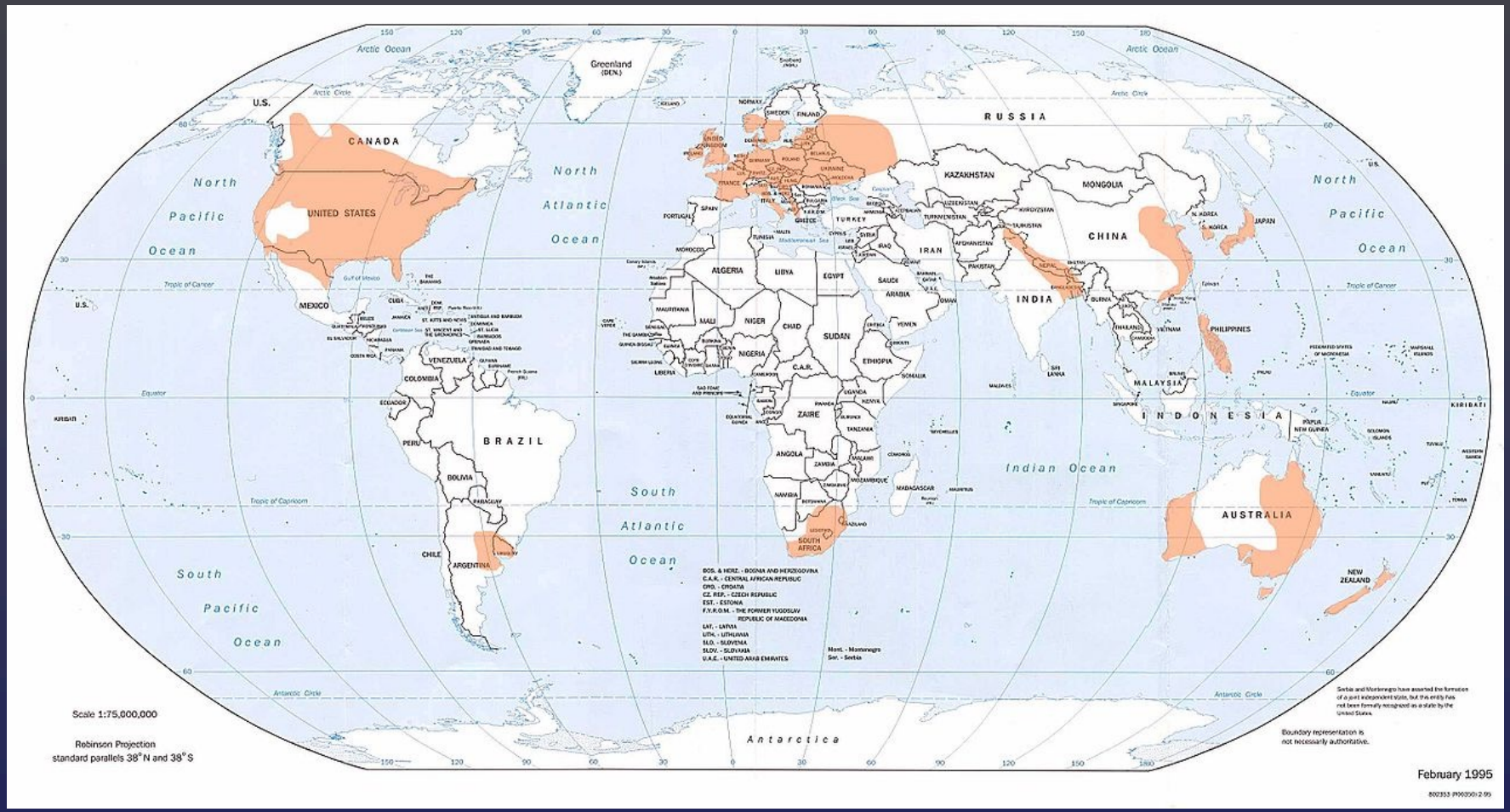
Severe Weather and Storm Chasing

UFSP 100

Ross A. Lazear

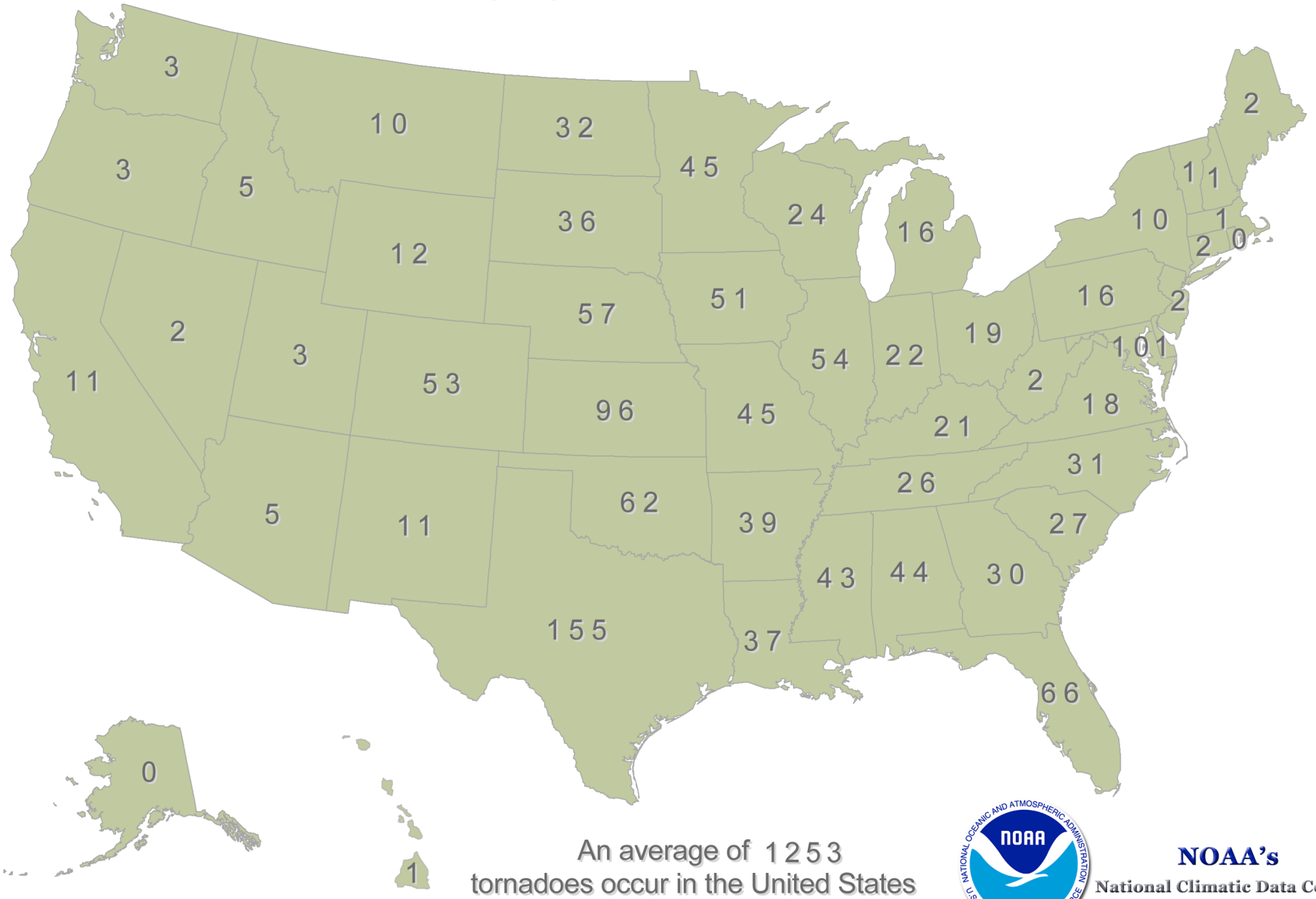
Global Tornado Occurrence



National Climatic Data Center (NCDC)

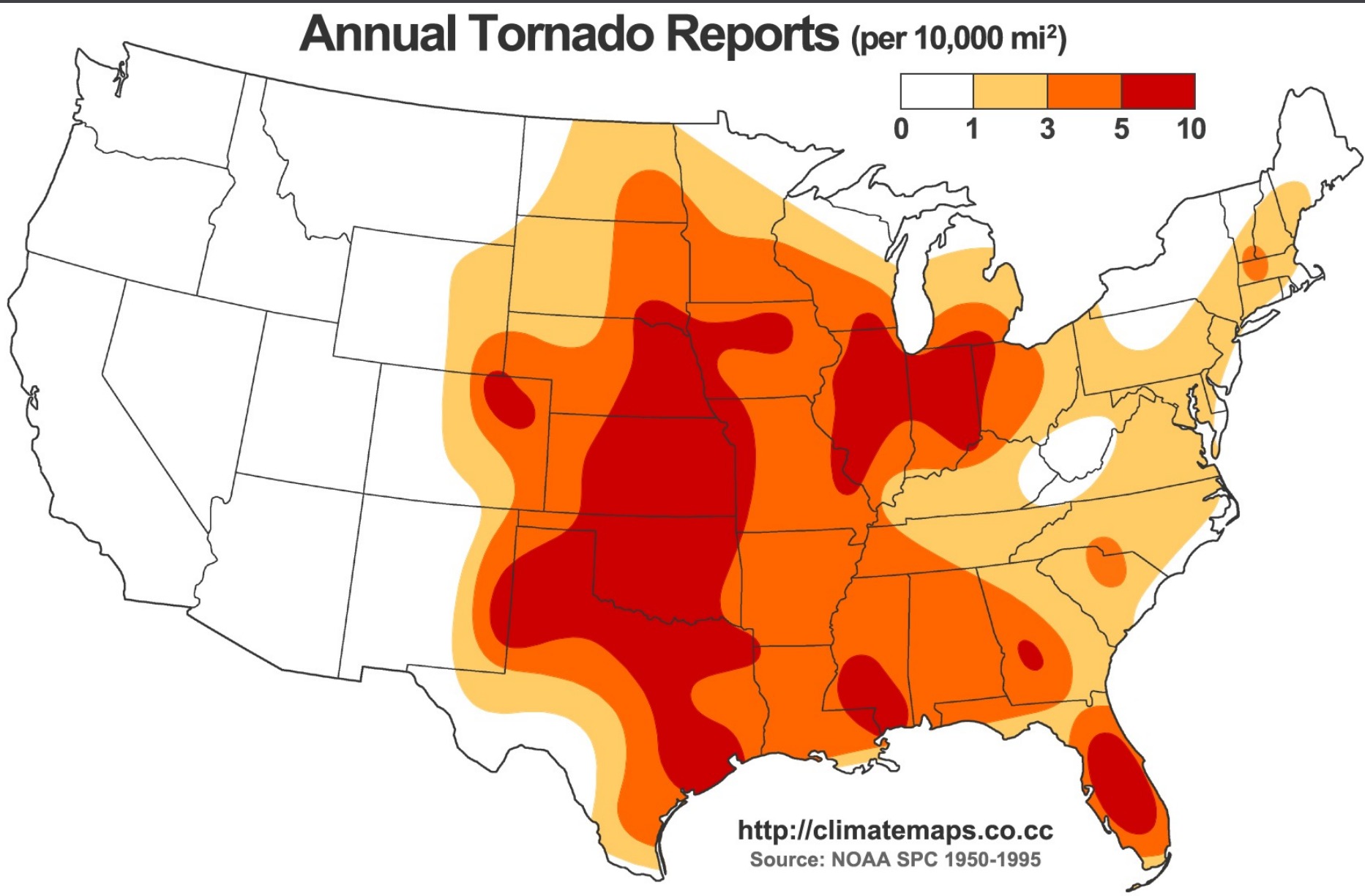
Average Annual Number of Tornadoes

Averaging Period: 1991 - 2010



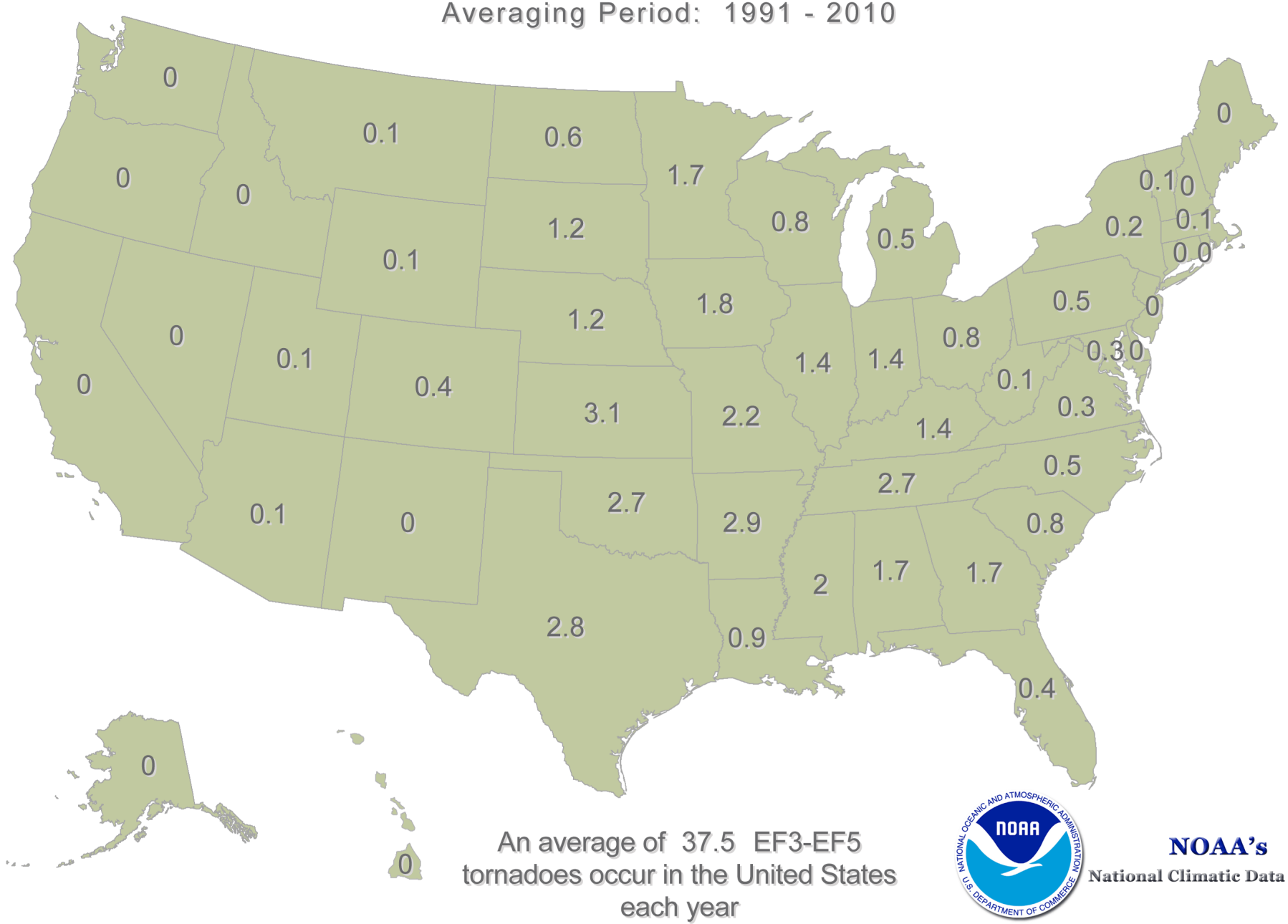
An average of 1253 tornadoes occur in the United States each year

NOAA's National Climatic Data Center


Annual Tornado Reports (per 10,000 mi²)
0
1
3
5
10
http://climatemaps.co.cc
Source: NOAA SPC 1950-1995

Average Annual Number of EF3-EF5 Tornadoes

Averaging Period: 1991 - 2010



An average of 37.5 EF3-EF5 tornadoes occur in the United States each year

NOAA's National Climatic Data Center

Why "Tornado Alley"?

