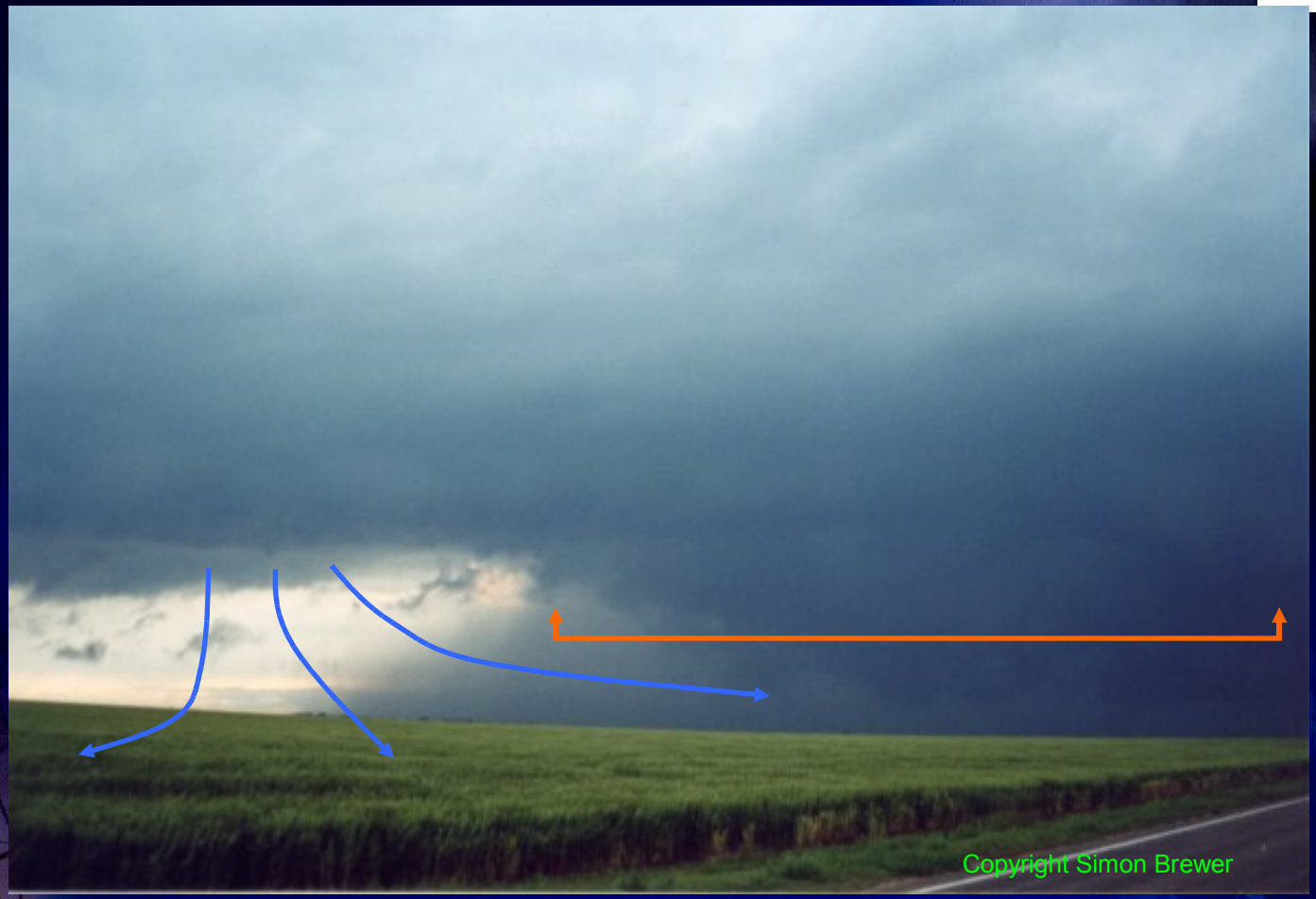




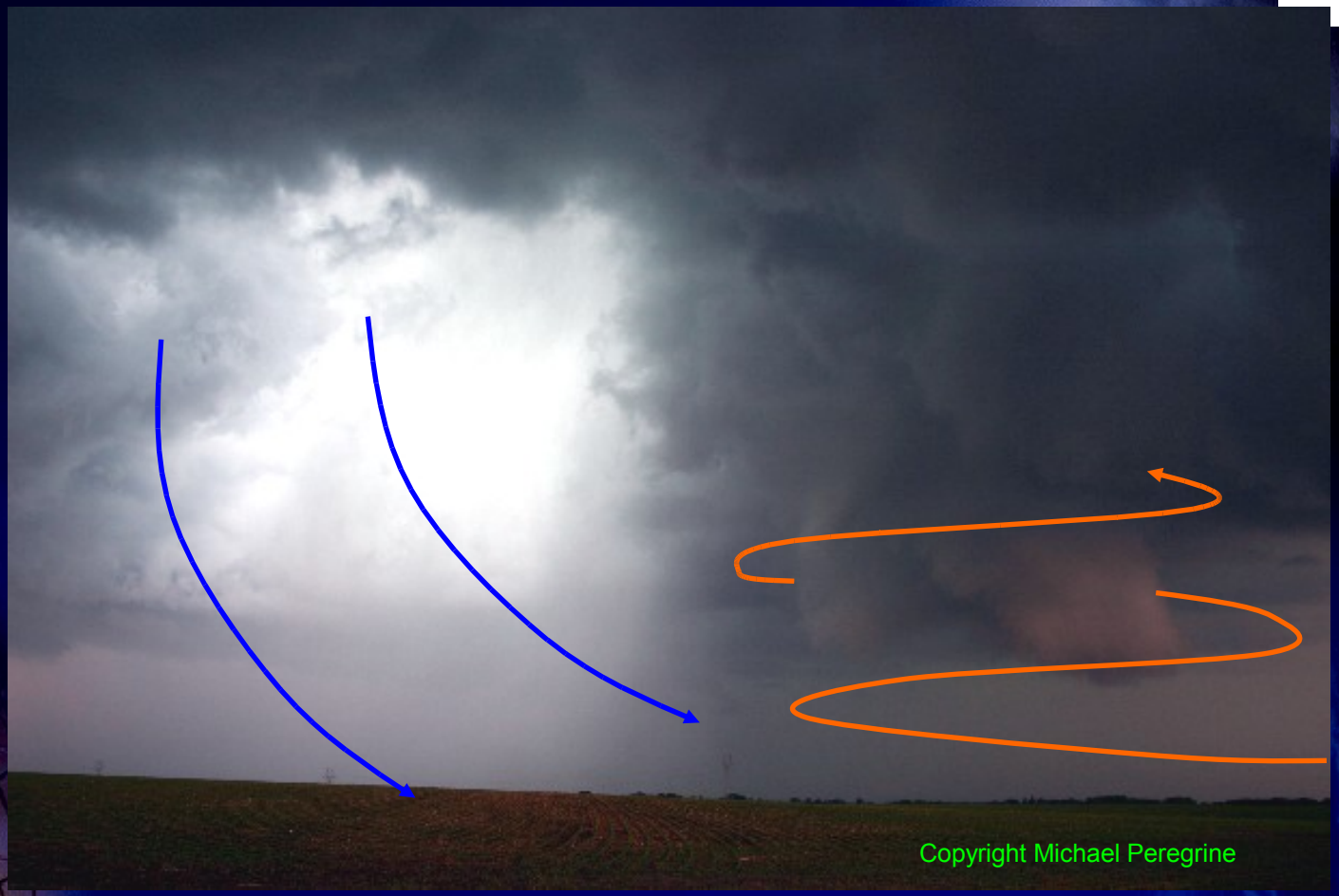
Updraft/Downdraft Tornadogenesis



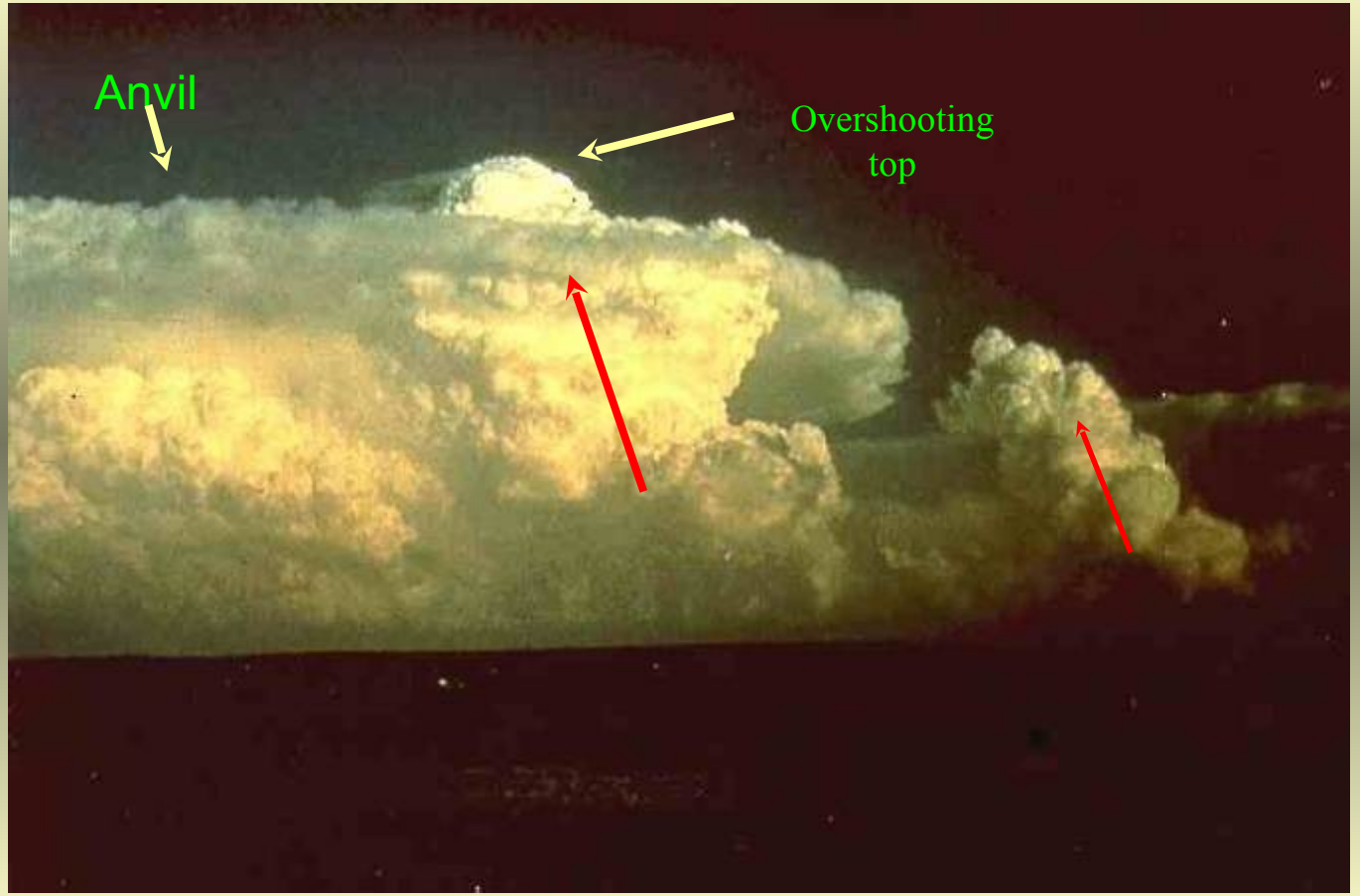
Rear Flank Downdraft



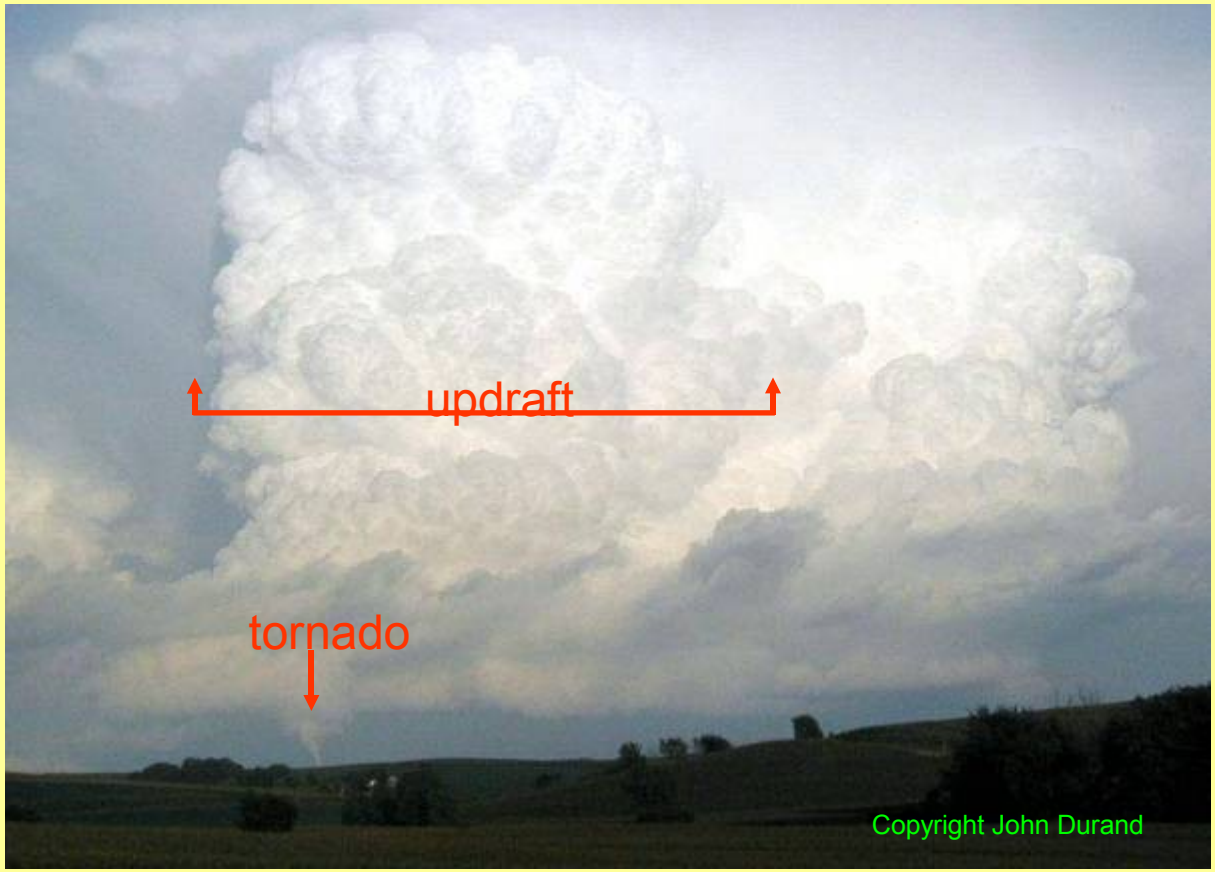
Rear Flank Downdraft



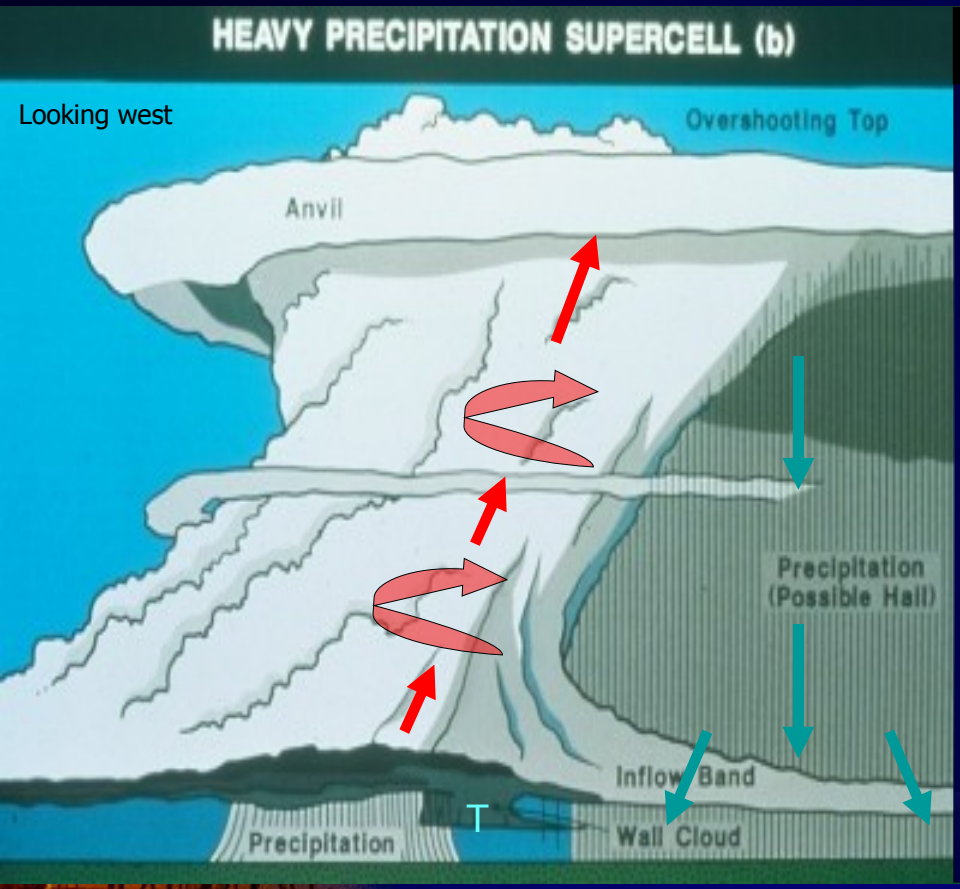
Classic Supercell Thunderstorm

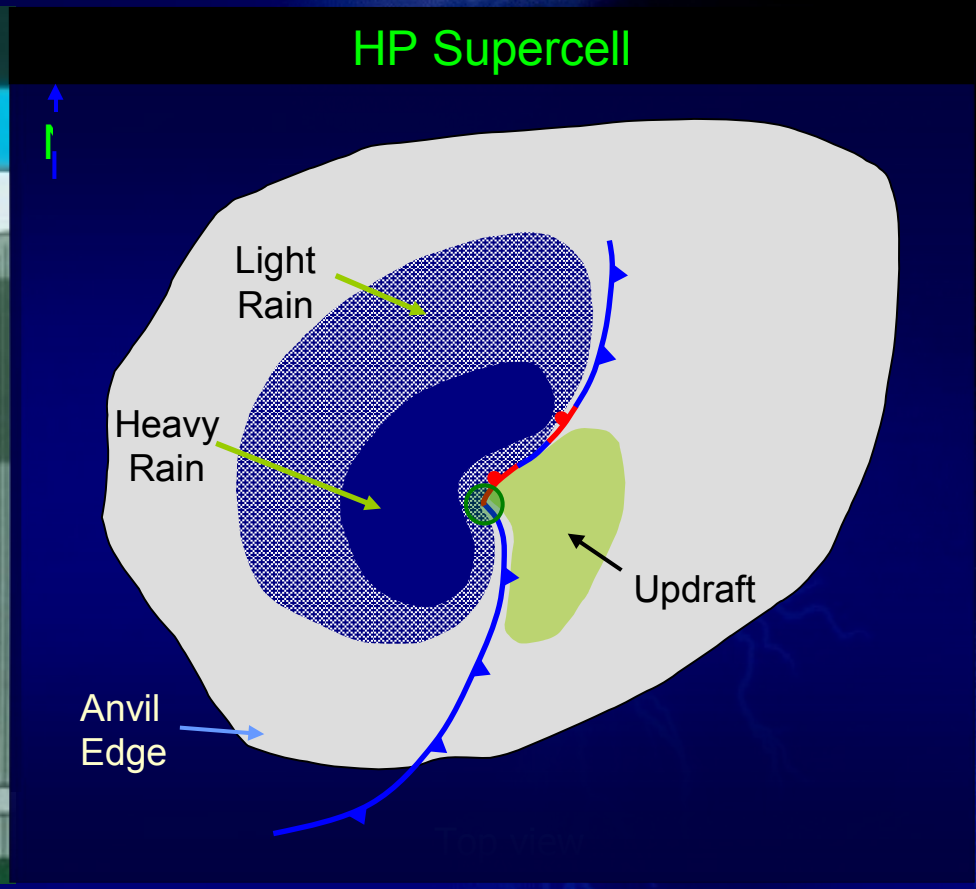


Classic Supercell Thunderstorm



HP Supercell





