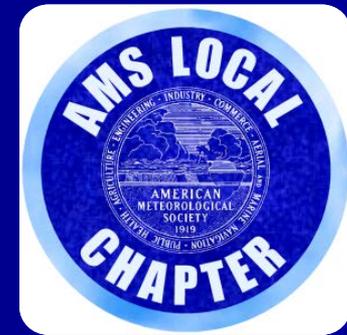


The 7 June 2007 Tornadic Supercell Outbreak in Northern and Central Wisconsin

Greater Milwaukee Chapter
American Meteorological Society



Jeff Last
Gene Brusky
NOAA NWS Green Bay

www.weather.gov/grb



Overview of the Event

Supercell thunderstorms rapidly moved across northeast Wisconsin on 7 June 2007 and produced five tornadoes, near record size hailstones, injured 4 people, and caused \$60 million in damage.



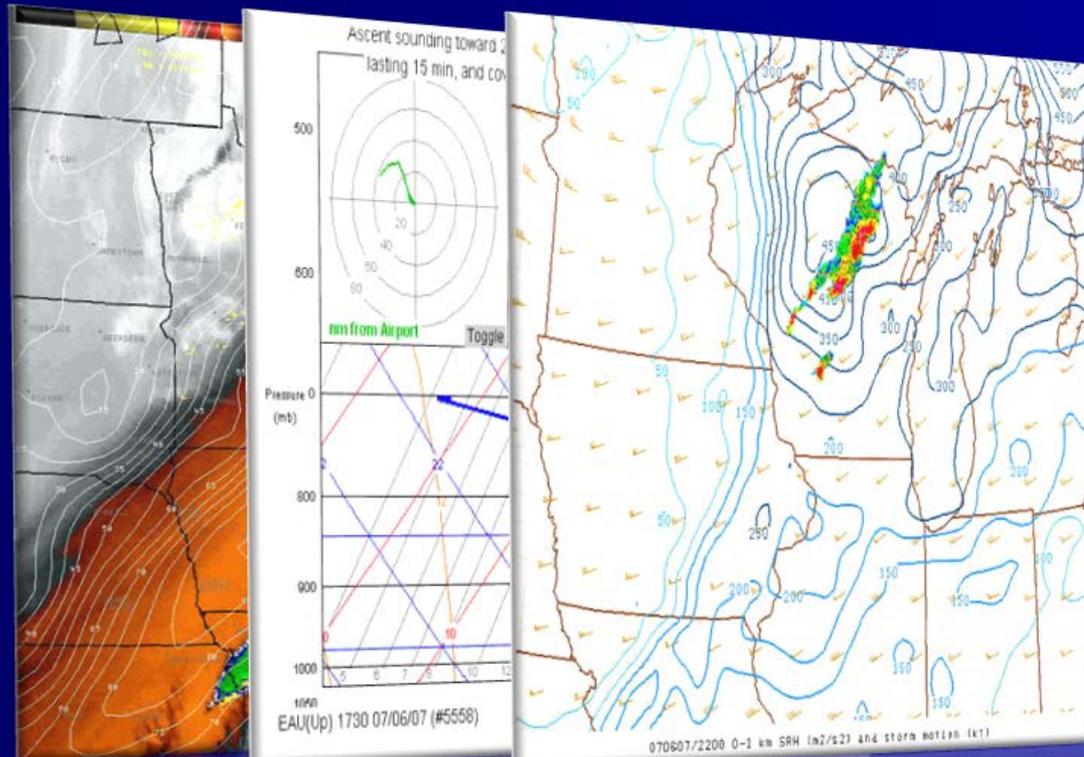
Outline

- Meteorological Setup
- Radar Evolution and Structure
- Service and Customer Response
- The Aftermath

Ben Christianson
Oconto Co.