Perfect combination of . . .

- Warm, moist air at surface
- Cool, dry air aloft (> ~2 km above surface)

  -Instability

- Coupled with this is often a change in wind speed and direction with height

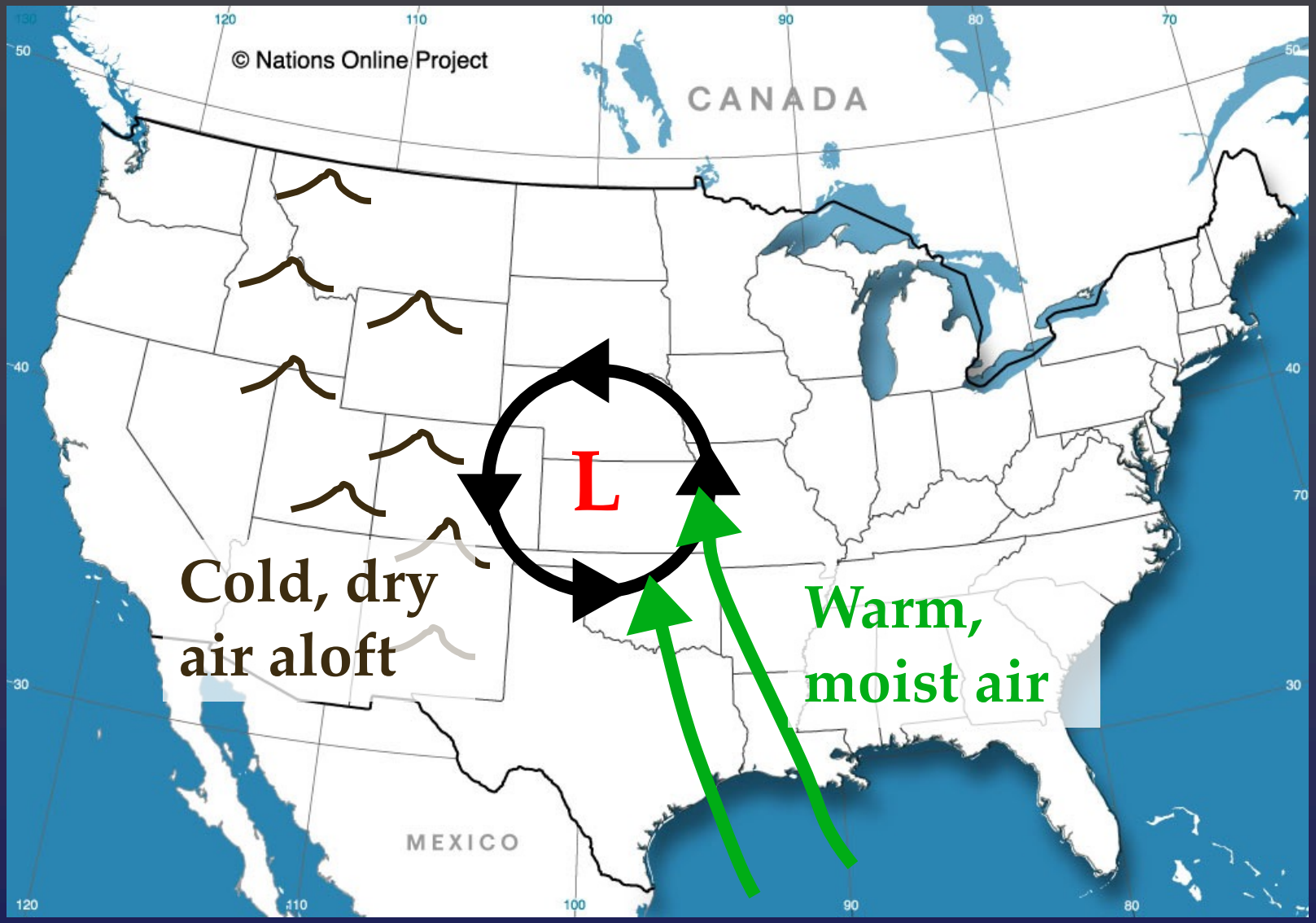
  -Wind shear

Why are these tornado ingredients, and why are they such a common occurrence in Tornado Alley?

Why "Tornado Alley"?

Why "Tornado Alley"?

Why "Tornado Alley"?



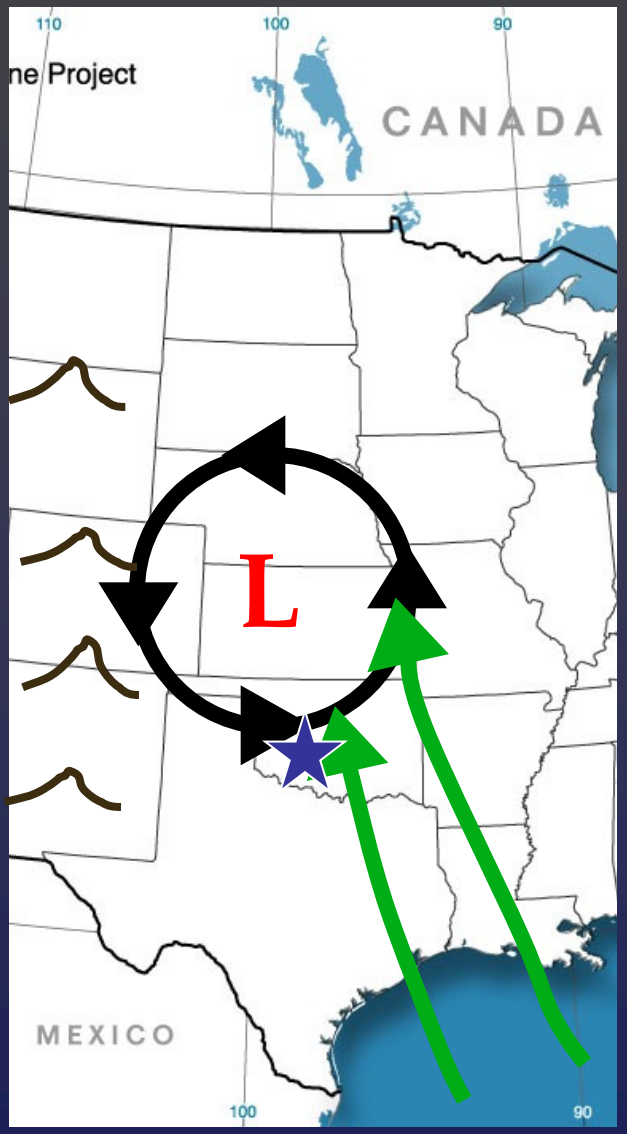
Why "Tornado Alley"?

-- ~10 km: Top of troposphere

Cold, dry air aloft

--1 km

Warm, moist air



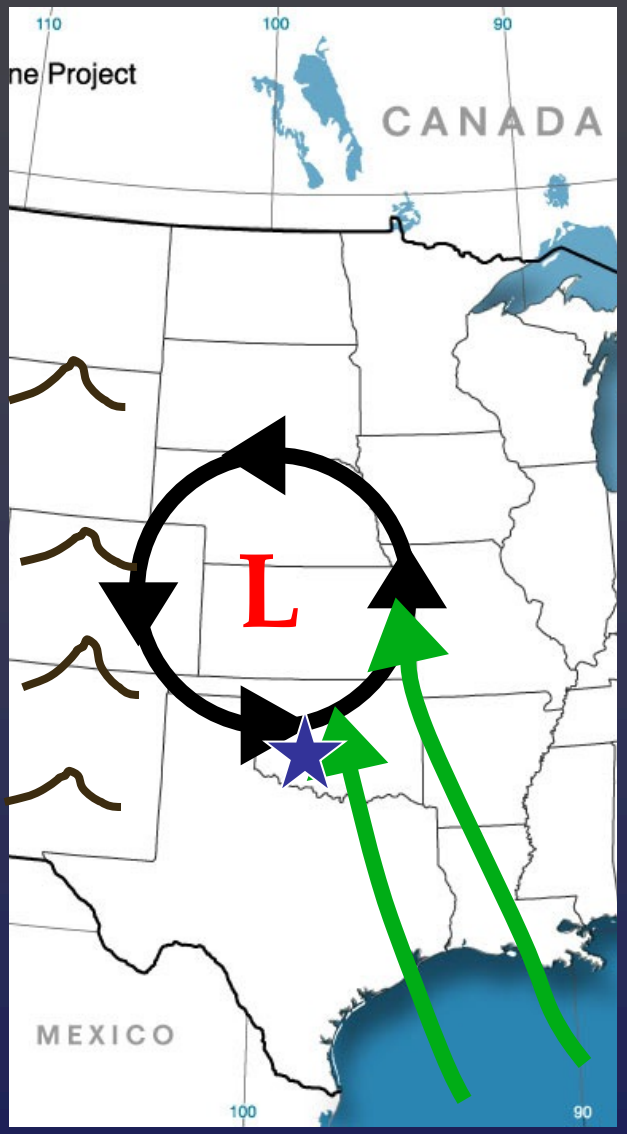
Why "Tornado Alley"?

-- ~10 km: Top of troposphere

Cold, dry air aloft — **More dense**

--1 km

Warm, moist air — Less dense



Why "Tornado Alley"?

-- ~10 km: Top of troposphere

Cold, dry air aloft

More dense

--1 km

Warm, moist air

Less dense

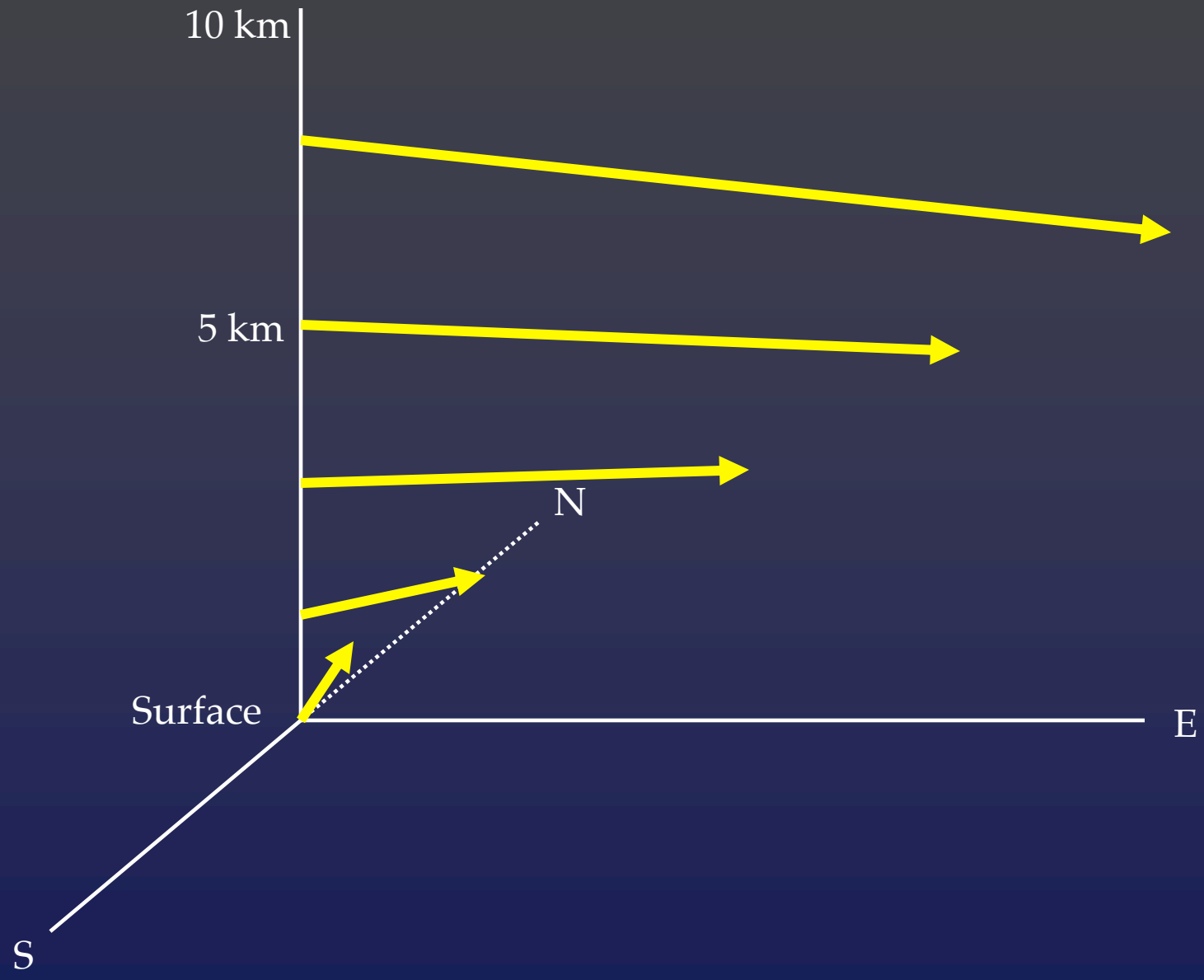
As in the convection tank:

Warm, less dense air rises

Now we have convection (cumulonimbus).
How do we get **ROTATION**?