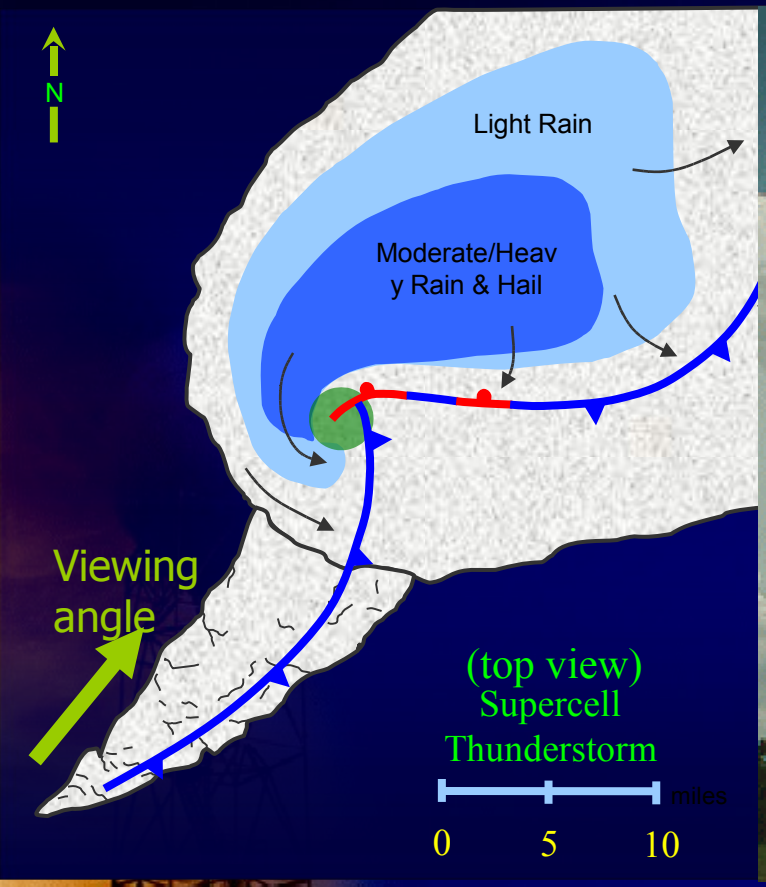
HP Supercell

HP Supercell

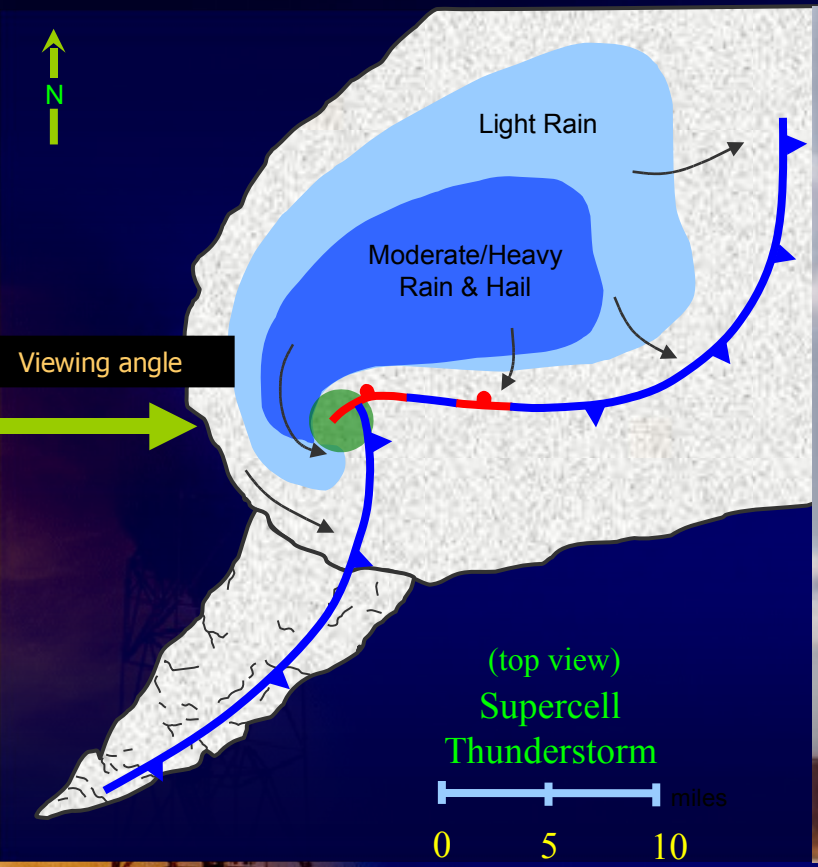
HP Supercell

Spotter Positioning

Spotter Positioning



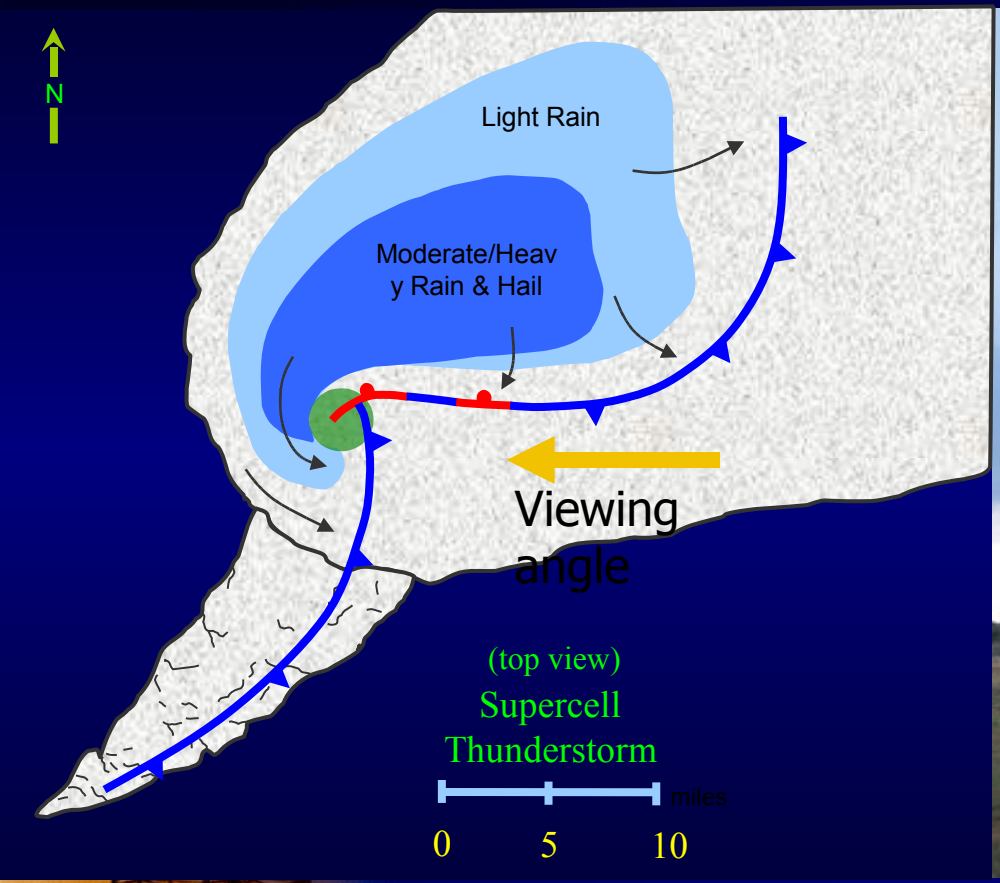
Spotter Positioning



Spotter Positioning

Copyright Jon Davies

Spotter Positioning

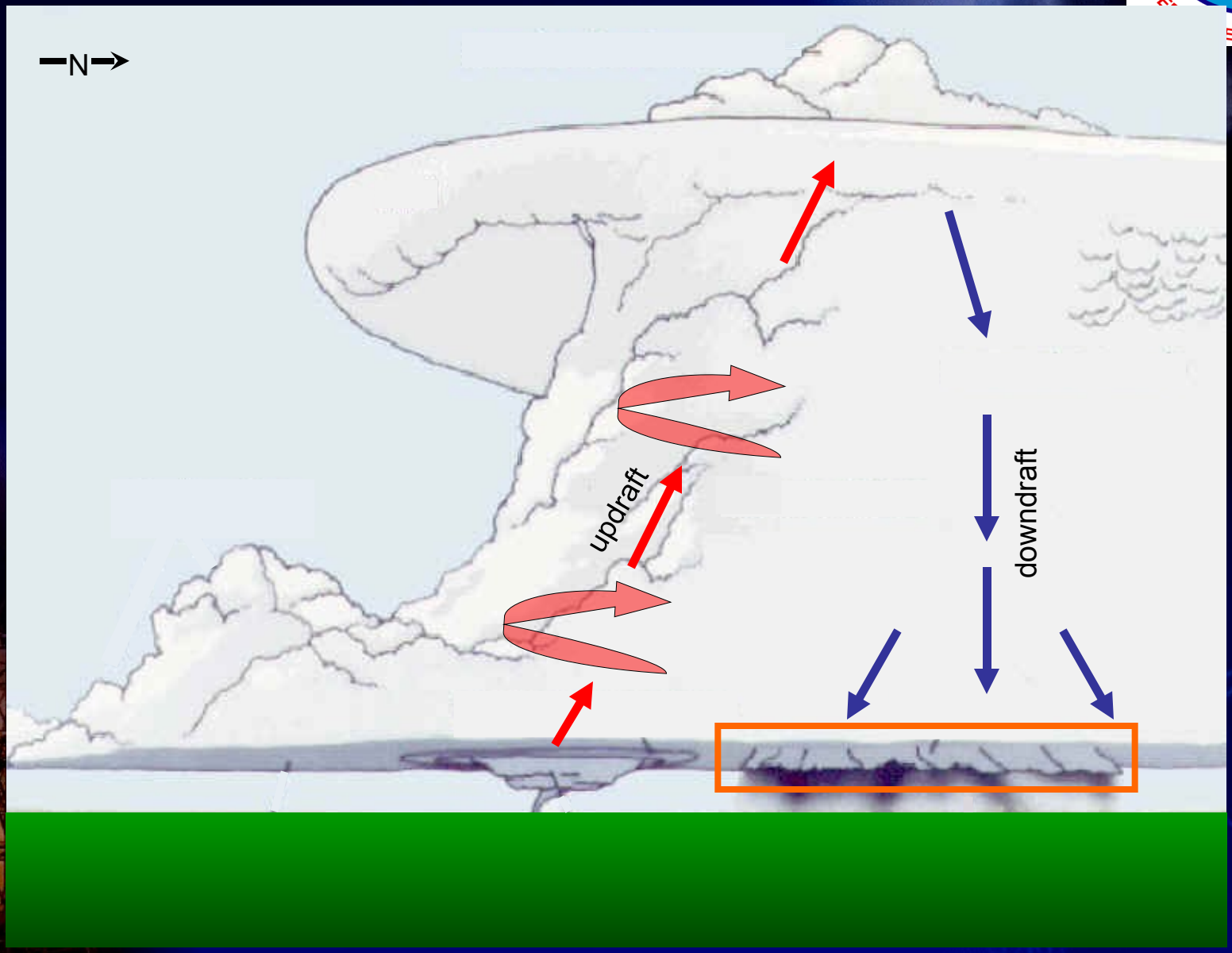


Spotter Positioning

Presentation Topics

- National Weather Service overview, mission, and products