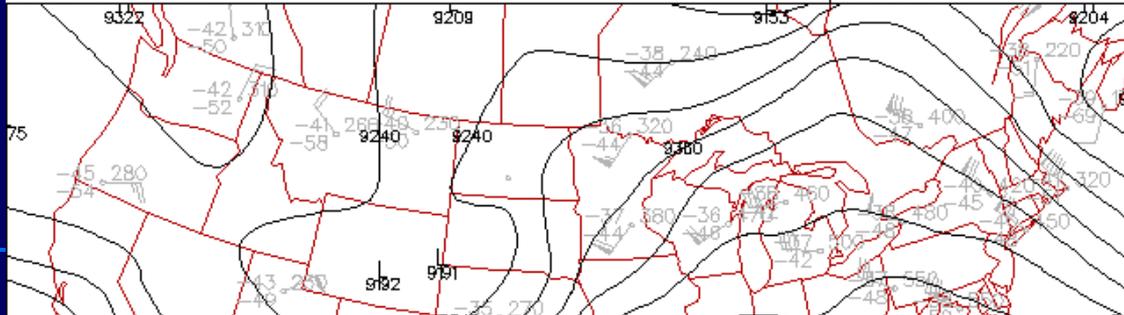
Meteorological Setup



Plymouth State Weather Center

300 mb Geopotential Height (m)
300 mb All data

WXP analysis for 1200Z 7 JUN 07
Analysis for 1200Z 7 JUN 07



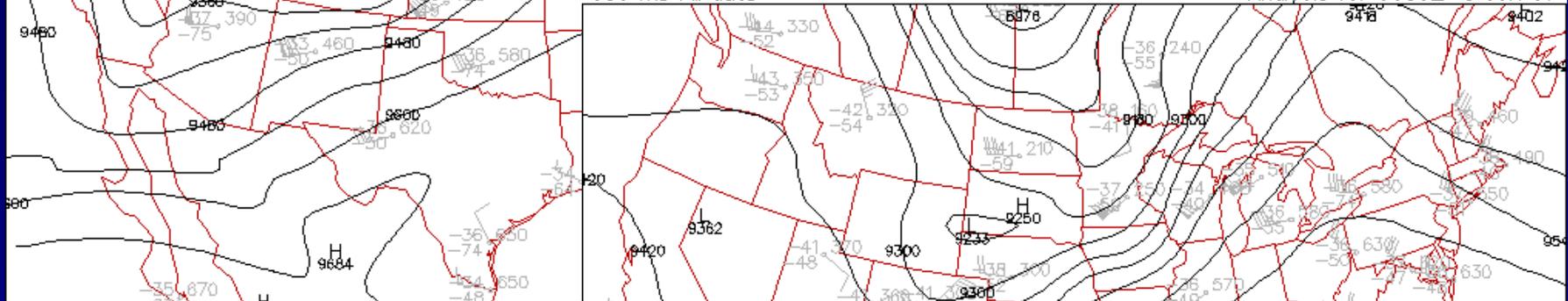
Overview

300 mb

Plymouth State Weather Center

300 mb Geopotential Height (m)
300 mb All data