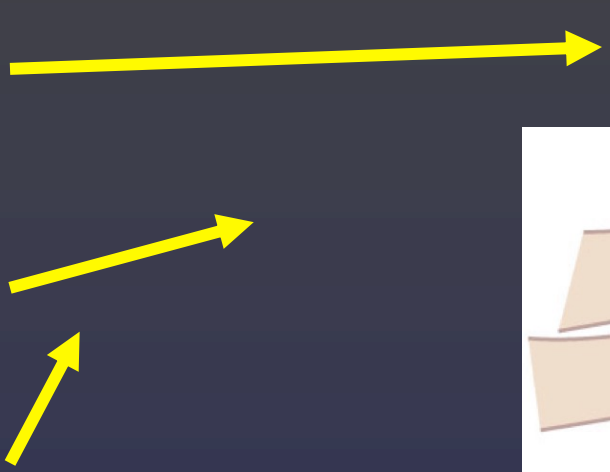
Vertical wind shear

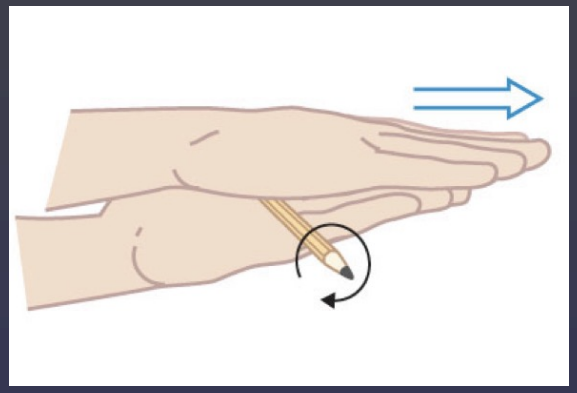
Change in wind speed and direction with height



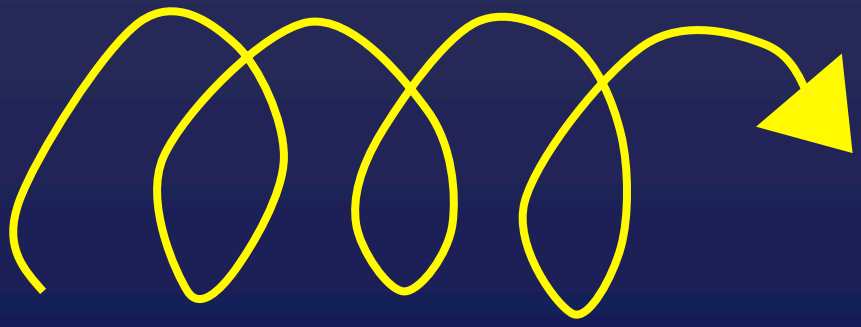
Vertical wind shear

Change in wind speed and direction with height

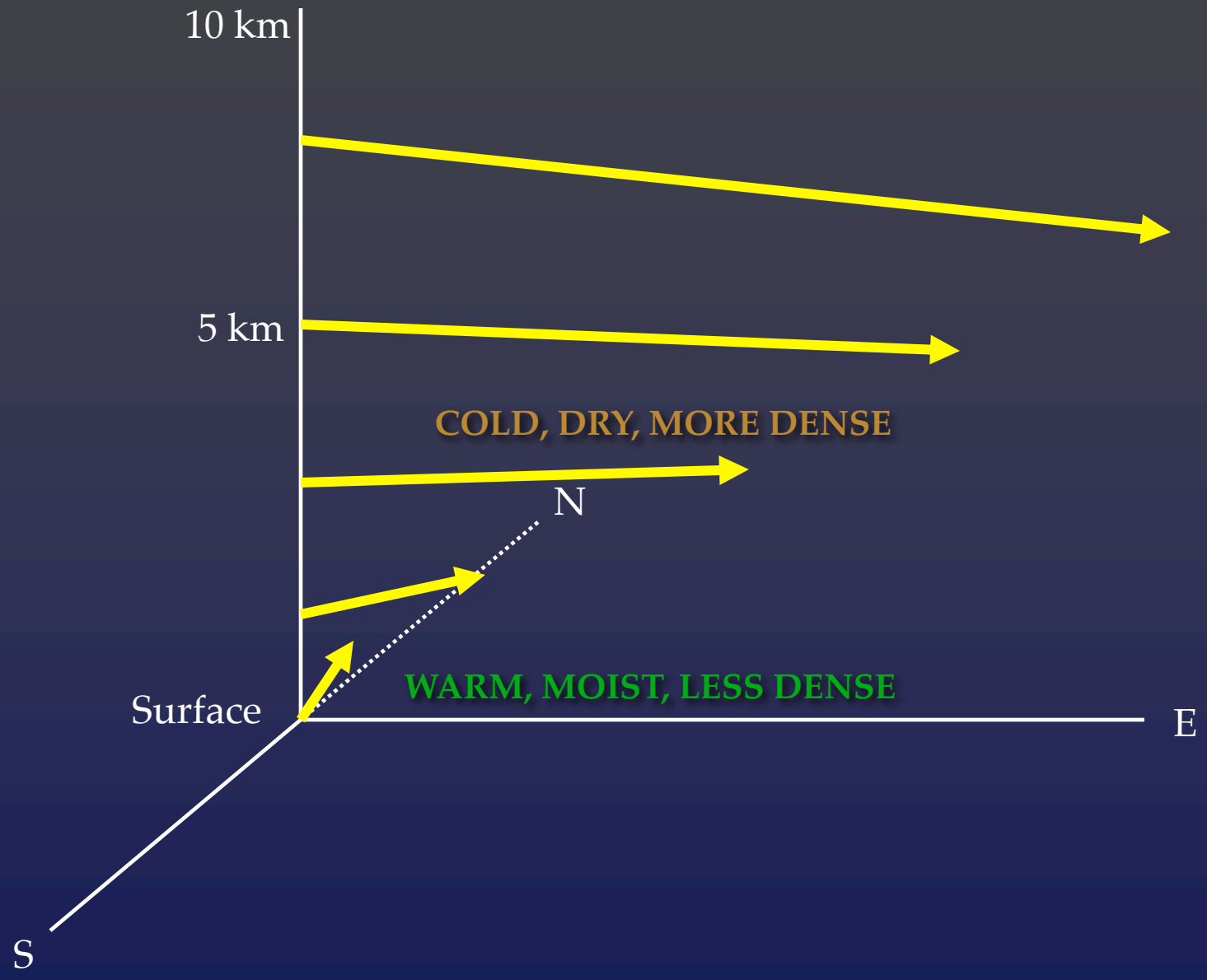




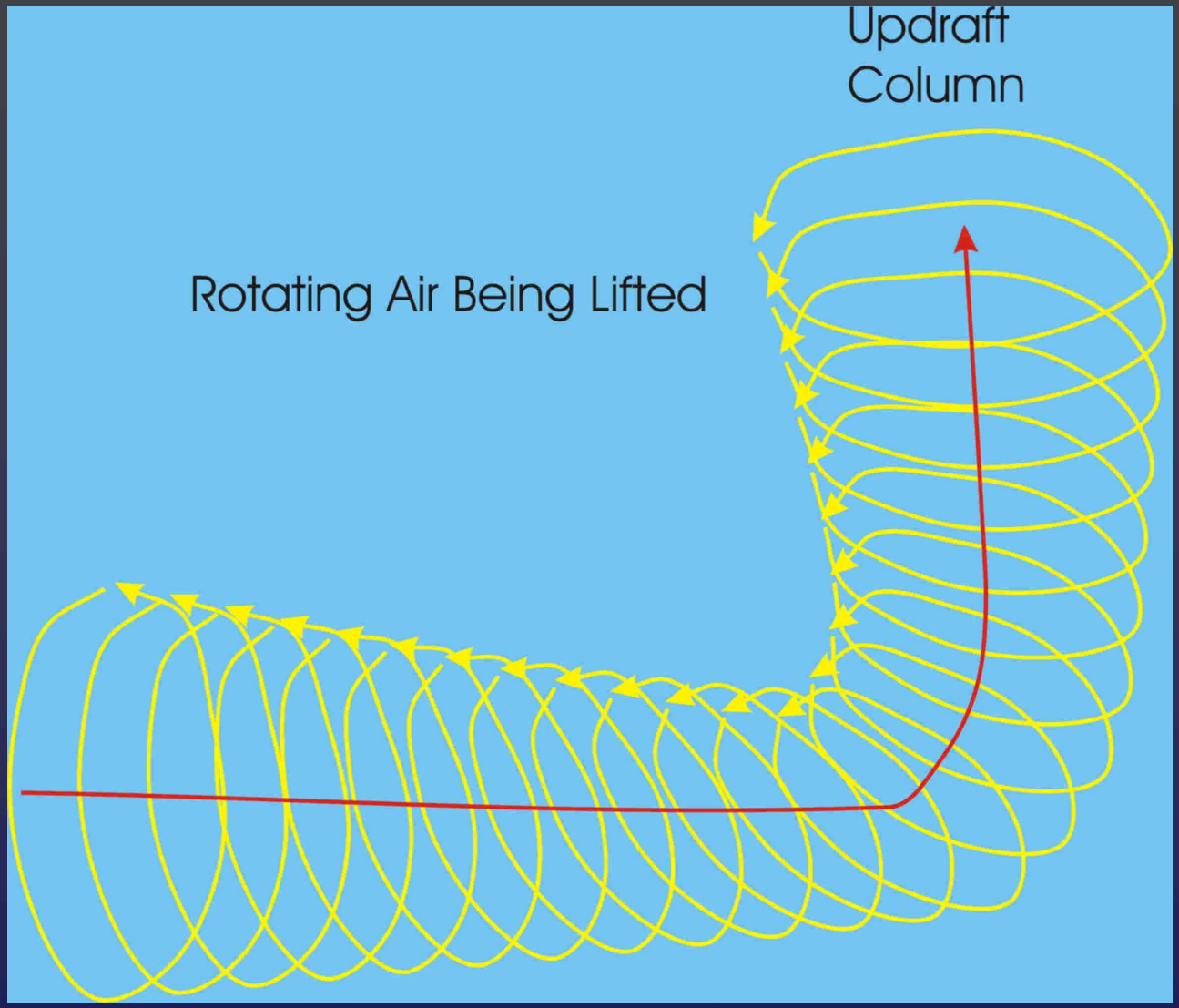
Wind shear creates a horizontal vortex



Add instability . . .



Convective "updraft" plus Vertical wind shear



From MadSciTech.org

2324 UTC
27 May
2014

Castroville
Texas

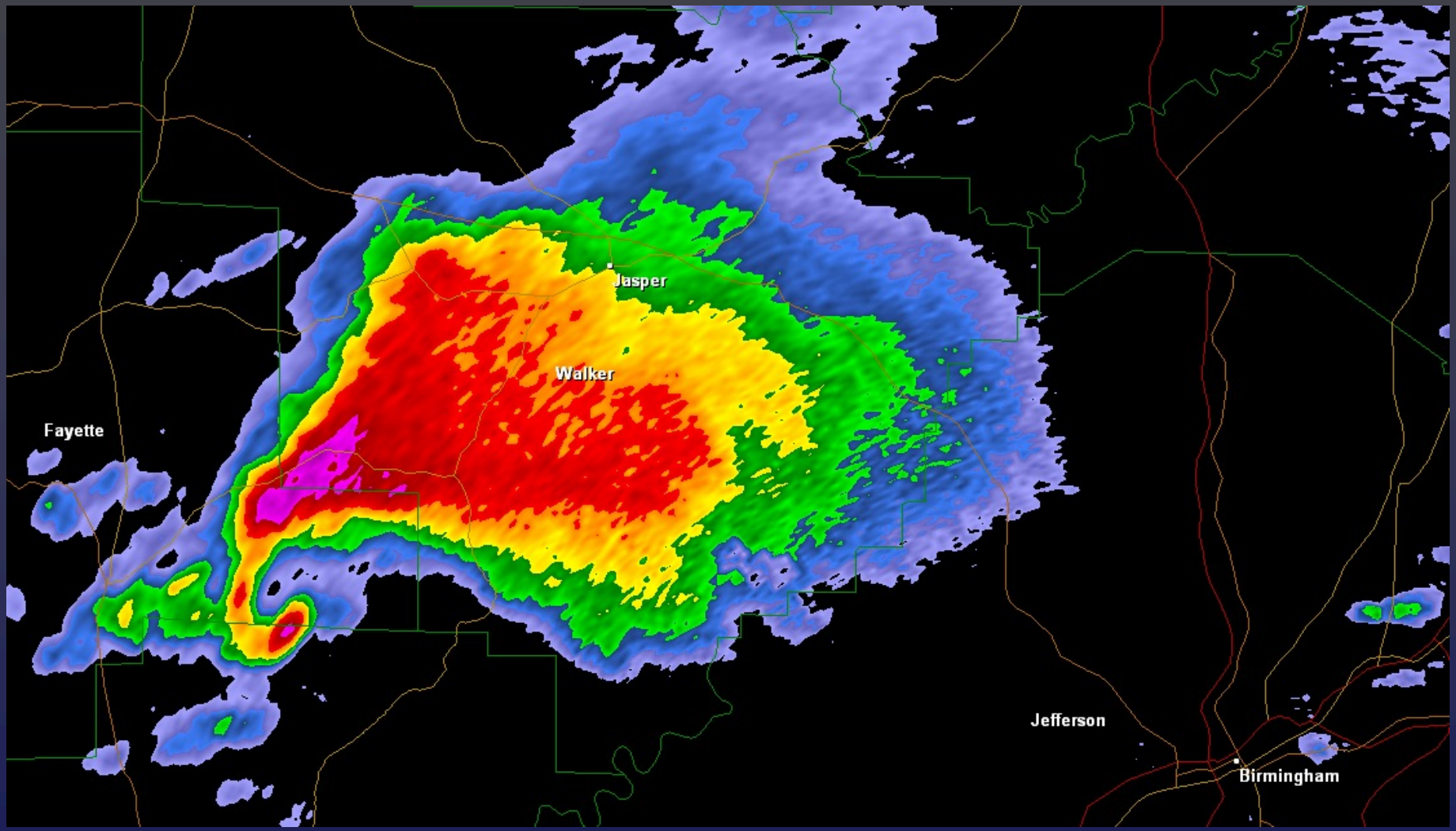
2334 UTC 27 May 2014 – Castroville, Texas

2337 UTC 27 May 2014 – Castroville, Texas

Photo by Mike Hollingshead
June 13, 2004 – Alvo, Nebraska

Supercell Thunderstorm

A thunderstorm with a rotating updraft (mesocyclone)