- Severe weather climatology
- Why we need spotters
- What to report
- Thunderstorm development and types – Single, multicell, supercell
- Thunderstorm components – wall clouds, funnel clouds, land spouts, shelf clouds
- Thunderstorm phenomena look alike

Shelf Clouds



Shelf Cloud

Palmer

Shelf Clouds

-Marks the leading edge of the gust front

-Usually produced by rain cooled air

-Can be found on the FFD or RFD

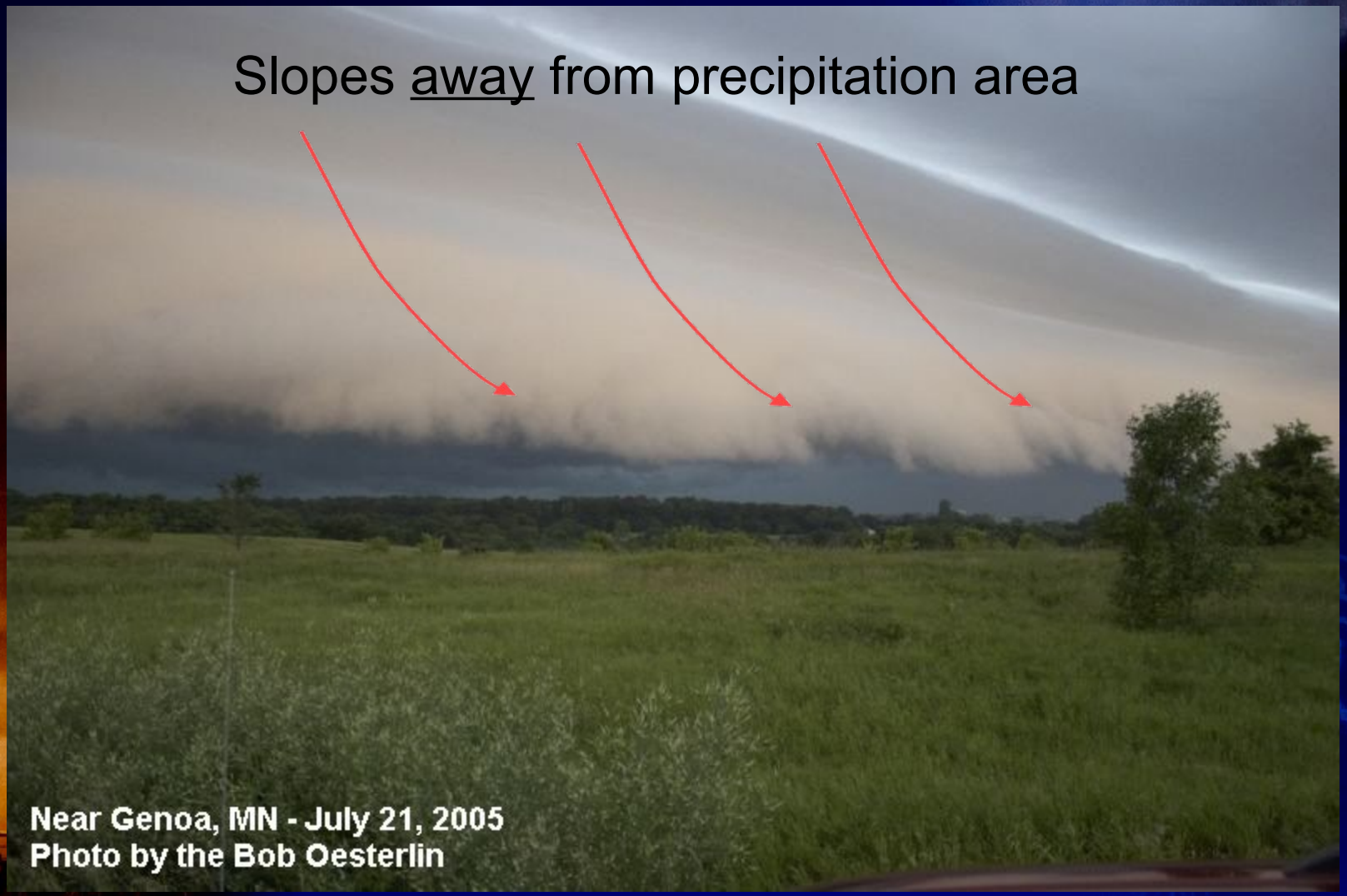