WXP analysis for 0000Z 8 JUN 07
Analysis for 0000Z 8 JUN 07



INTERVAL: 60.0

INTERVAL: 60.0

LO: 8976.3 HI: 9691.3



Plymouth State Weather Center

500 mb Geopotential Height (m)
500 mb All data

WXP analysis for 1200Z 7 JUN 07
Analysis for 1200Z 7 JUN 07



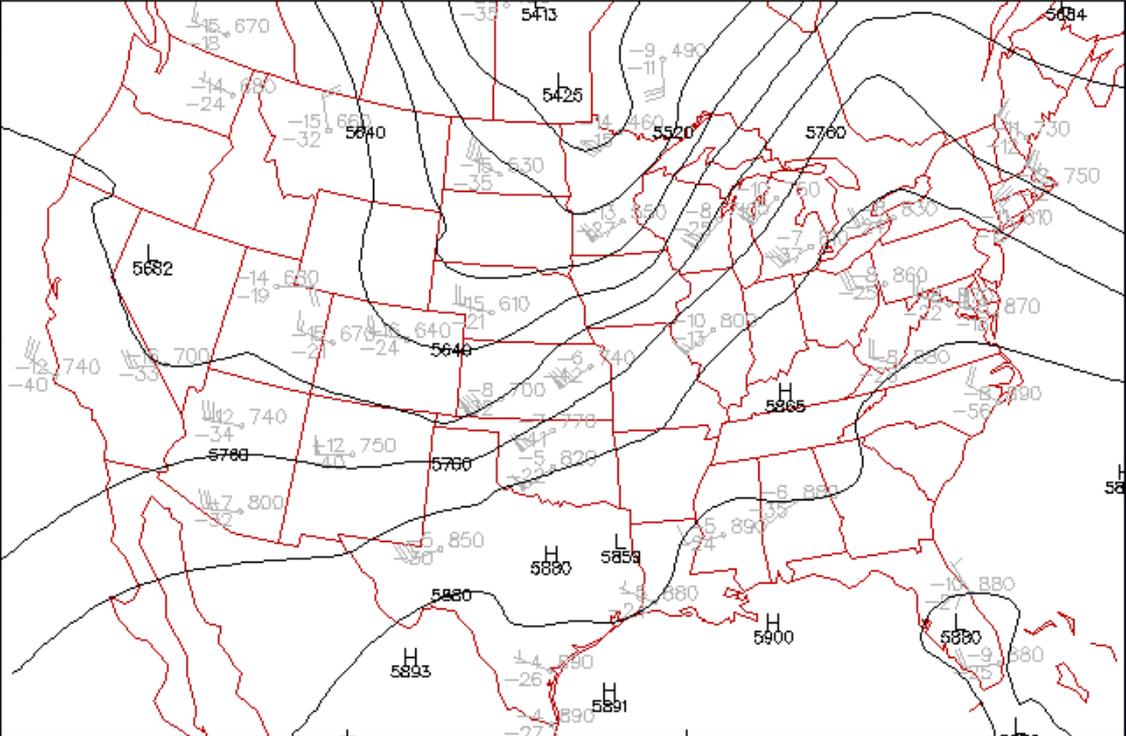
Overview

500 mb

Plymouth State Weather Center