Supercell near Birmingham, AL on April 27, 2011

Supercell Thunderstorm

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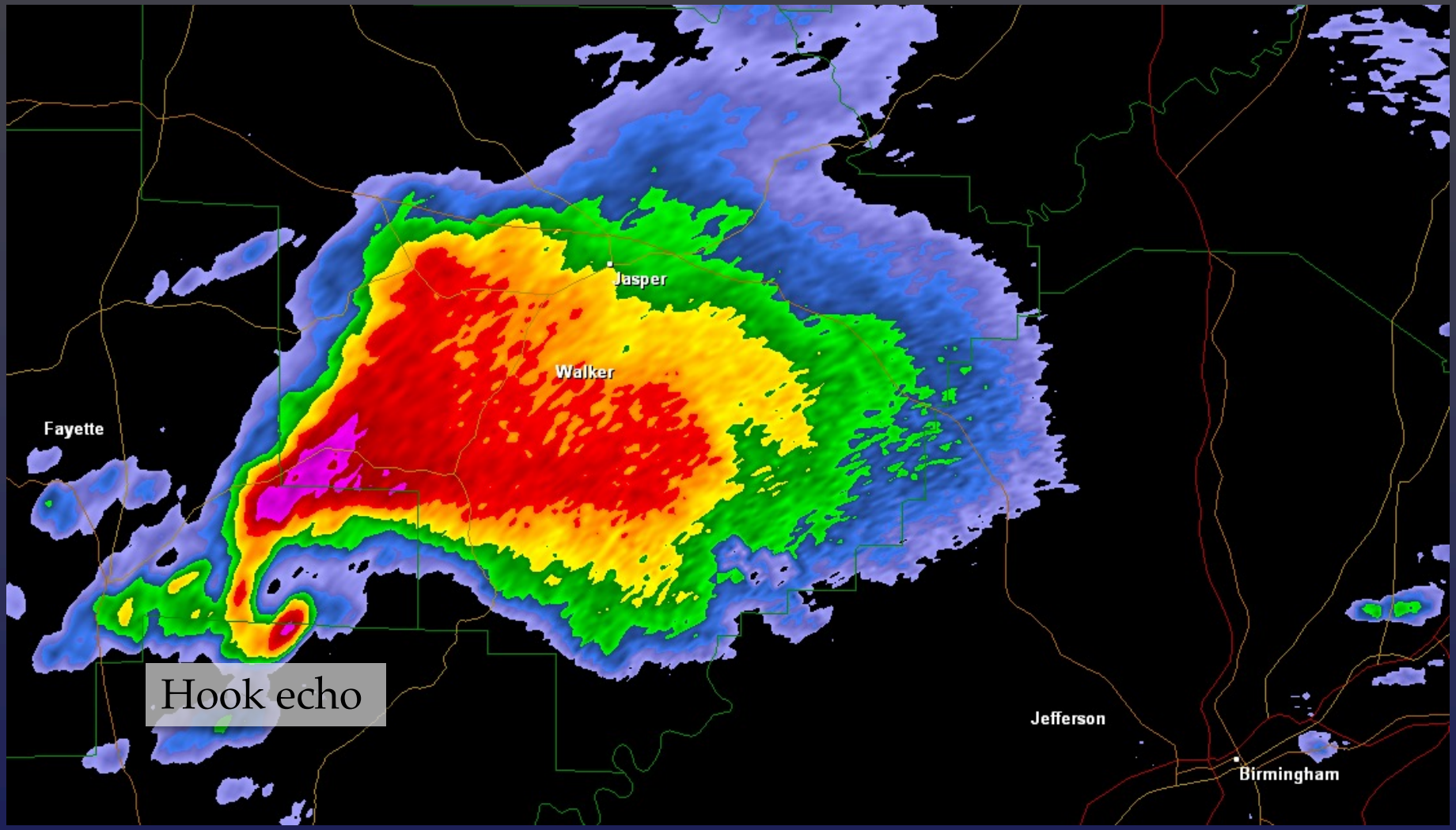

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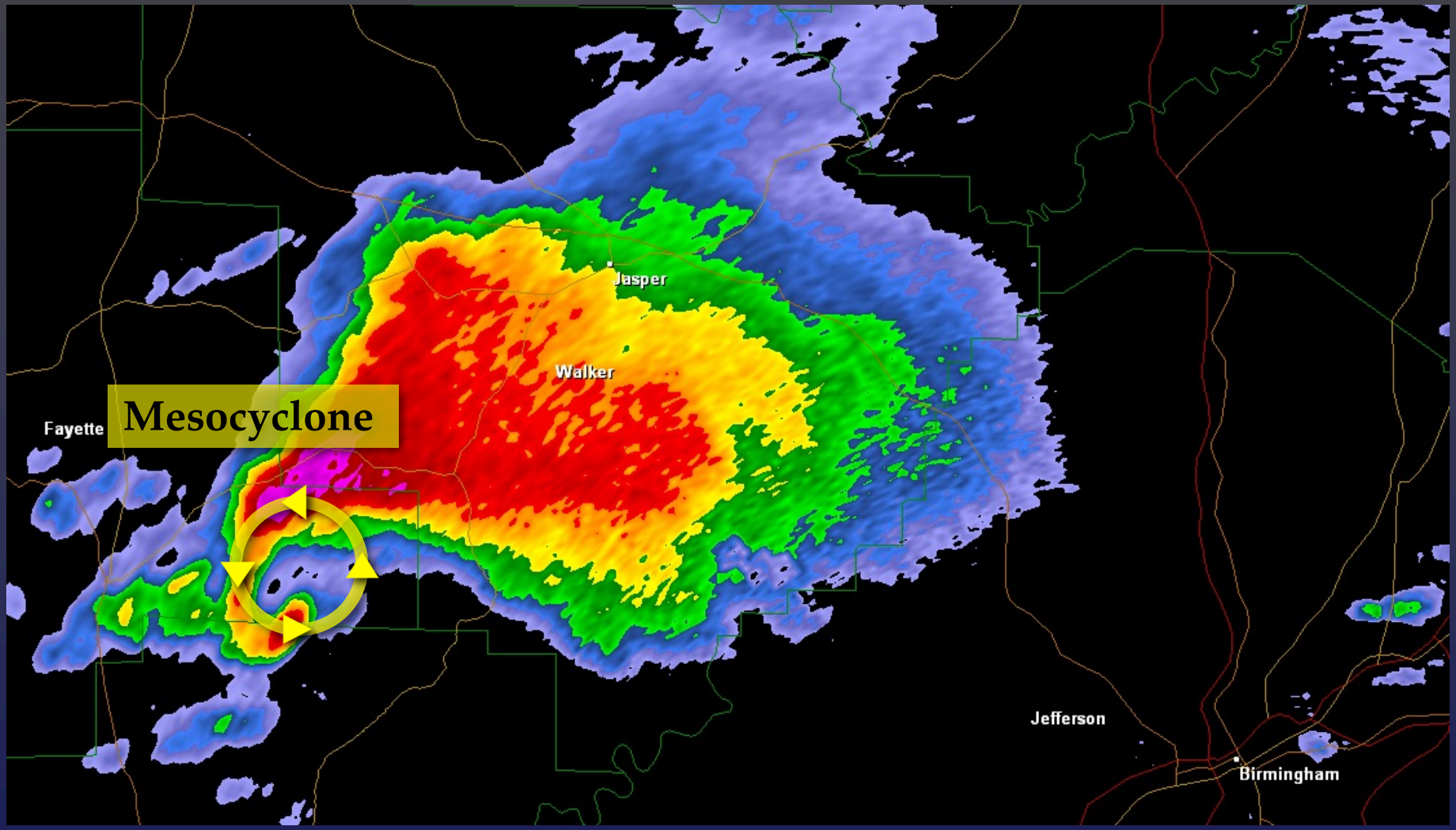

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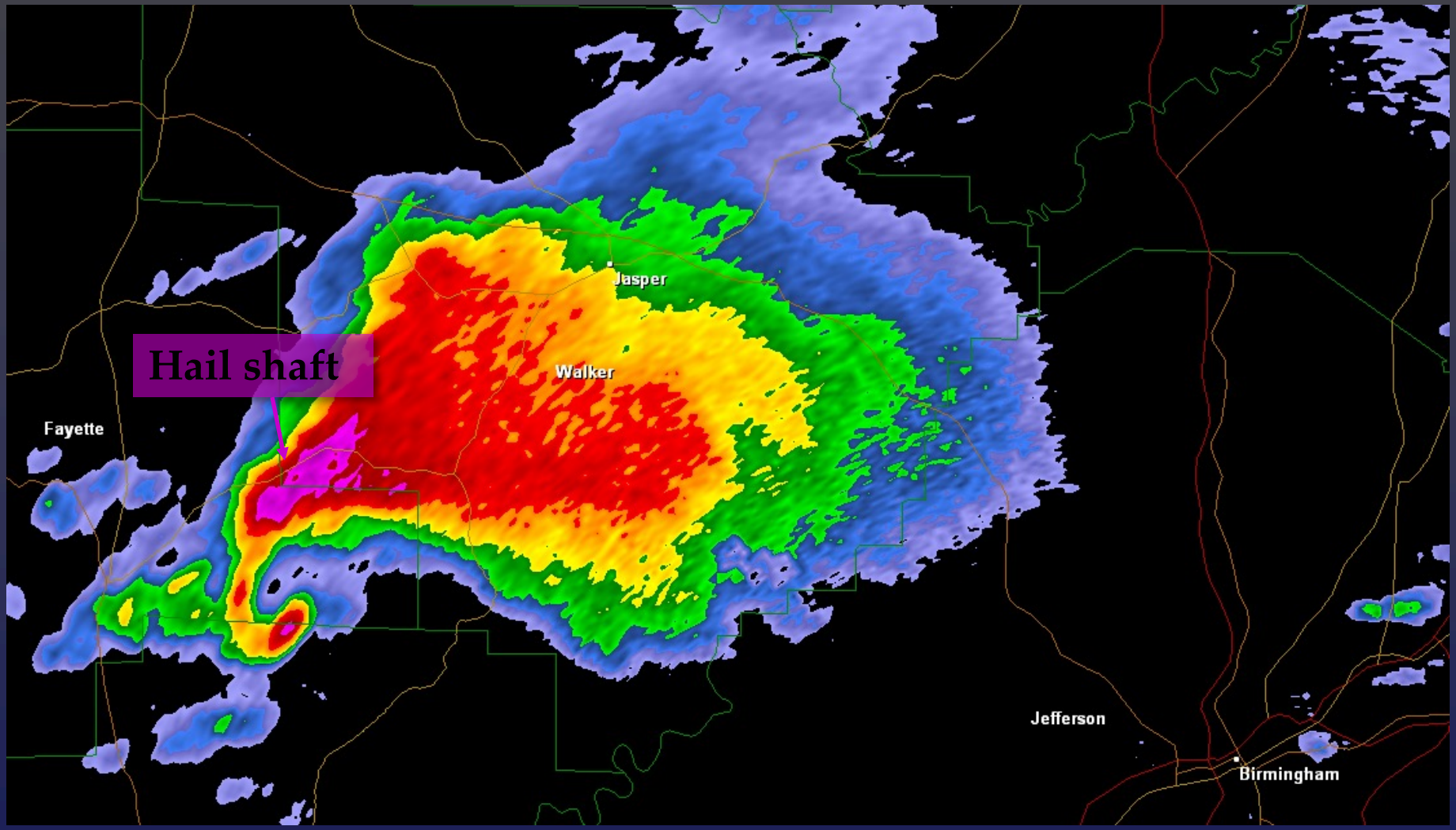

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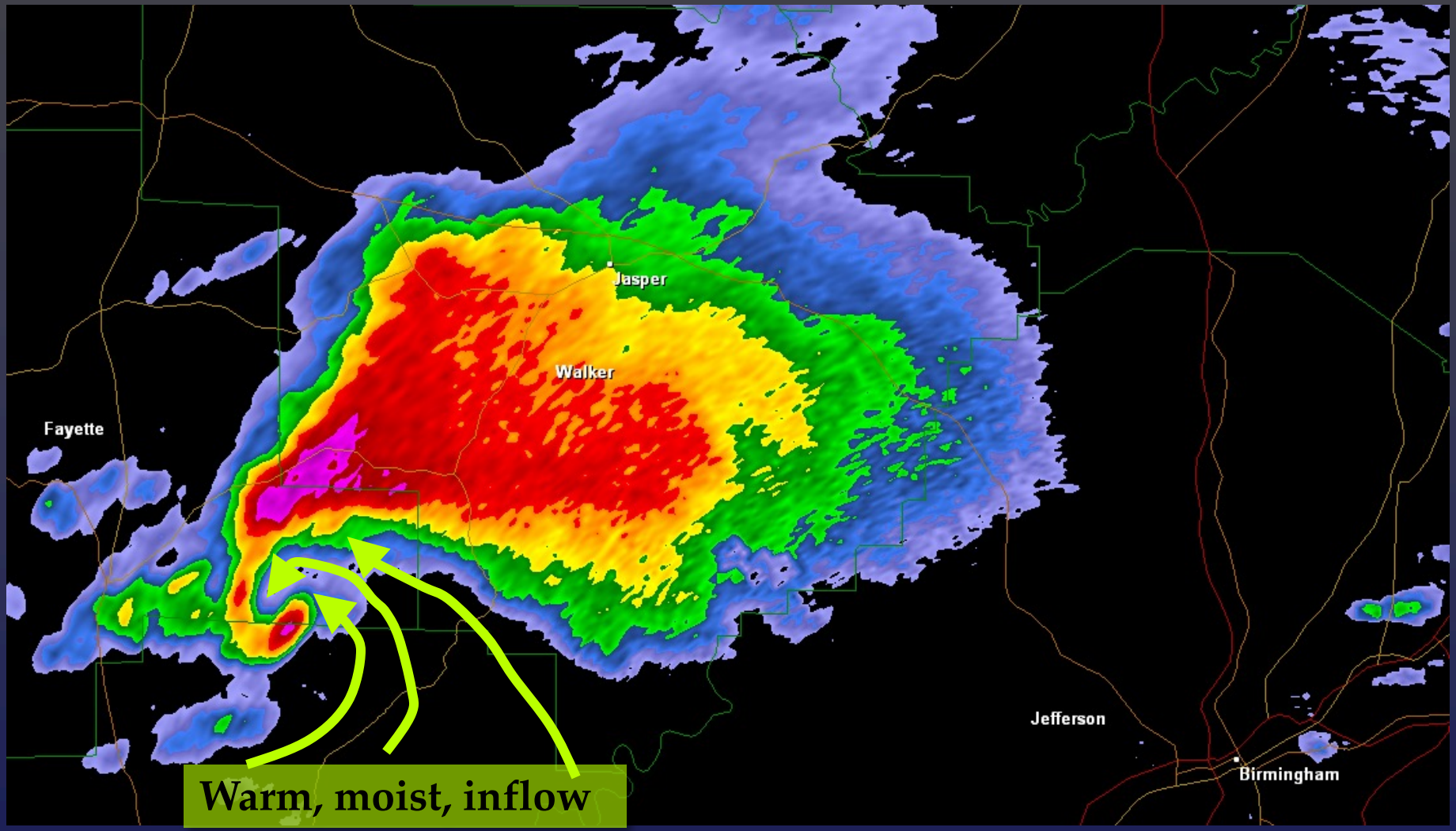
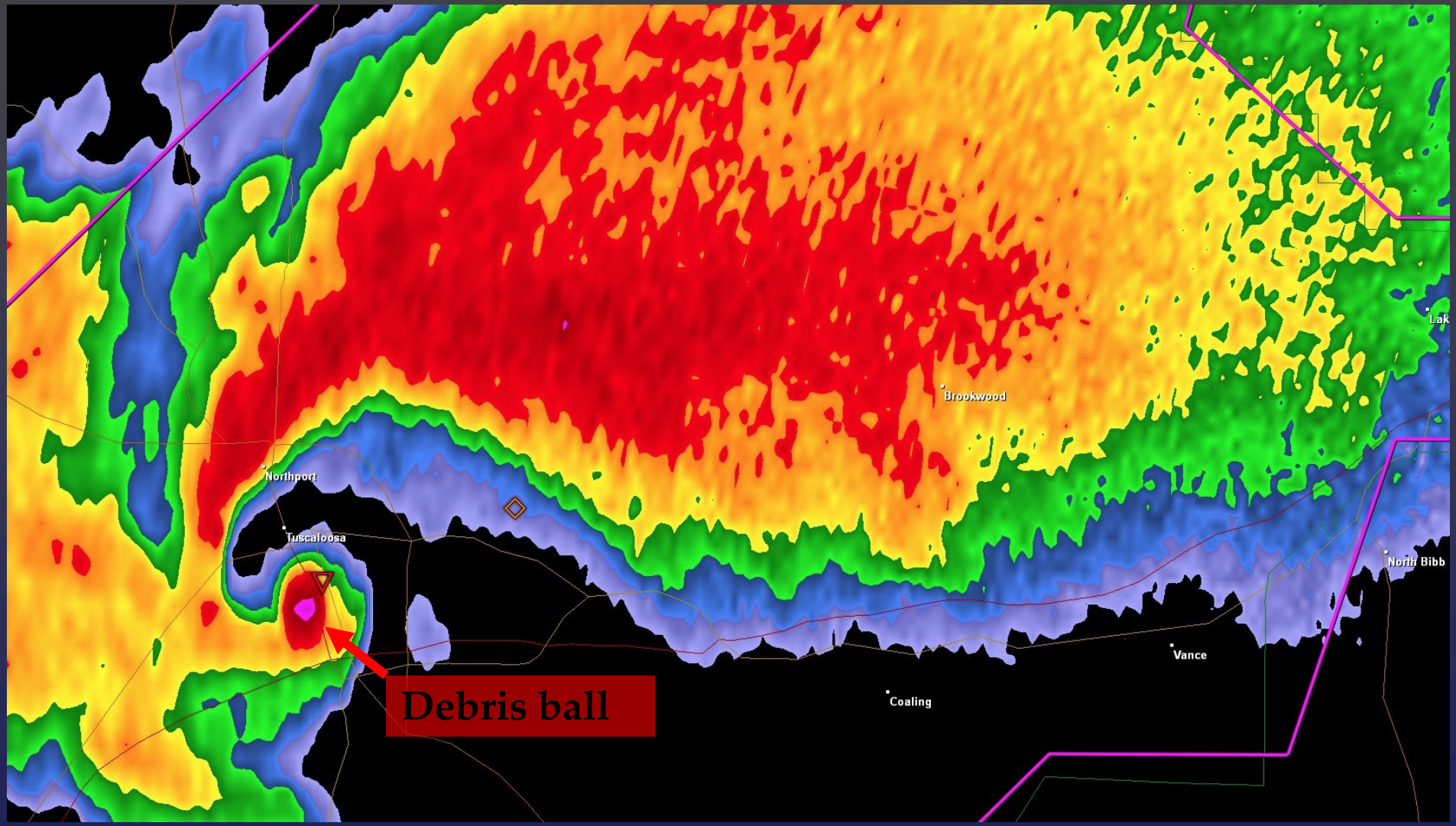