-Usually in area of low level shear

-Slope down away from precipitation area

-Often associated with a squall line- can be associated with gustnadoes or damaging straight-line wind

Shelf Clouds

Shelf Cloud = Outflow

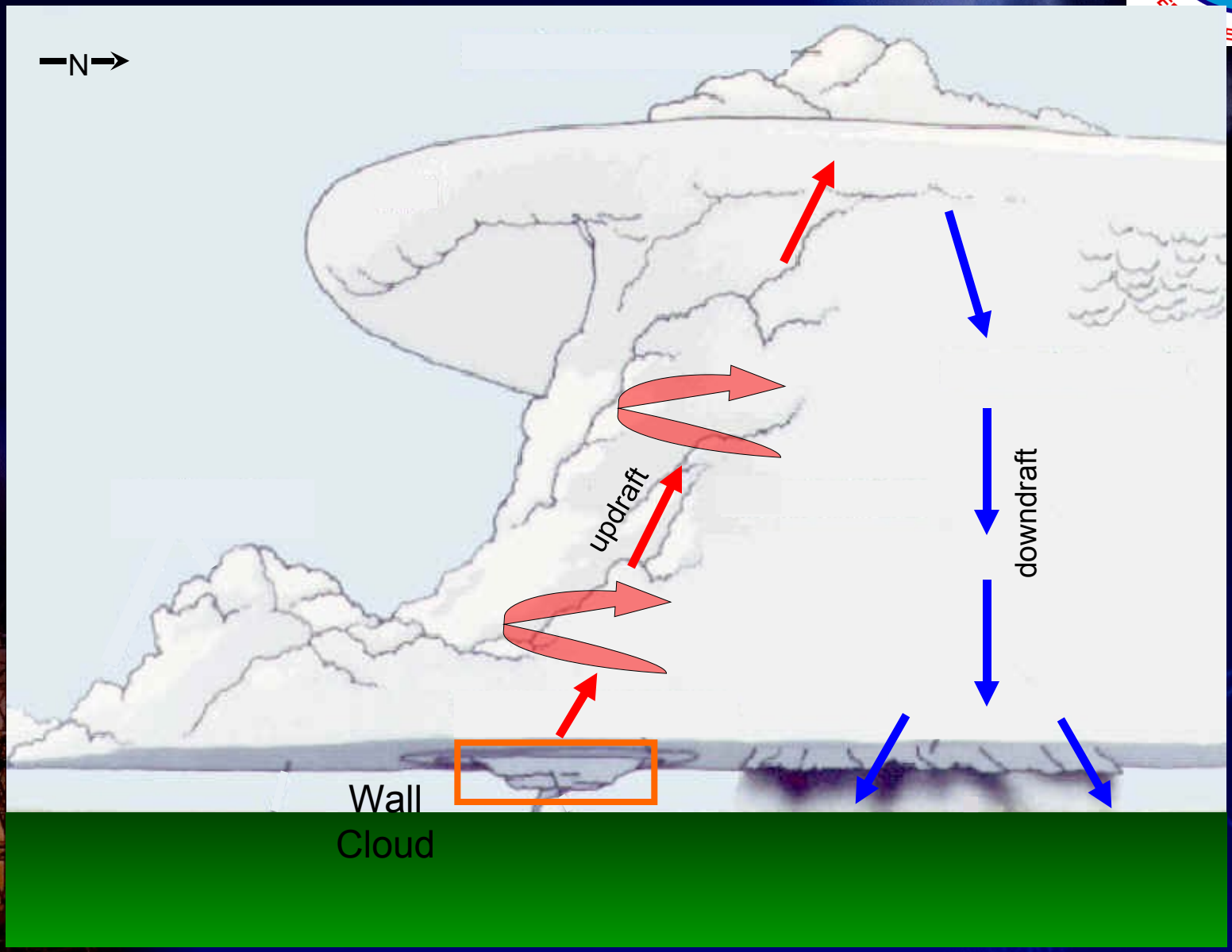


Shelf Cloud

Copyright Mike Umscheid

Shelf Cloud

Wall Clouds



The Mesocyclone

A storm-scale region of rotation, typically 2-6 miles in diameter.