500 mb Geopotential Height (m)
500 mb All data

WXP analysis for 0000Z 8 JUN 07
Analysis for 0000Z 8 JUN 07



INTERVAL: 60.0

INTERVAL: 60.0

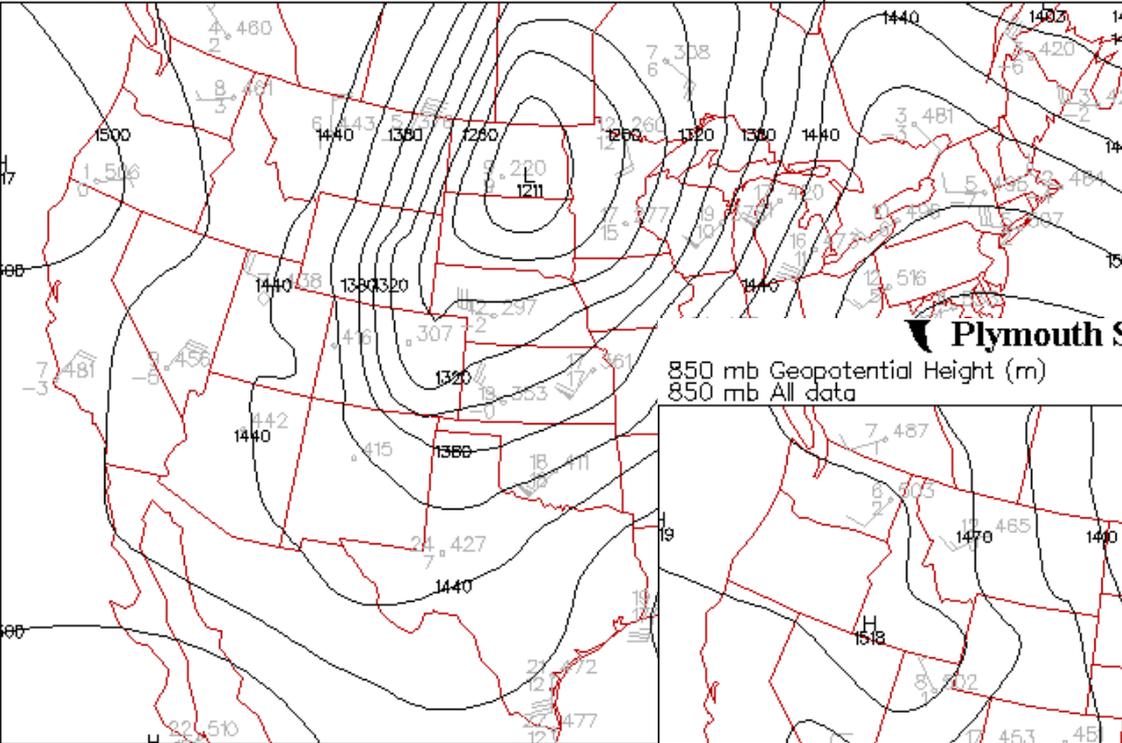
LO: 5412.6 HI: 5899.7



Plymouth State Weather Center

850 mb Geopotential Height (m)
850 mb All data

WXP analysis for 1200Z 7 JUN 07
Analysis for 1200Z 7 JUN 07



INTERVAL: 30.0