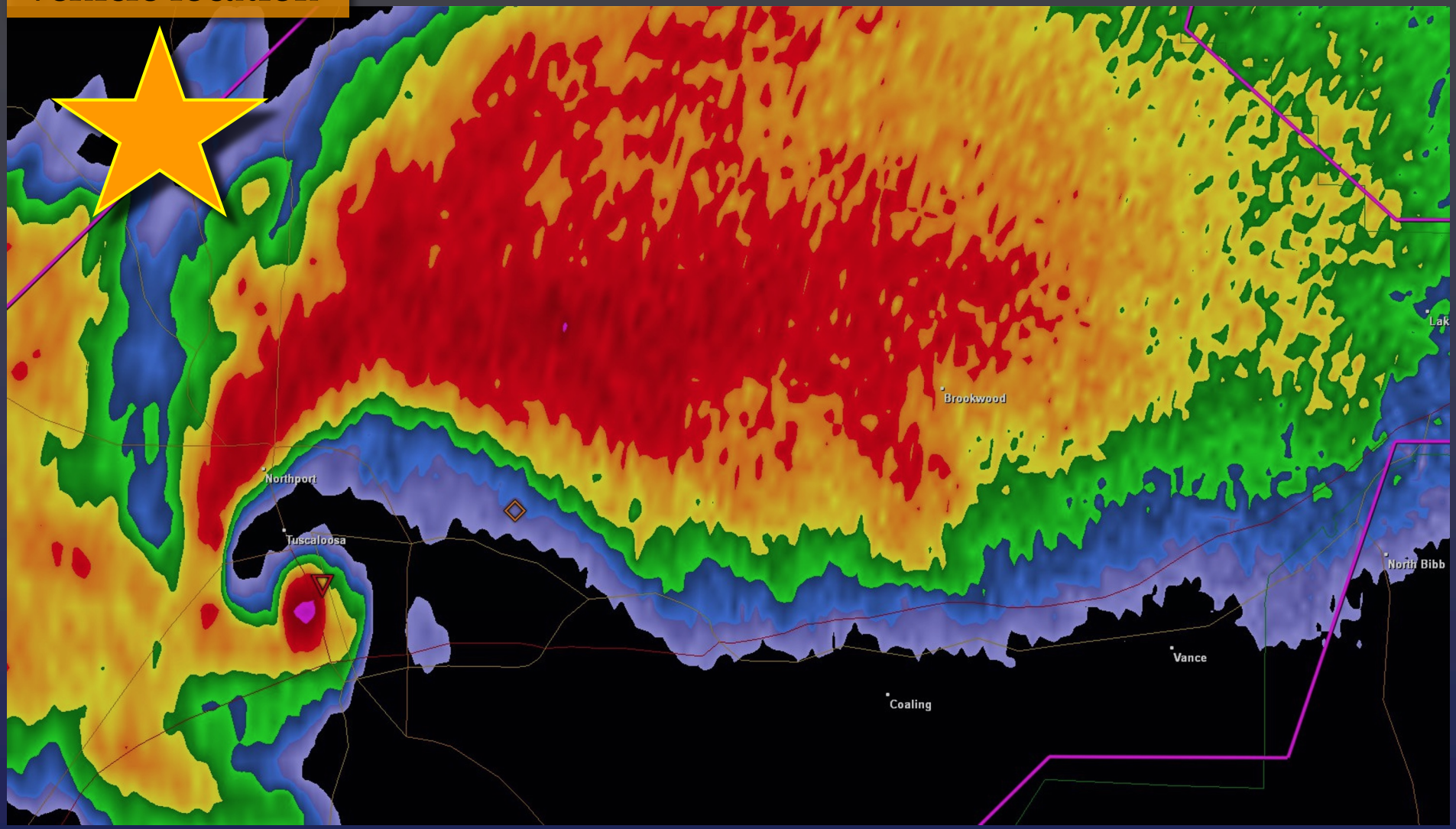
Supercell near Birmingham, AL on April 27, 2011

Supercell Thunderstorm



Supercell near Tuscaloosa, AL on April 27, 2011

“Chasing” a tornado . . .

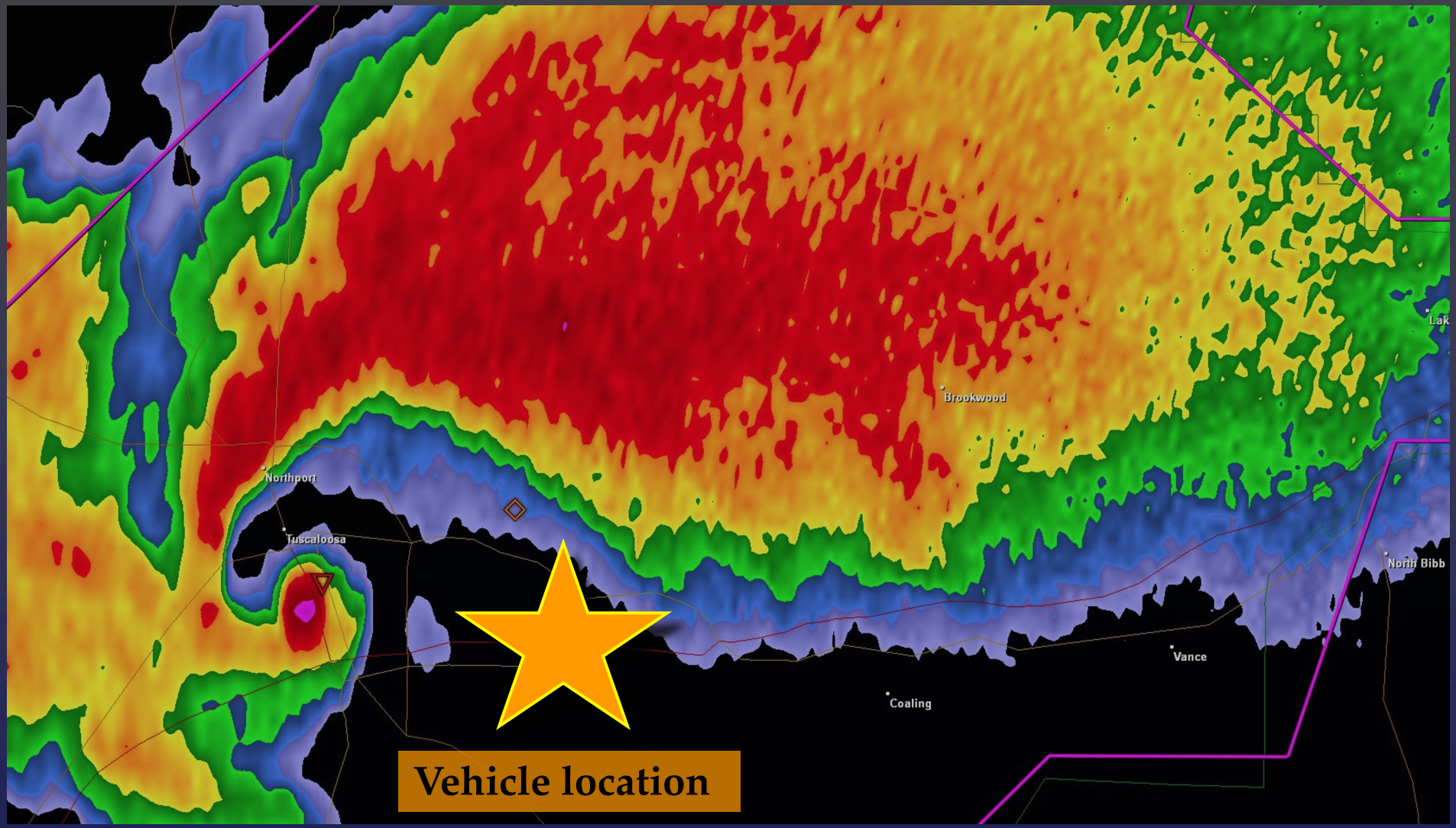


Supercell near Tuscaloosa, AL on April 27, 2011

“Chasing” a tornado . . .

Photo from storm chase on June 5, 2010 near Magnolia, IL

“Chasing” a tornado . . .



Supercell near Tuscaloosa, AL on April 27, 2011

“Chasing” a tornado . . .

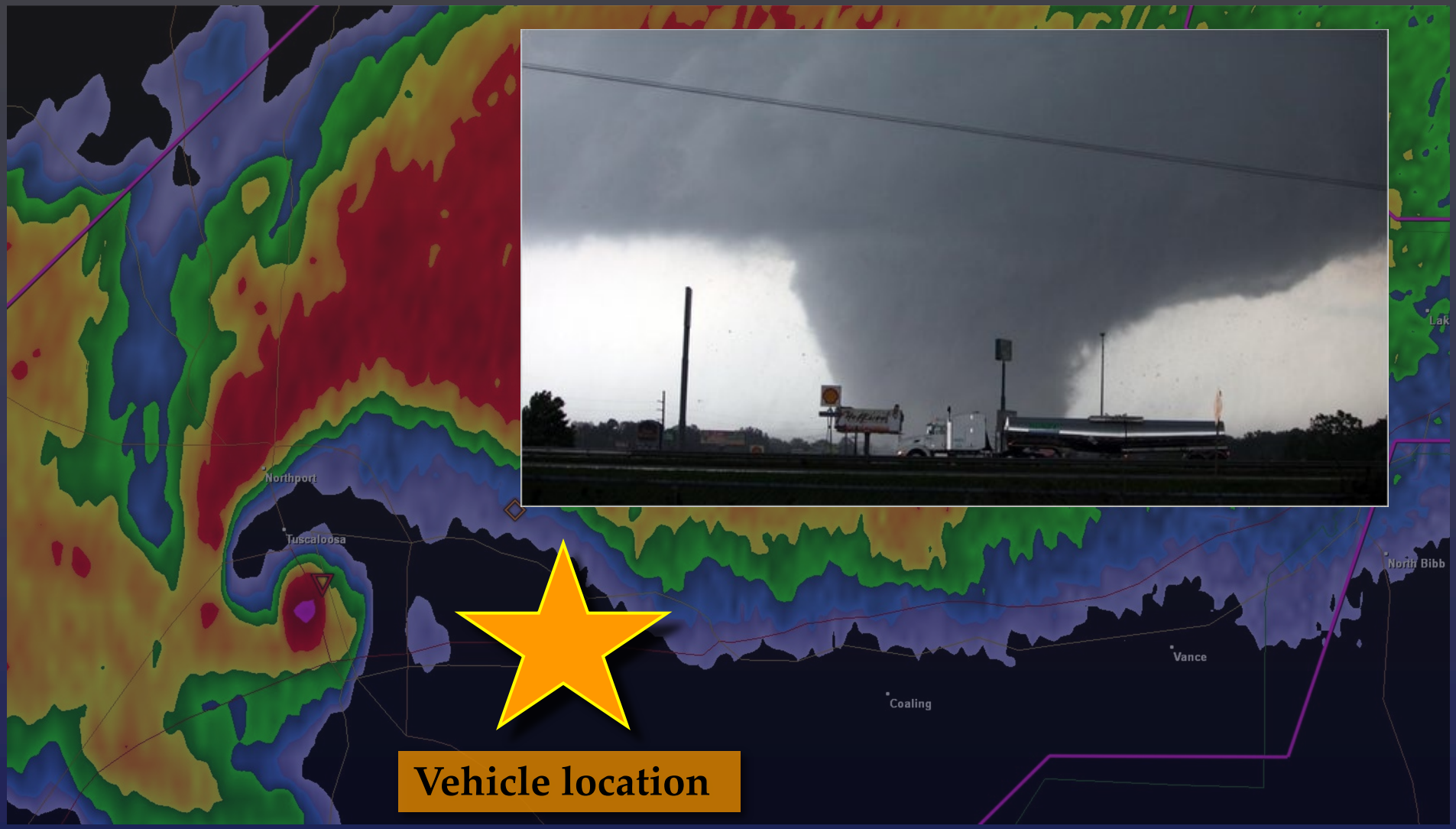
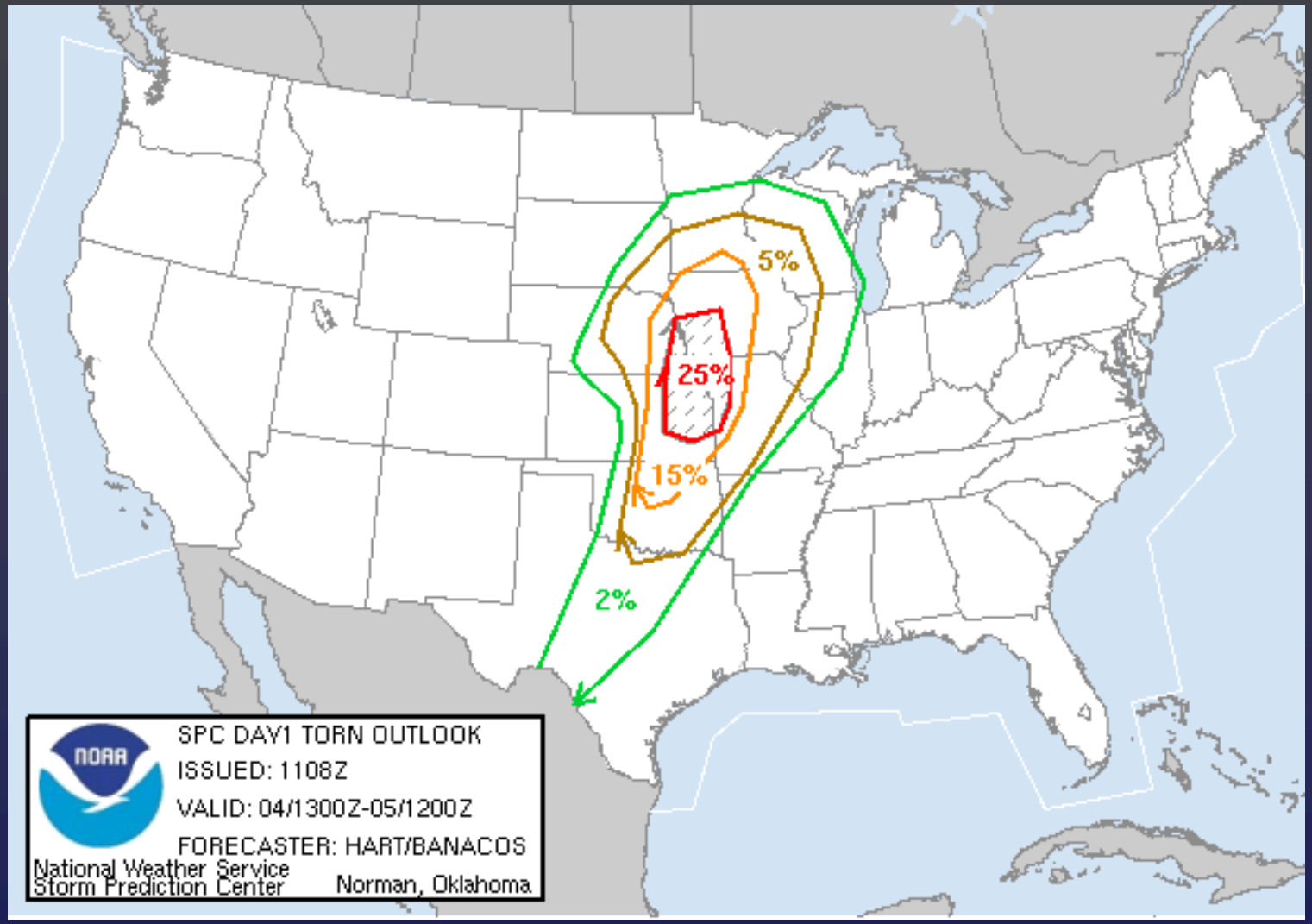