The circulation of a mesocyclone covers an area much larger than the wall cloud or tornado that may develop within it.

The Wall Cloud

- A localized, persistent, lowering of the cloud from the rain free base.

- Normally found on the south/southwest (inflow) side of the thunderstorm.

- May exhibit rapid upward and downward motion, as well as rotation. However, not all wall clouds rotate.

Wall Cloud Characteristics

> Surface based inflow under the updraft

> Attached to cloud base

> Look for persistence

> May or may not rotate

>Look for vertical cloud motion

>Often slopes or points toward precipitation or downdraft

Wall Cloud Development

1a.

1b.

1c.

2a.

2b.

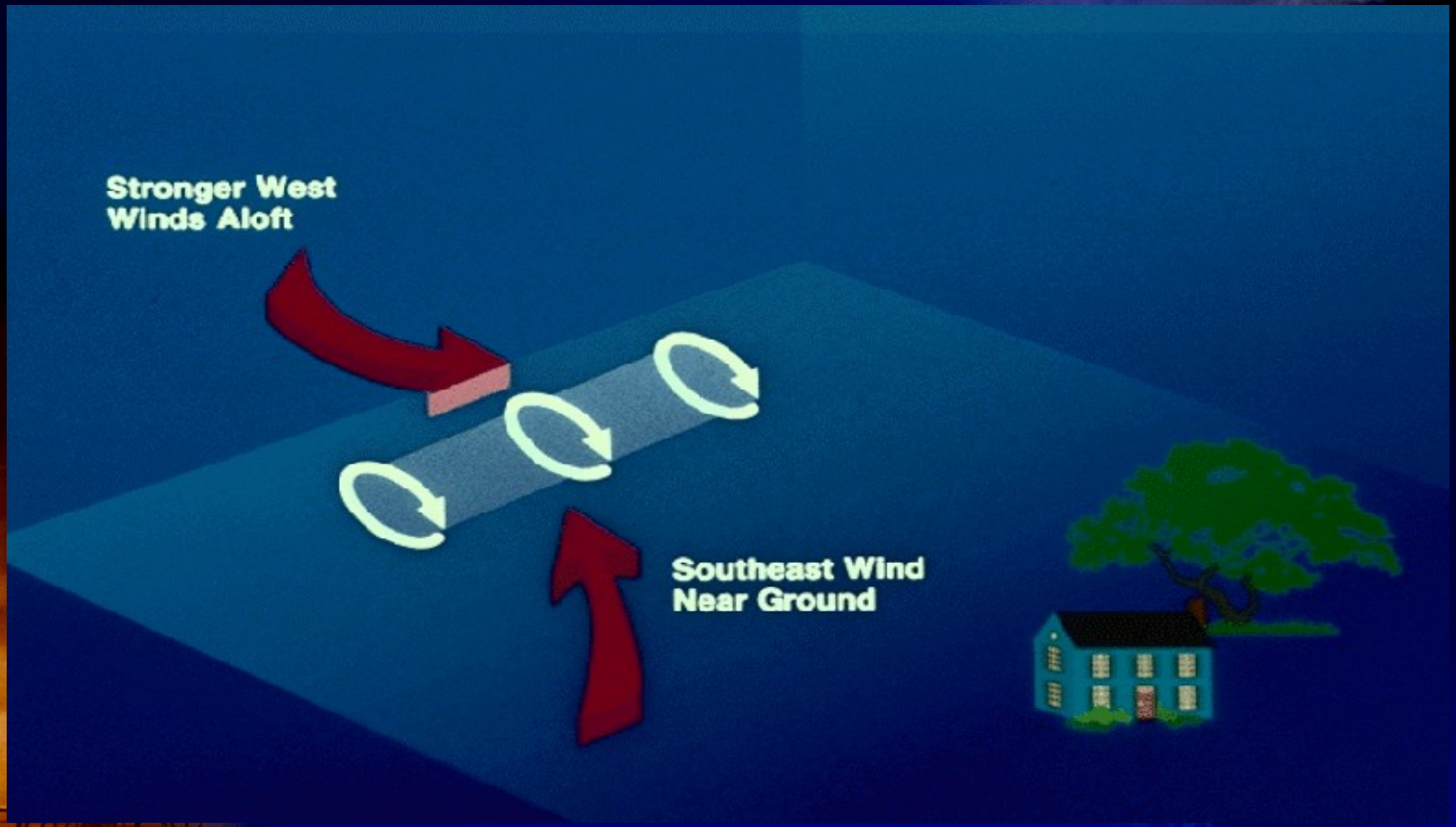
More examples of wall clouds…

Wall Cloud

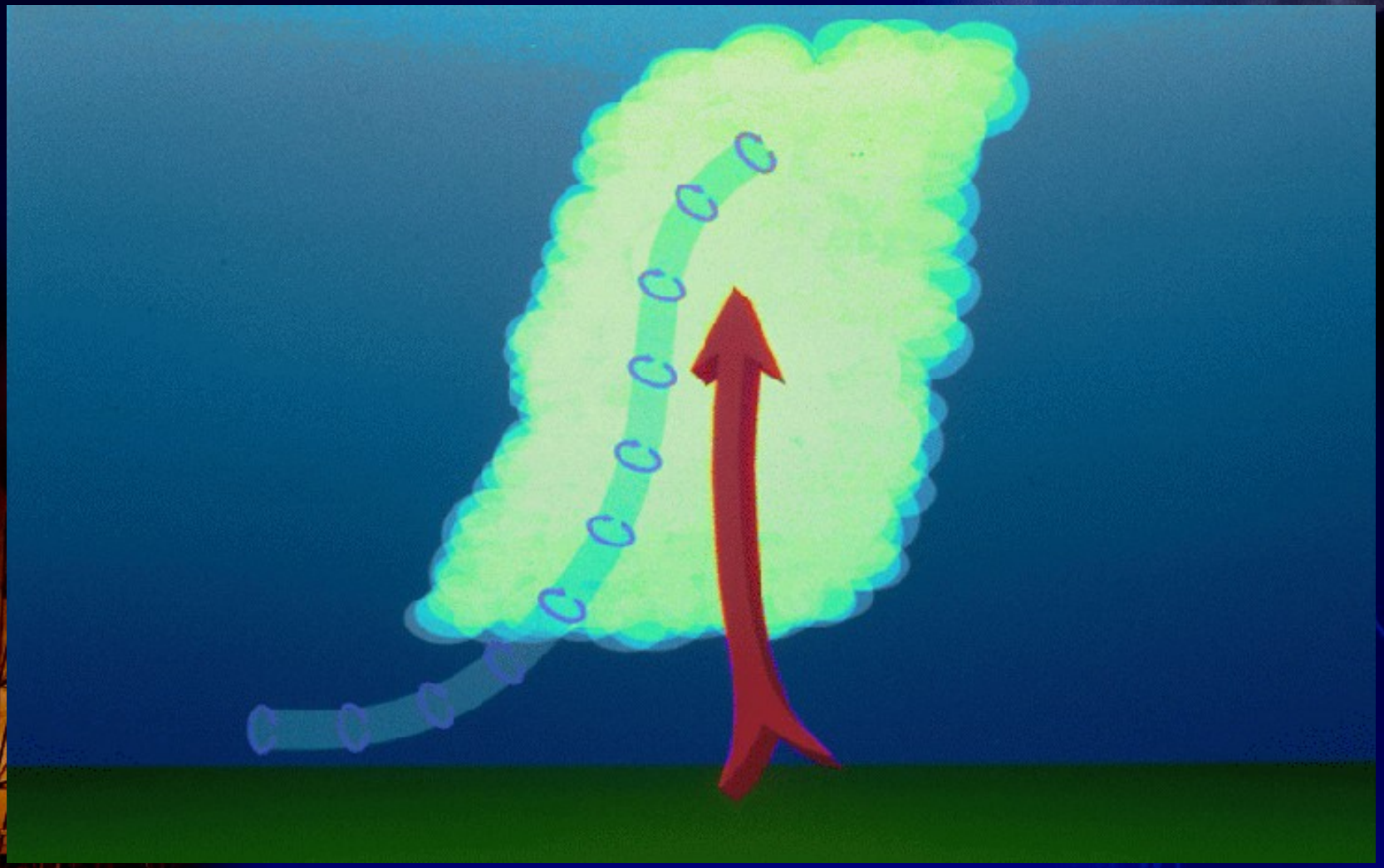
Wall Cloud / Shelf Cloud Summary

	Wall Cloud	Shelf Cloud
Associated with the updraft	Yes	No
Associated with the downdraft	No	Yes
Often slopes down toward the rain (downdraft)	Yes	No
Slopes down away from the rain (downdraft)	No	Yes
Sometimes associated with gustnadoes	No	Yes
Often associated with funnel clouds	Yes	No
Favored area for rotation	Yes	No