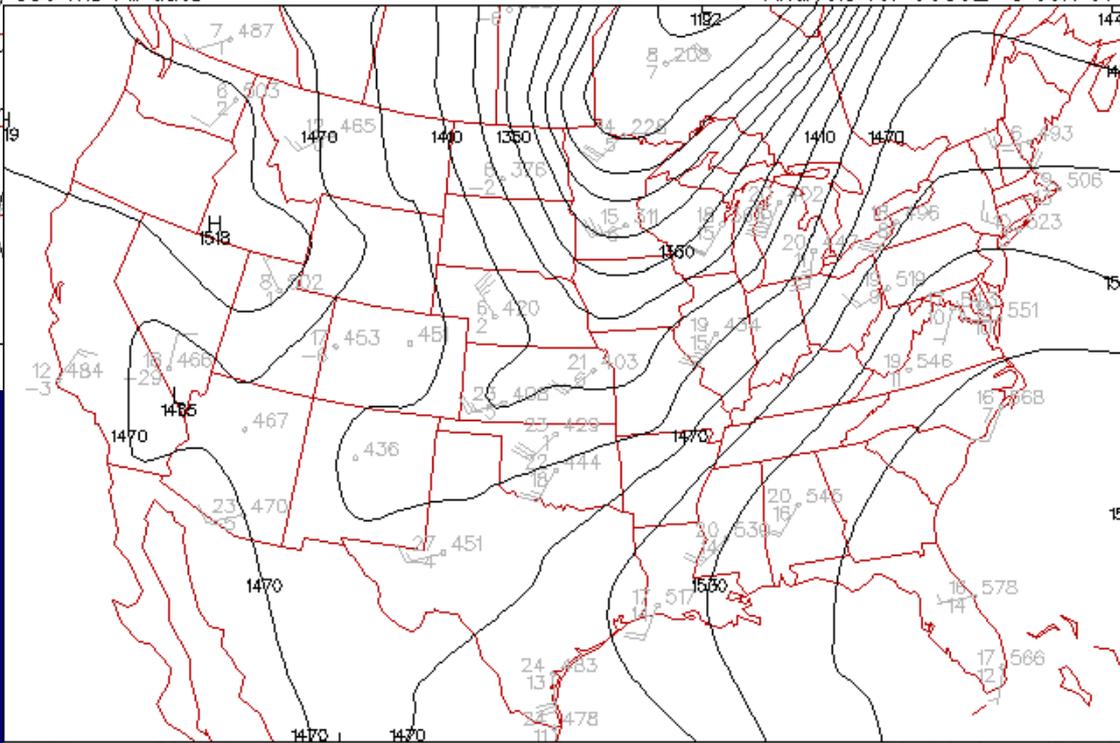
Overview

850 mb

Plymouth State Weather Center

850 mb Geopotential Height (m)
850 mb All data

WXP analysis for 0000Z 8 JUN 07
Analysis for 0000Z 8 JUN 07



INTERVAL: 30.0

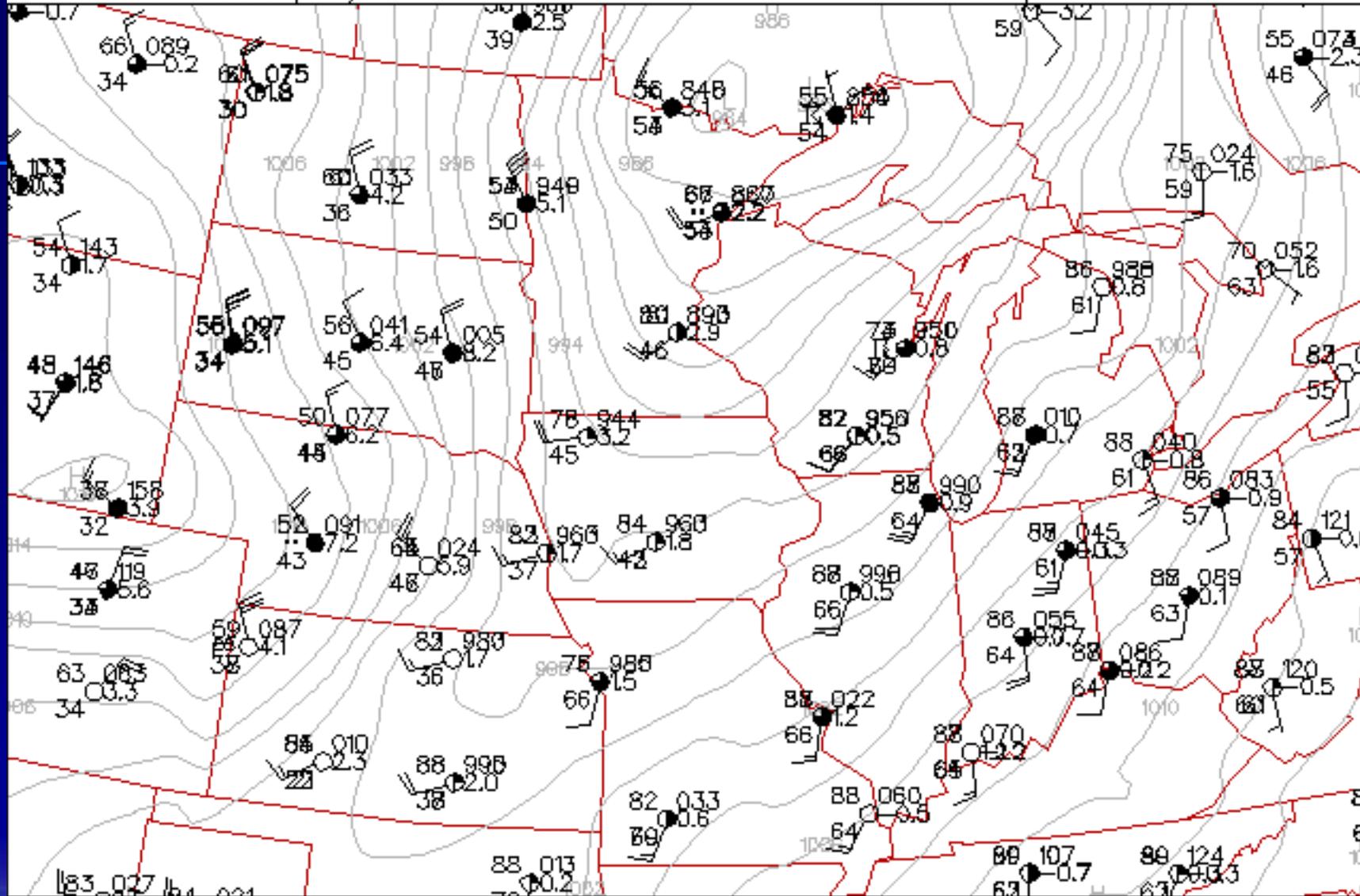
LO: 1191.8 HI: 1584.2



Plymouth State Weather Center

Surface All data
Sea level Pressure (mb)