Photo by Dusty Compton/Tuscaloosa News, 4/27/11

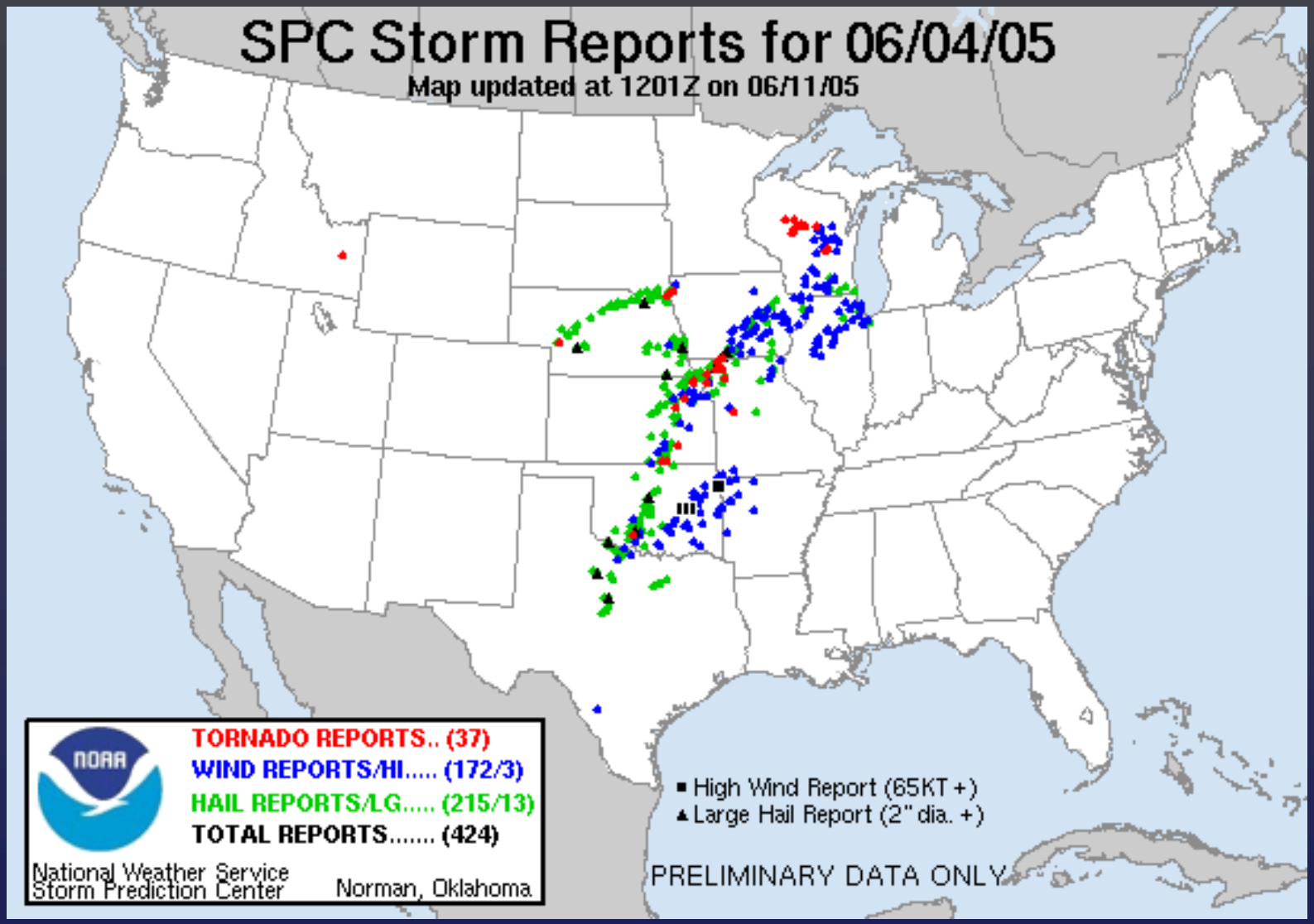
Storm Chase

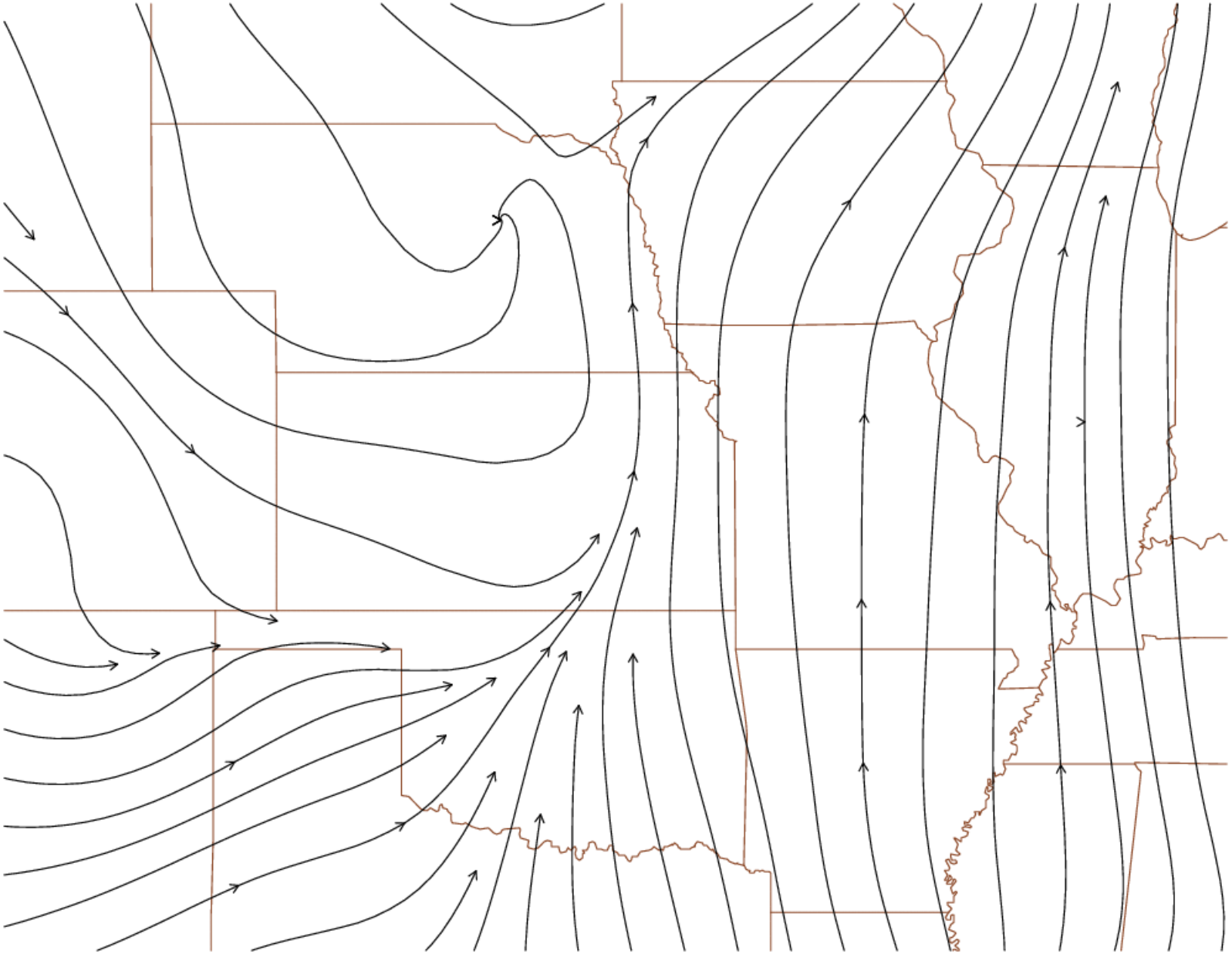
June 4, 2005
Northwest Missouri

Storm Prediction Center
Tornado Outlook

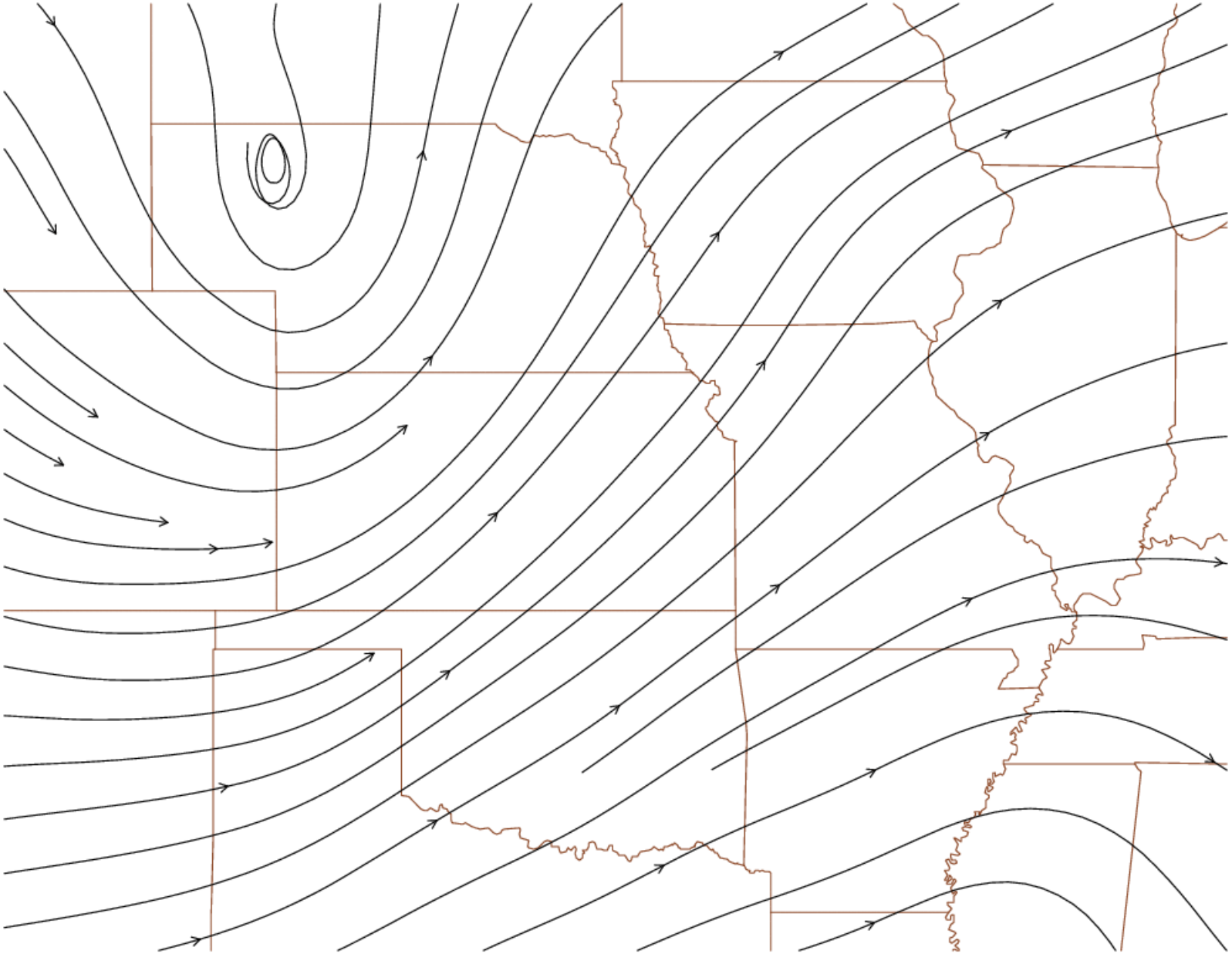


Storm Prediction Center
Storm Reports





050605/0000F000 900-mb wind



050605/0000F000 500-mb wind

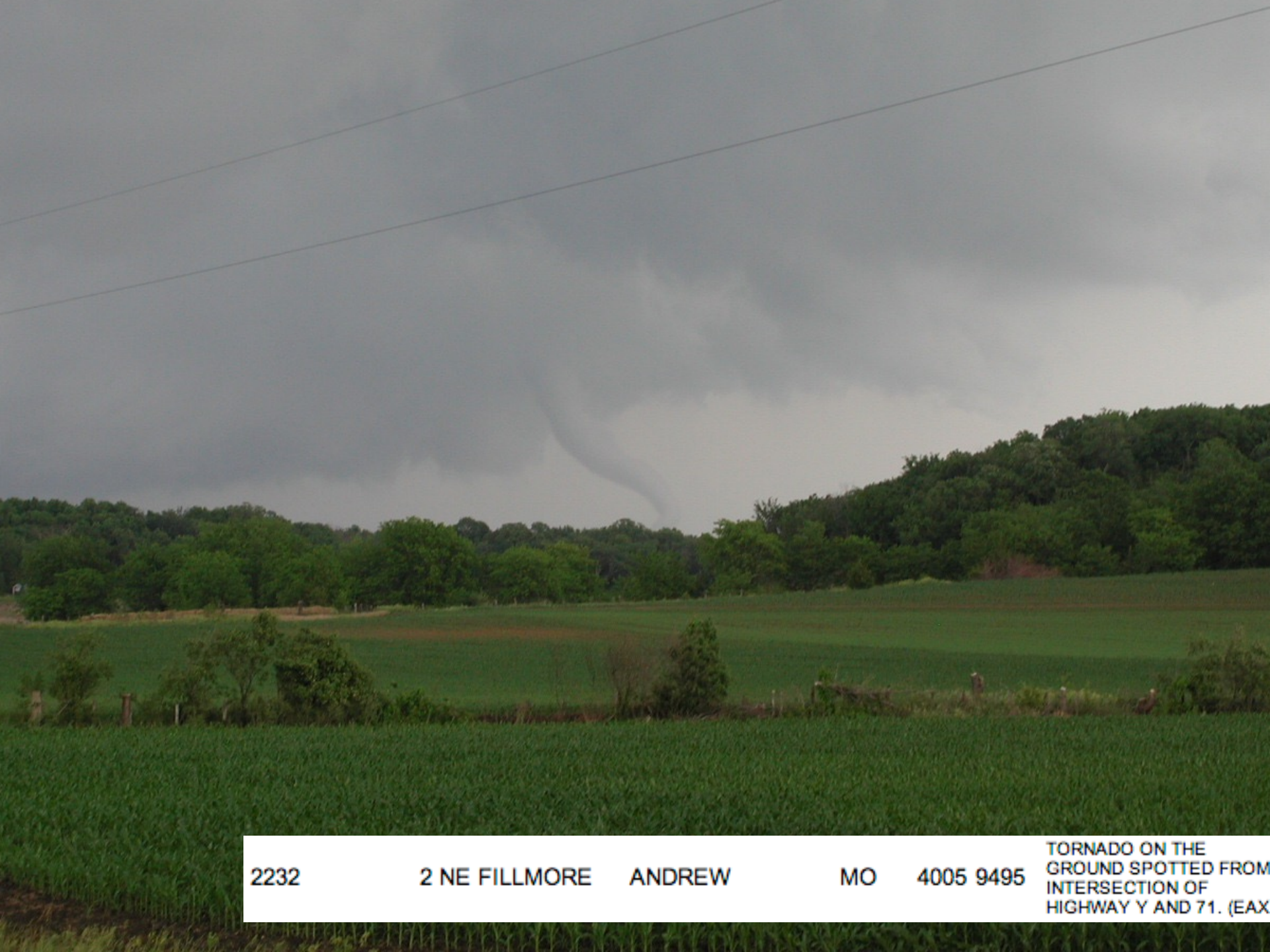

59
B


STOP


59
B
12536


59
B


WRONG WAY

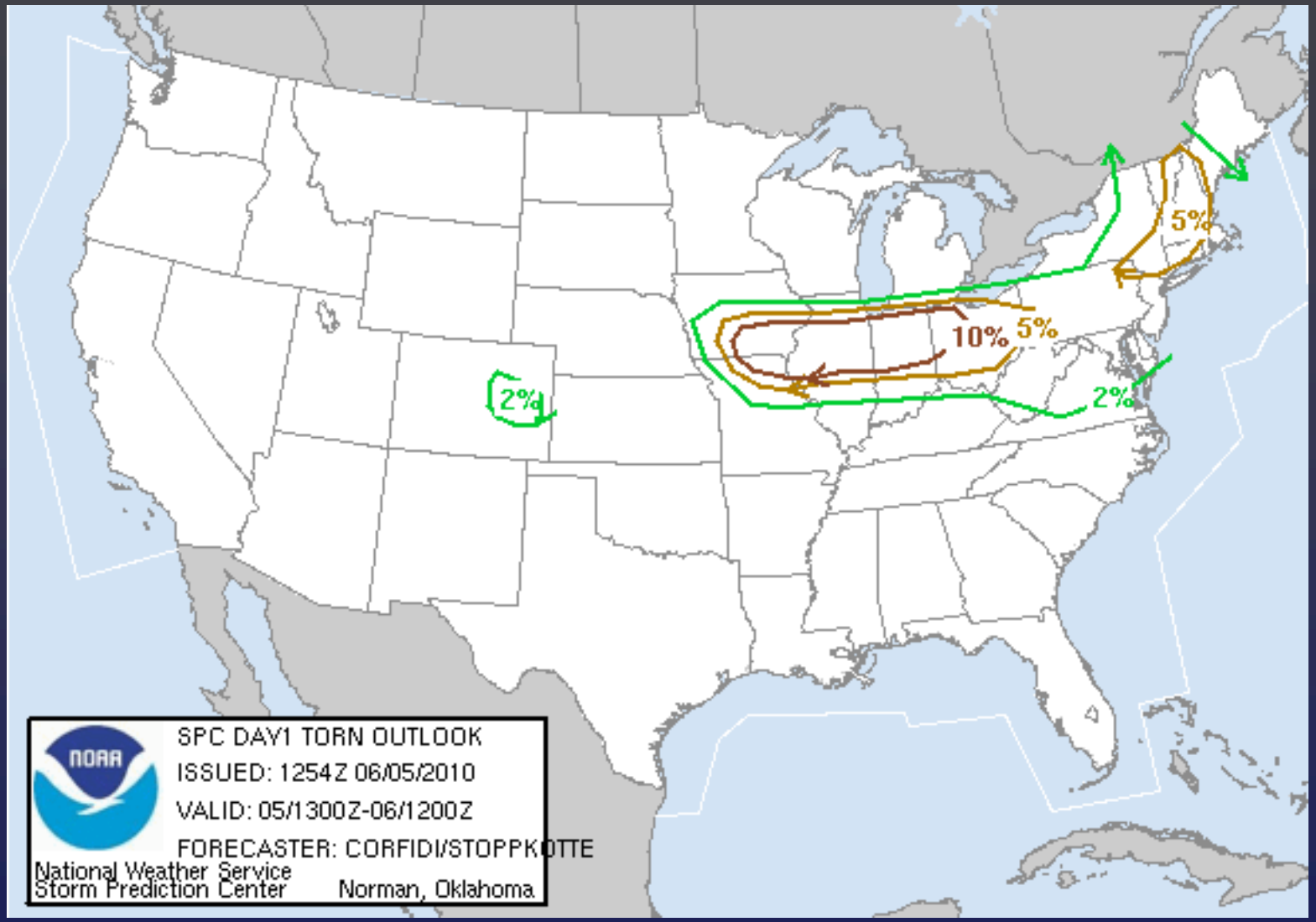


2232	2 NE FILLMORE	ANDREW	MO	4005 9495	TORNADO ON THE GROUND SPOTTED FROM INTERSECTION OF HIGHWAY Y AND 71. (EAX

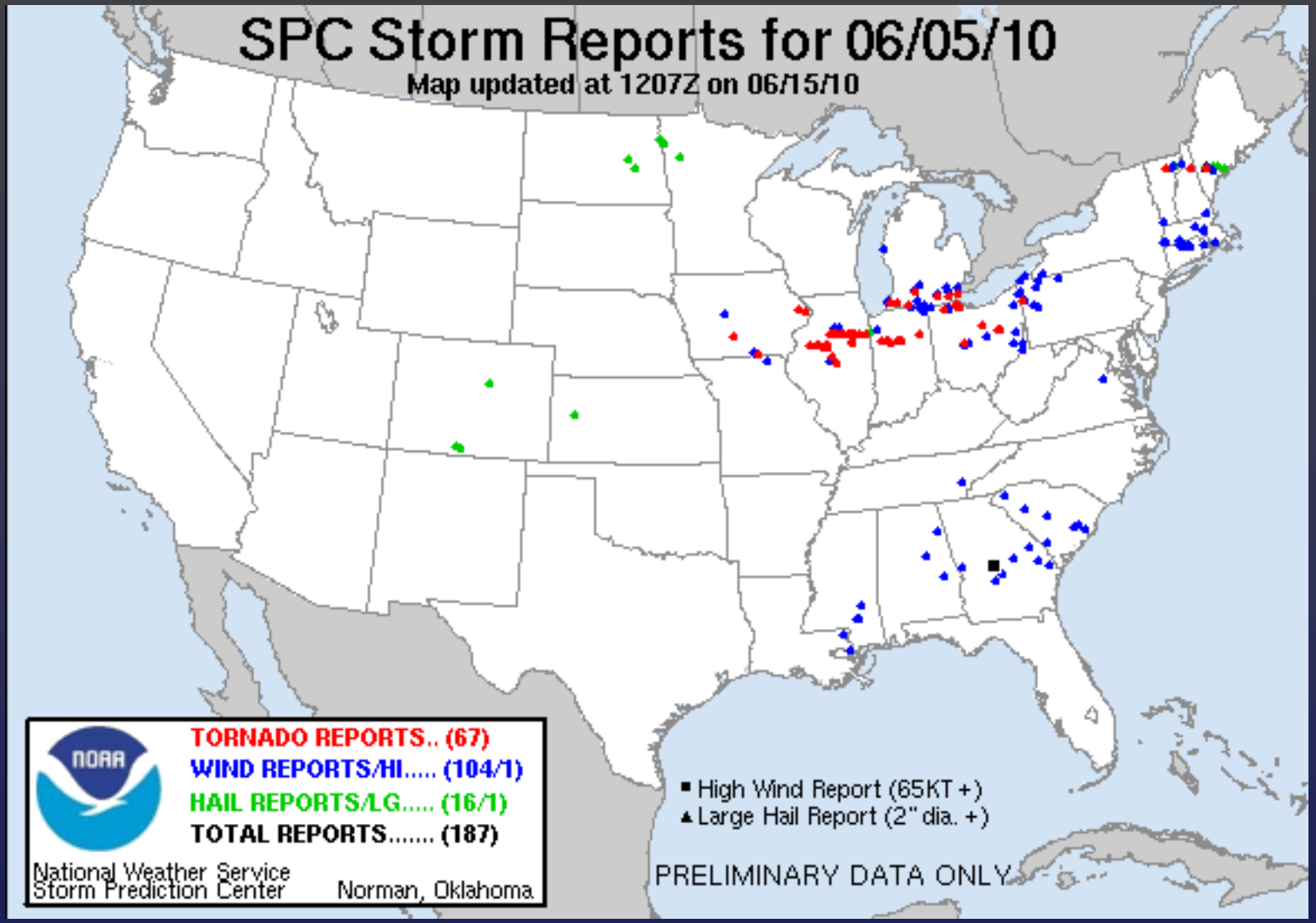