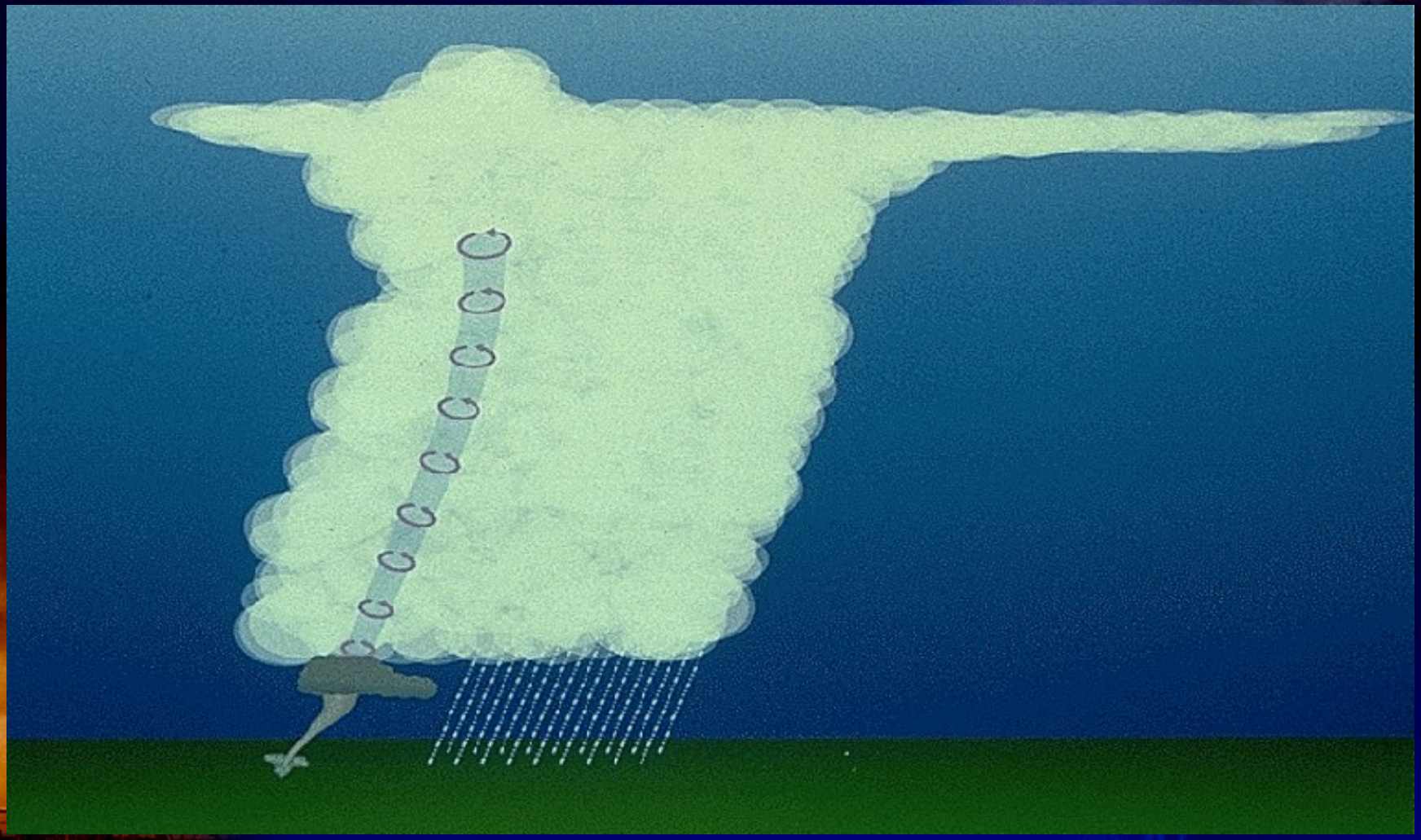
Tornado Formation



Tornado Formation



Tornado Formation



Funnel Clouds

> A rotating, funnel-shaped cloud extending downward from a thunderstorm base.

> Usually located near updraft but can be found anywhere

> Attached to cloud base

> Exhibit rapid rotation and are most often laminar or smooth in appearance

> Do not reach ground

Tornado

A violently rotating column of air extending from cloud base to the ground.

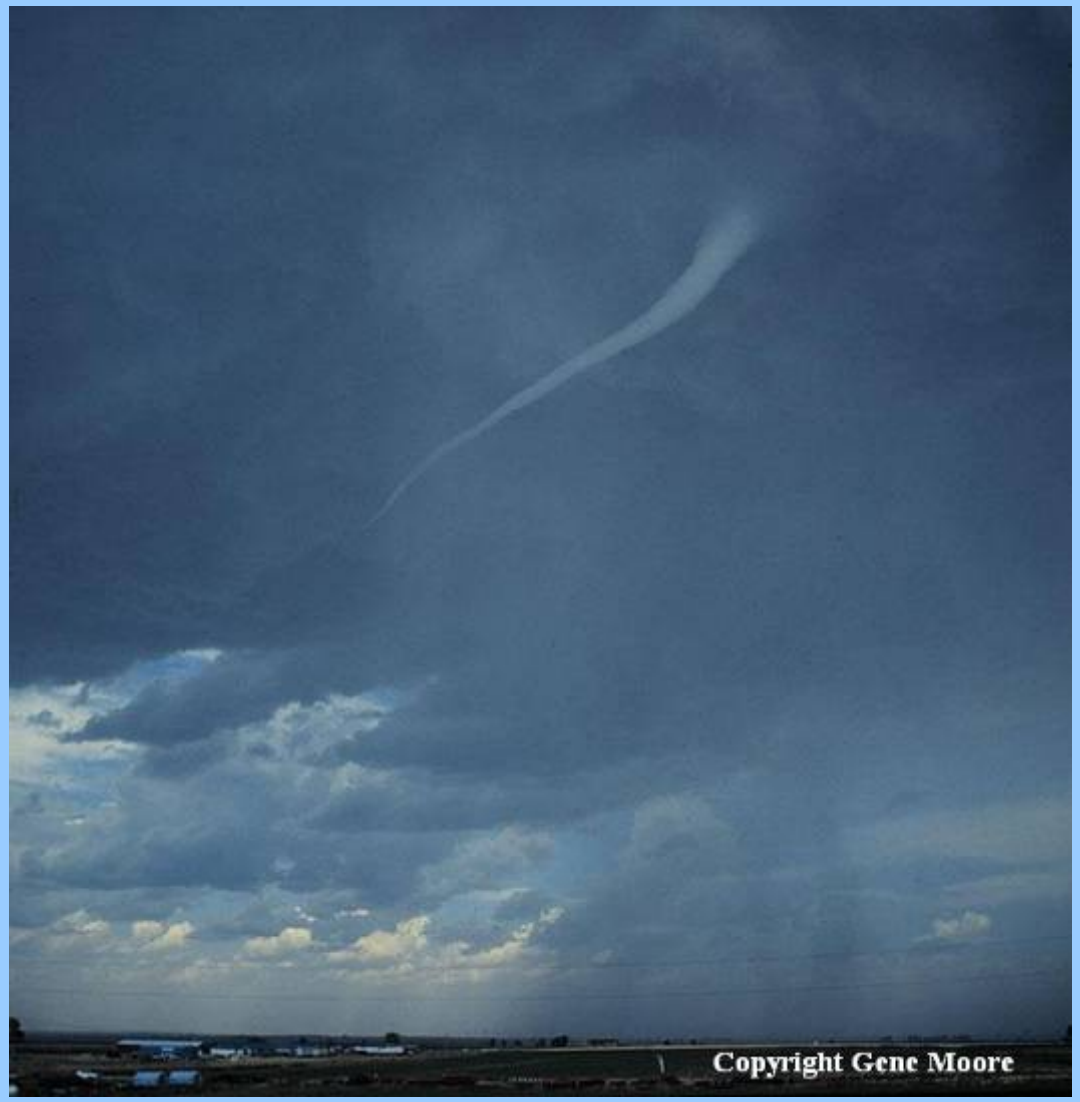
Funnel Cloud

Copyright Paul Craven

Funnel Cloud

Copyright Jason Parkin
KCCI

Funnel Cloud



Tornado

Copyright Mike Umscheid

Funnel Cloud or Tornado

Funnel Cloud or Tornado

Copyright Chris Gullikson

Tornado

Funnel Cloud/Tornado

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Tornado

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Look Alike

pyright Jeremy Grams

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Look Alike

Look Alike

Copyright Simon Brewer

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Look Alike

Look Alike

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Look Alike

Copyright Dave Chapman

Look Alike

Copyright
Susan Kula

Look Alike

Look Alike

Spotter Safety

- If a mobile spotter, use two people (an extra pair of eyes needed to watch skies above and behind you)
- If you are a mobile spotter, do not speed (especially on wet roads)
- If mobile, avoid dirt roads (they get extremely slick when wet)
- If mobile, park well off the road (and not under electrical lines)
- If mobile, never take shelter under a highway overpass

Spotter Safety

- Keep a one to two mile safety buffer zone between you and the storm. Have an escape route available.
- If a tornado approaches, when possible, move away at a right angle to the tornado- if this is not possible, abandon your vehicle for a sturdy shelter (like a house)- if no shelter is available, lay flat in a dry ravine or ditch away from your vehicle
- If indoors – the safest place is the basement, if a basement is not available, move to a small interior room away from windows

Lightning Safety

- The safest place to remain is indoors and away from windows and electrical appliances
- If mobile spotting, the safest place is to remain inside your vehicle
- If mobile spotting, do not park along fence lines, or near overhead electric/phone lines
- Avoid being the tallest object, and stay away from other tall objects such as isolated trees.
- If you can hear thunder, you are in danger of being struck by lightning. Take shelter.

Flood Safety

- Never cross through water covering the road unless absolutely sure the water depth is very shallow, the water is not moving, and the roadway is still intact. If the water covering a road is muddy (as it will be in most cases), water depth and road conditions will be hard to determine. In this case, turn around and find an alternate route.
- Water-filled roadway dips are difficult to see at night. Slow down! Hydroplaning is a real threat.
- Two feet of running water can pick up and carry most vehicles (including trucks and SUVs).
- Never underestimate the incredible power and force of fast moving water.
- If water levels are up to a bridge, do not cross it as it may be damaged and unable to support the weight of your vehicle.

Flood Safety

It may just be a whole lot deeper than what you think!

Remember, boats float, cars don't.

http://tadd.weather.gov

Don’t become another flood death statistic

Story County, IA

Nighttime Spotting

- Mobile spotting at night is especially dangerous
- Watch for ground based flashes produced by a tornado breaking power lines
- Note the wind direction and changes in wind direction
- Utilize lightning to note storm structure and possible lower cloud base
- Know your directional relationship to the storm
- Don’t confuse shelf clouds with wall clouds, look for signs of rising or rotating clouds.