Storm Chase

June 5, 2010
North Central Illinois

Storm Prediction Center
Tornado Outlook



Storm Prediction Center
Storm Reports




MORRISON'S
MARKET
THIS WEEKS SALE ITEMS
STRAWBERRIES 2$4
DORITOS 2$6
POP TARTS $2.79
IGA BACON $3.09
ZOLA

Google Maps link

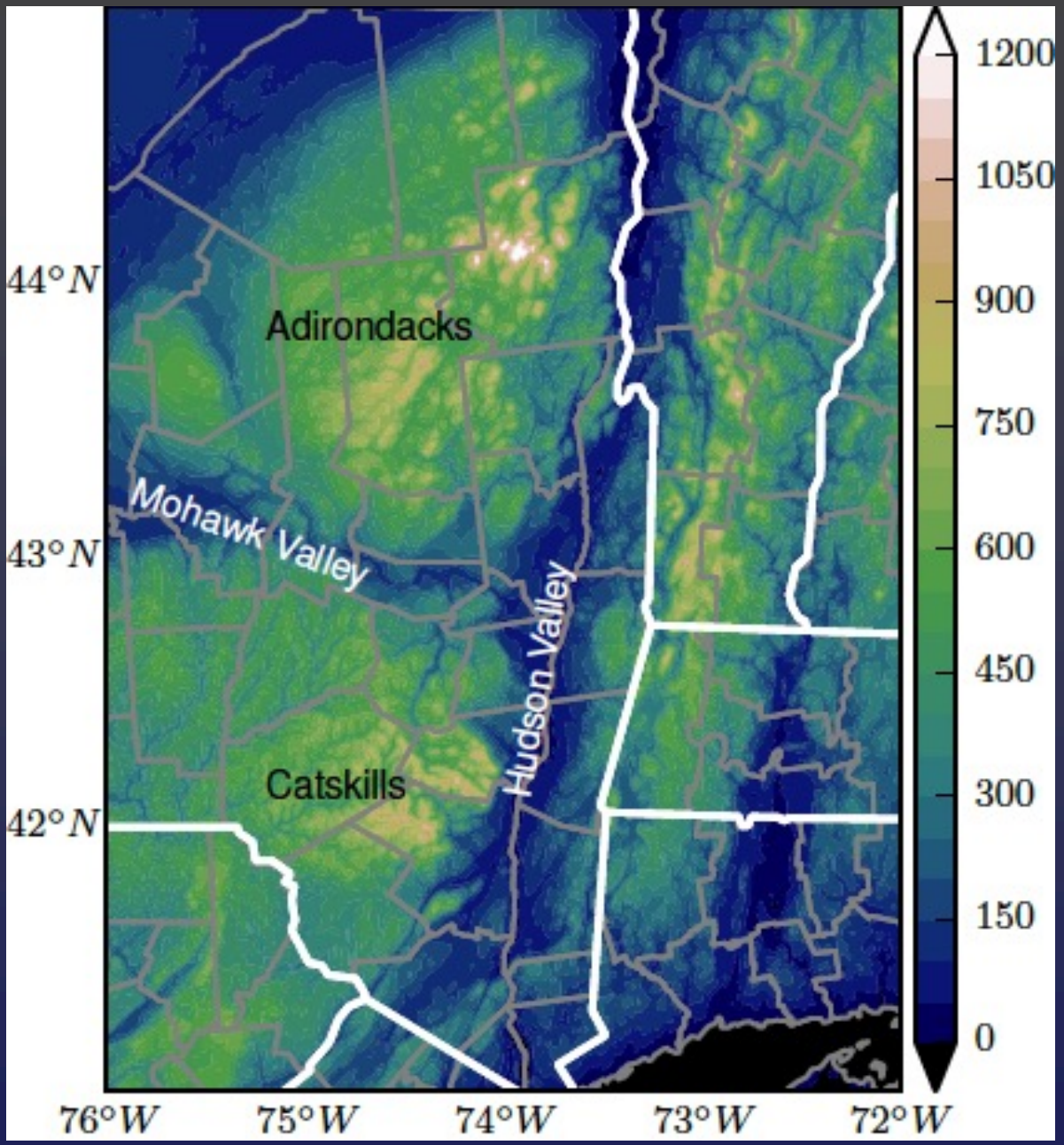
Storm Chase

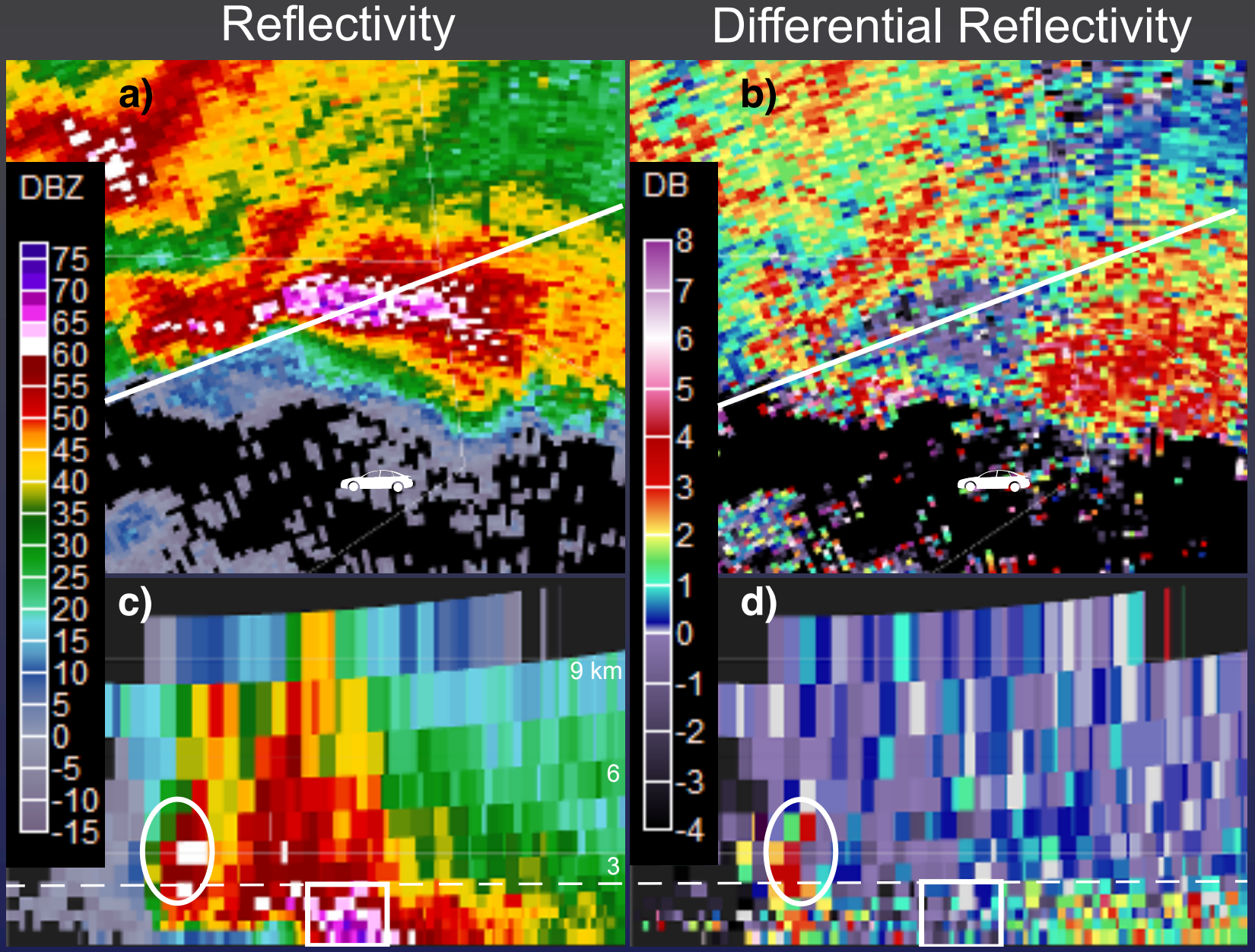
May 22, 2014

Montgomery and Schenectady County, New York

Slides courtesy of Prof. Brian Tang

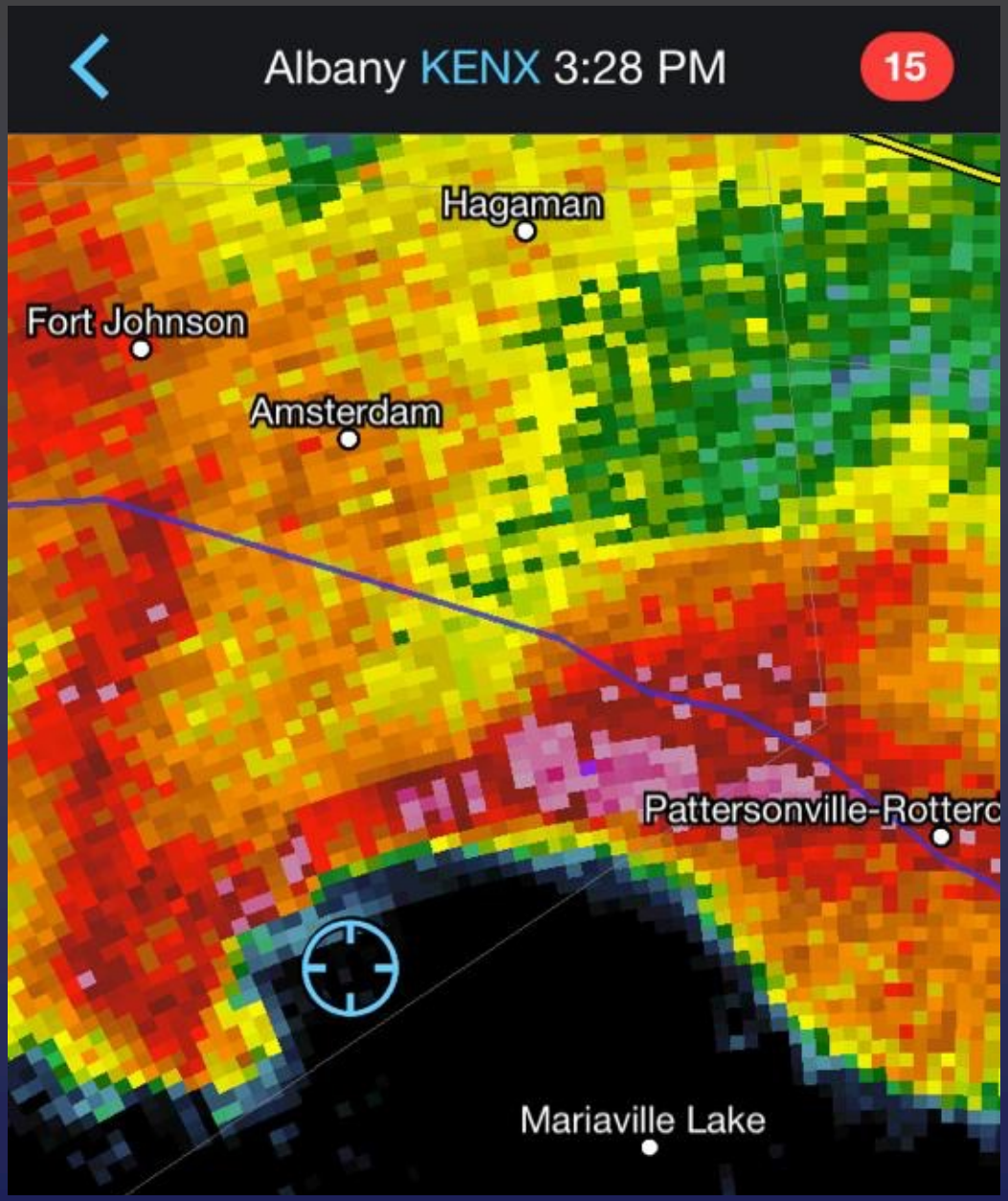
Low-level winds channel WNW up the Mohawk Valley, enhancing shear!




Reflectivity
Differential Reflectivity
a)
b)
DBZ
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
-5
-10
-15
DB
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
c)
d)
9 km
6
3
1905 UTC

1920 UTC: 4” (10 cm) hailstone in Amsterdam, NY, tying New York state record

Source: CBS

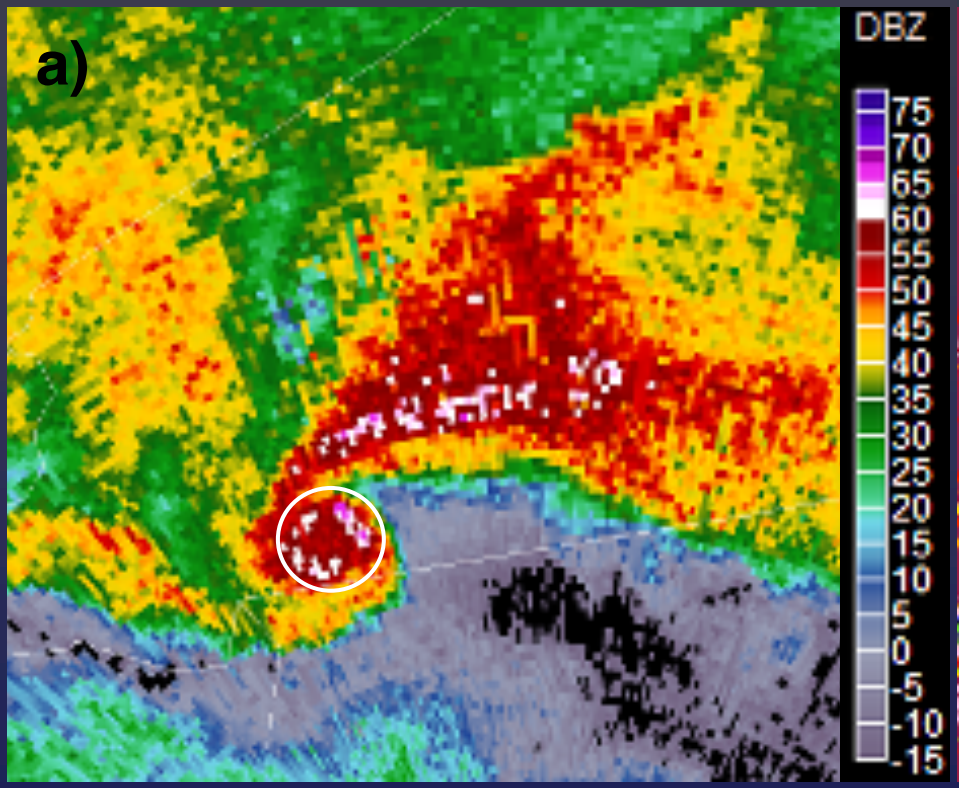


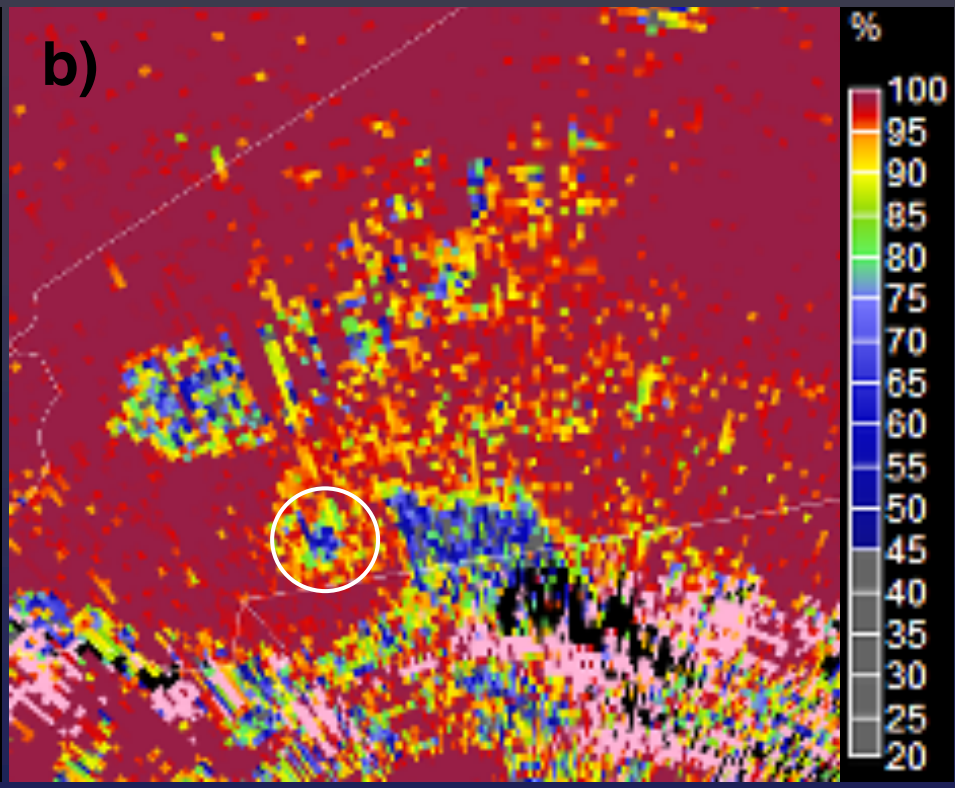
Five minutes prior to tornado touchdown west of Mariaville Lake

AT 351 PM EDT...NATIONAL WEATHER SERVICE DOPPLER RADAR CONTINUED TO INDICATE A TORNADO ON THE GROUND WITH A TORNADIC DEBRIS SIGNATURE JUST SOUTH OF DUANESBURG IN SCHENECTADY COUNTY

Reflectivity

Correlation Coefficient





1951 UTC

ICECREAM Field Campaign – Summer 2023


DUNDER
MIFFLIN
PAPER COMPA
NO
PARKING