Spotters Must

- Know the difference between a shelf cloud and a wall cloud
- Know that funnel clouds usually do not form on a shelf cloud
- Know that a low hanging cloud in the shape of a funnel, if not rotating, is NOT a funnel cloud
- Know the difference between blowing dust and a tornado
- Spotters must not exaggerate their report

How to Get Weather Information

NOAA WEATHER RADIO
S.A.M.E.

COMPUTER

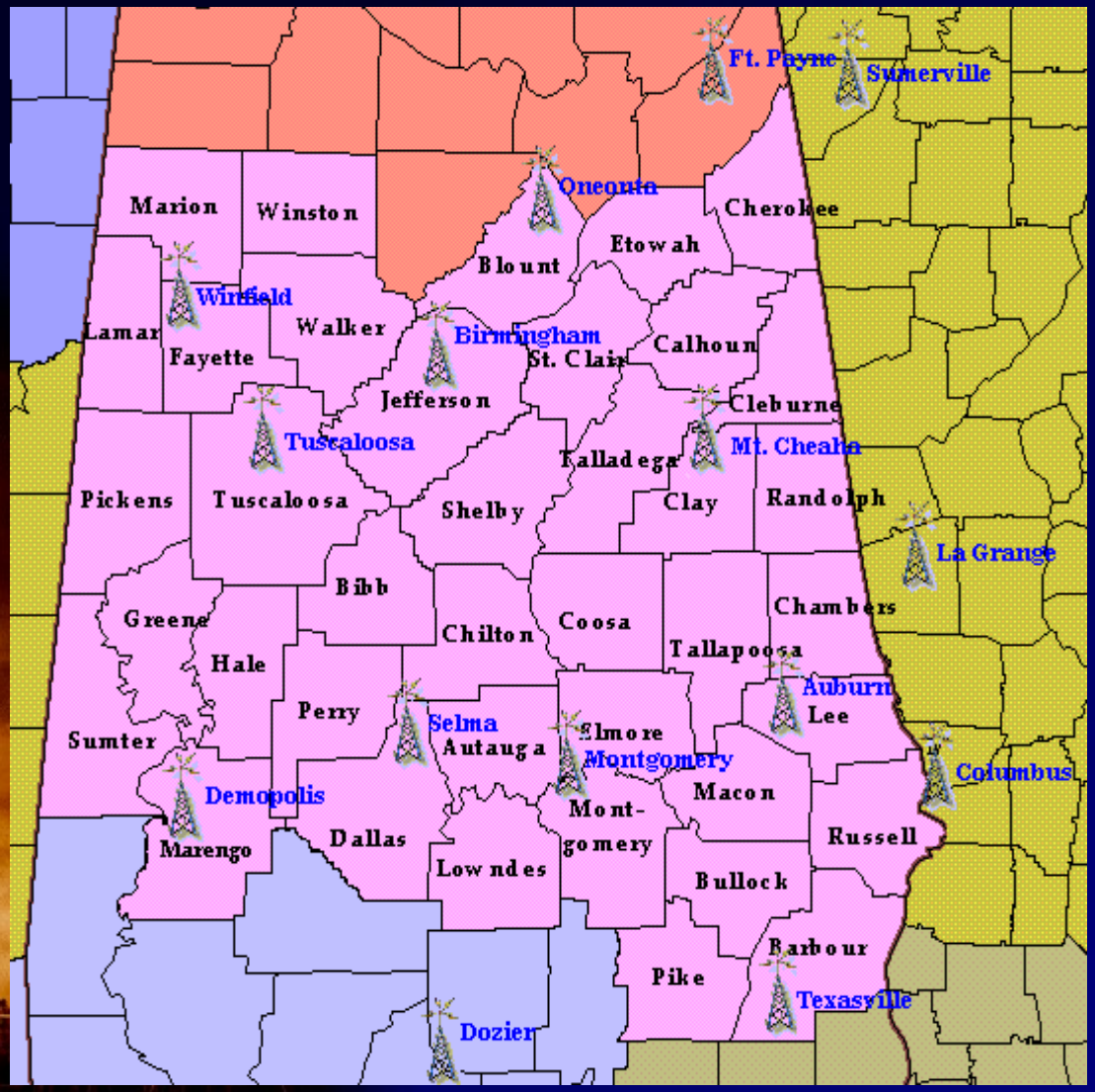
TELEVISION

BATTERY OPERATED RADIO

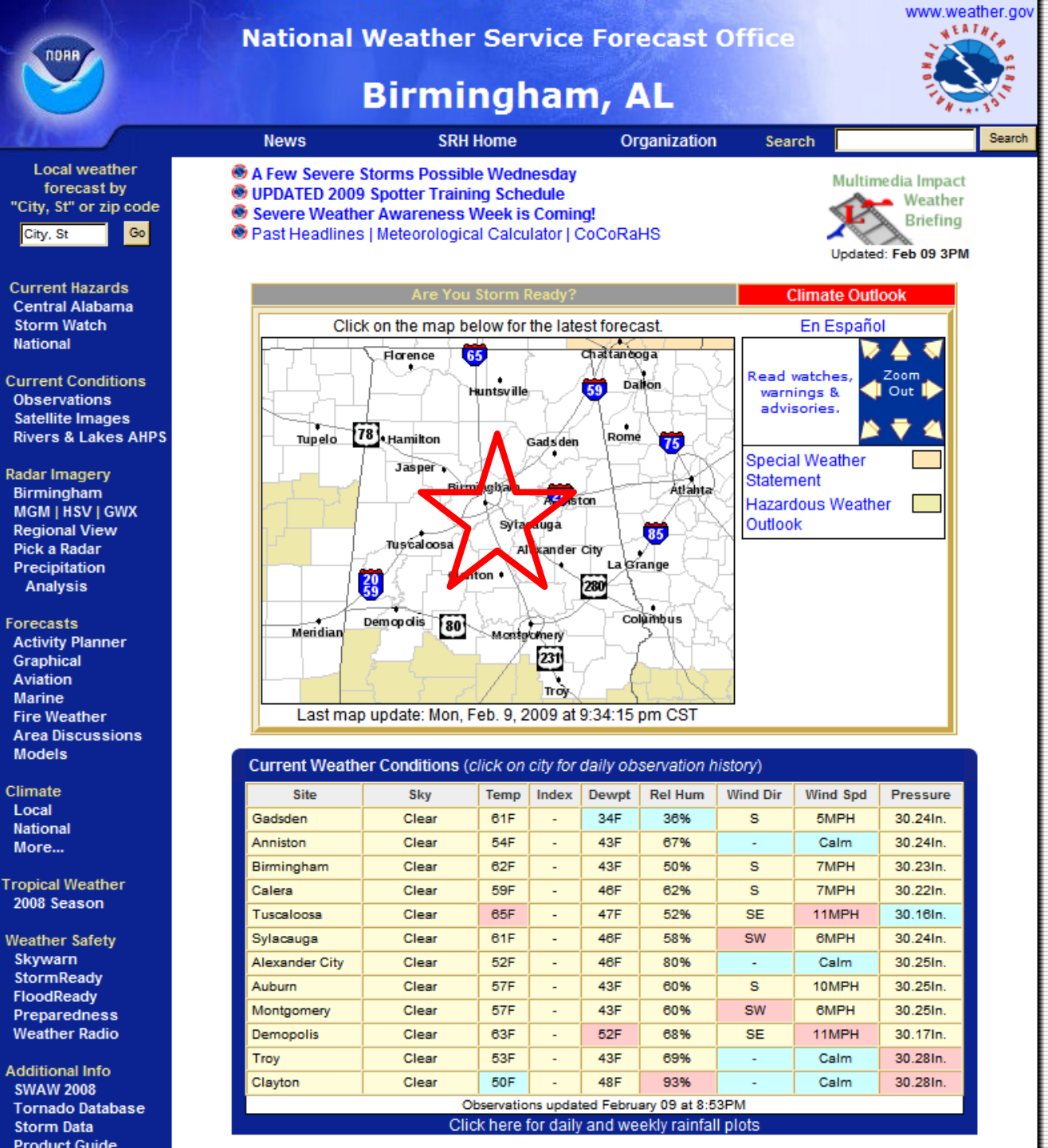
CELL PHONE

CAR RADIO

NOAA Weather Radio



- 10 Transmitters across Central Alabama
- NOAA Weather Radio is the fastest way to get our warnings!!!



Point Specific Information:

* Hazardous Weather Outlook

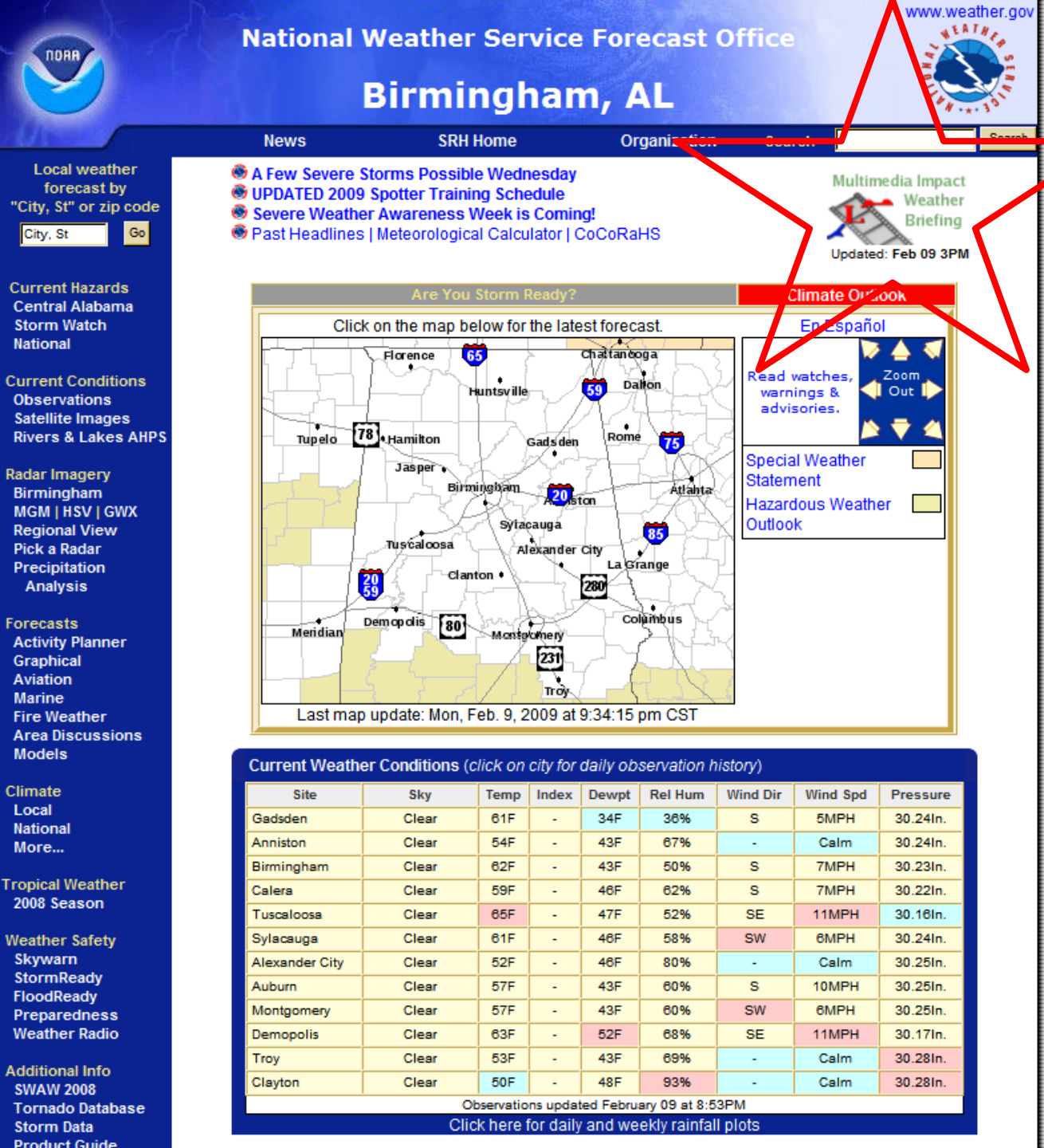
*Watches

*Warnings

* Severe Weather Statements

*Short Term Forecasts

National Weather Service . Since 1870



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National Weather Service . Since 1870

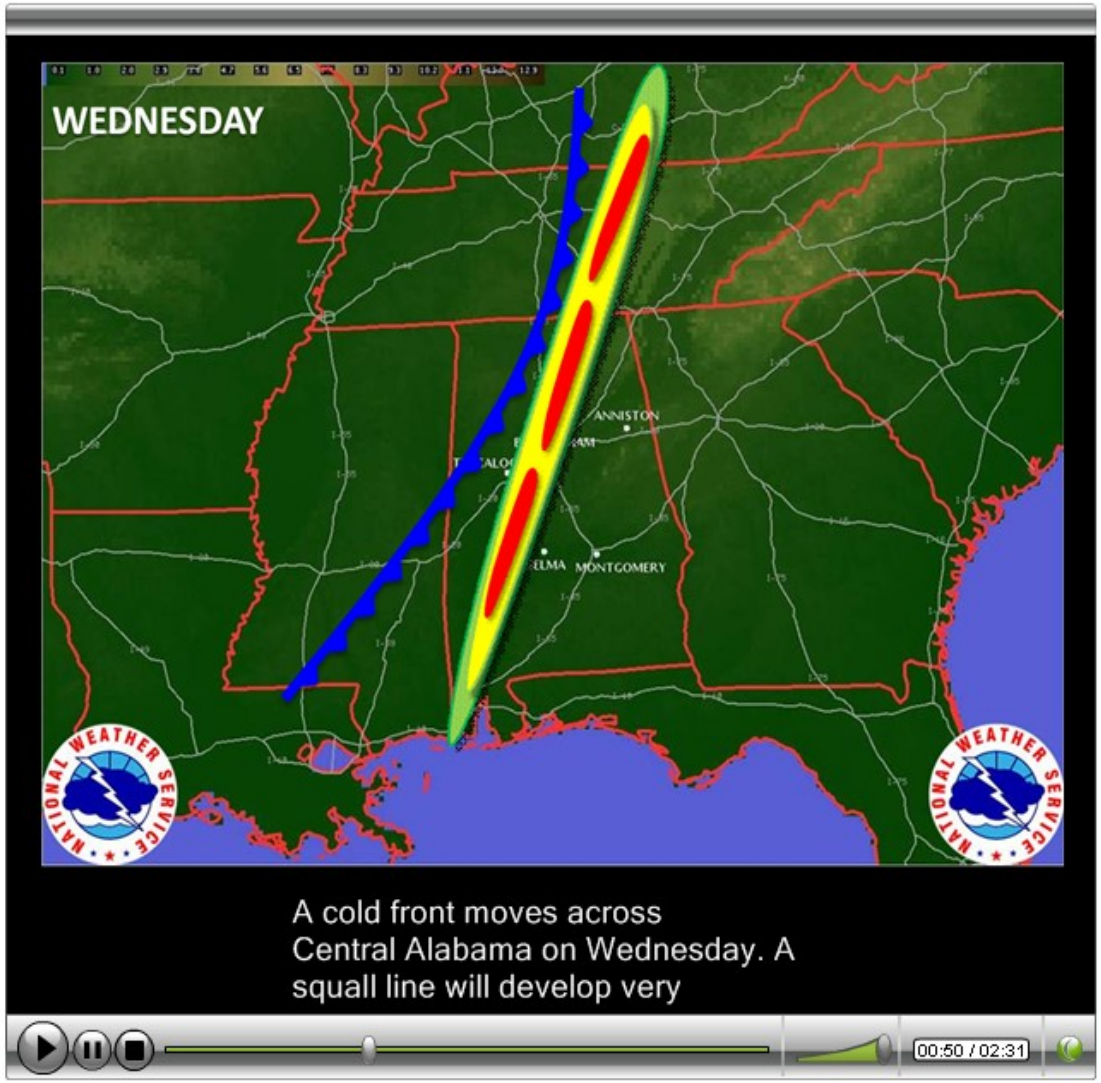
Daily Multimedia Impact Weather Briefing

The Central Alabama Impact Briefing is designed to keep you informed about any upcoming hazardous weather. The briefing will be updated at least twice per day when hazards are highlighted in the Hazardous Weather Outlook, with additional updates as needed. Information will consist of any potential hazards over the next 7 days, the latest forecast challenges and forecast uncertainty. Please be sure to take the online survey and let us know what you think about this product. Thank you!

You can listen to the MP3 audio file by clicking the Audio only (MP3) link below. The Multimedia Impact Weather Briefing uses the latest Flash Player from Macromedia/Adobe. You can download the latest Flash player for free here. Otherwise, just click on the movie to begin the briefing.

Audio only (MP3)

Online Survey




1-800-856-0758
Please Call in
Your reports!

We want your storm photos!!

If you have any storm photos or videos that you would like to share with us, please e-mail them to your local NWS. Include your name, date of the photo, where the photo was taken, and a description of the photo. Also indicate if you give the NWS permission to use the photo. We are interested in ALL weather phenomenon and cloud types. The best photos or videos are those taken which show a wide view of thunderstorm structure. Close-ups are good, but they do not allow others to take in the bigger picture (no pun intended). It is this wider perspective that allows others to learn by seeing the structure of a specific phenomenon relative to that of the entire thunderstorm.

Spotter Presentation Reference Material Website

http://www.srh.noaa.gov/bmx/SpotterTraining/SpotterTraining.html

- Business Cards / NWR Frequencies
- Spotter Certificates
- Web Links Page
- SPC Risk Level Page

Spotter Presentation Reference Material

Who issues *your* severe weather watches and warnings

National Weather Service
465 Weathervane Road
Calera, AL 35040
(205)-664-3010
www.srh.noaa.gov/bmx

....it's all about saving lives

NOAA Weather Radio Frequencies

Birmingham	Central, AL	162.550 MHz
Anniston	East Central, AL	162.475 MHz
Oneonta	North Central, AL	162.425 MHz
Selma	Central, AL	162.450 MHz
Demopolis	West Central, AL	162.475 MHz
Texasville	Southeast, AL	162.475 MHz
Montgomery	Central, AL	162.400 MHz
Tuscaloosa	West Central, AL	162.400 MHz
Winfield	Northwest, AL	162.525 MHz
Auburn	East Central, AL	162.525 MHz

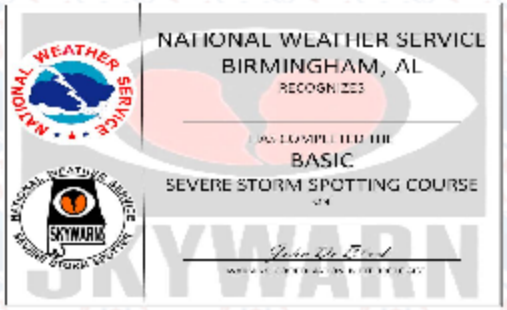
Download business card (front)

Note: When printing the cards with Adobe Reader make sure Page Scaling is set to None in the Page Handling section of the print menu.

Download business card (back)

Note: When printing the cards with Adobe Reader make sure Page Scaling is set to None in the Page Handling section of the print menu.

Basic Spotter Course Certificate



Advanced Spotter Course Certificate

Download our page of essential NWS links

QUESTIONS, SUGGESTIONS, OR COMMENTS?

John.DeBlock@noaa.gov , (205) 664-3010

or visit our website at:

www.srh.noaa.gov/bmx

Spotters are the eyes and ears of the National Weather Service. Without your help, our job of warning would be very difficult.

We thank you for your participation!

That number again…

1-800-856-0758

The End

Questions or Comments?

John.DeBlock@noaa.gov