Analysis for 00Z 8 JUN 07
WXP analysis for 00Z 8 JUN 07



INTERVAL: 2.0

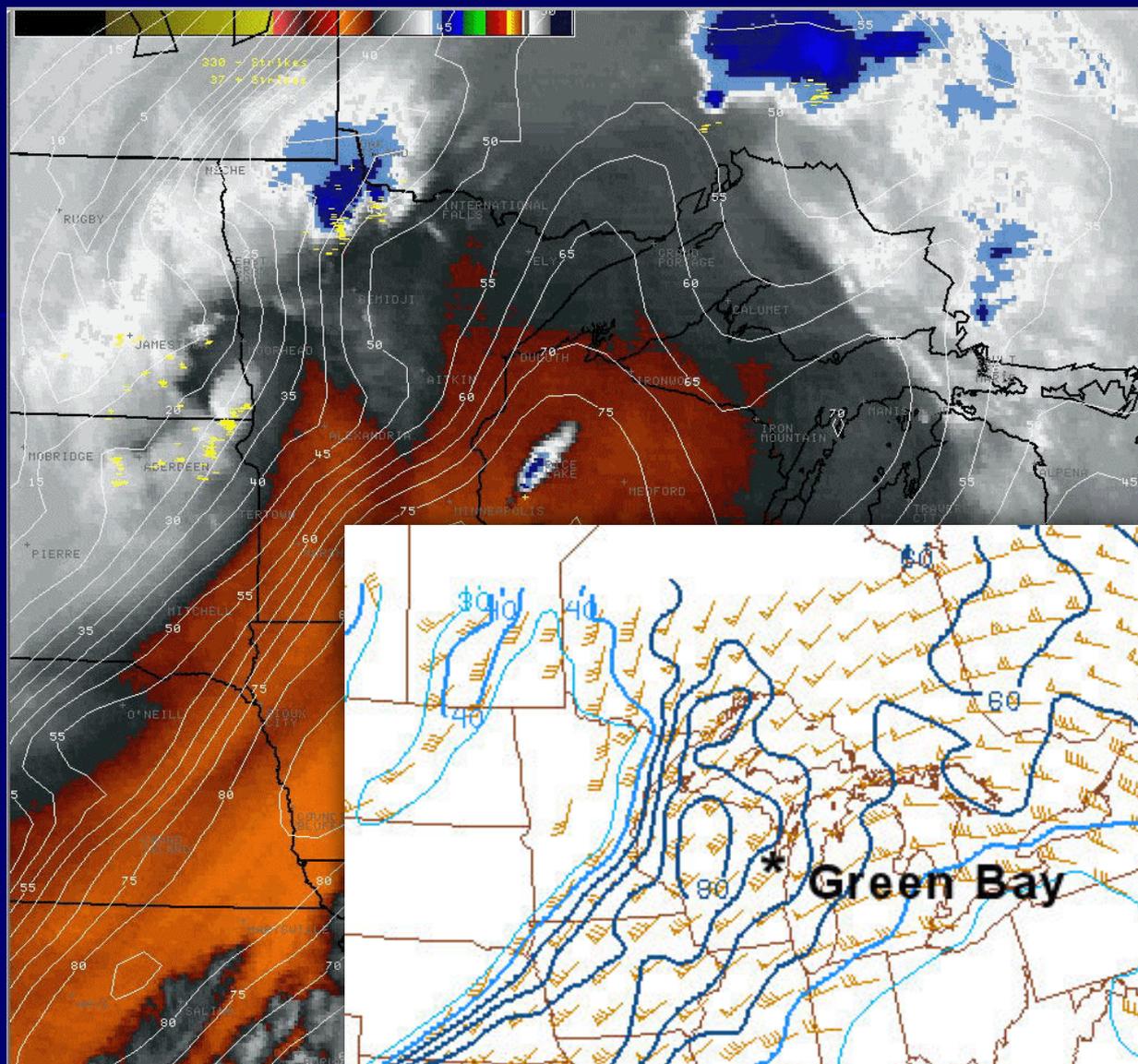
LO: 983.7 HI: 1016.3

WV imagery and RUC 500 mb isotachs 1700-2300Z

Unseasonably strong upper-level system

Very strong mid-level jet with 500 mb winds speeds near 90 knots overspread central Wisconsin during the day.

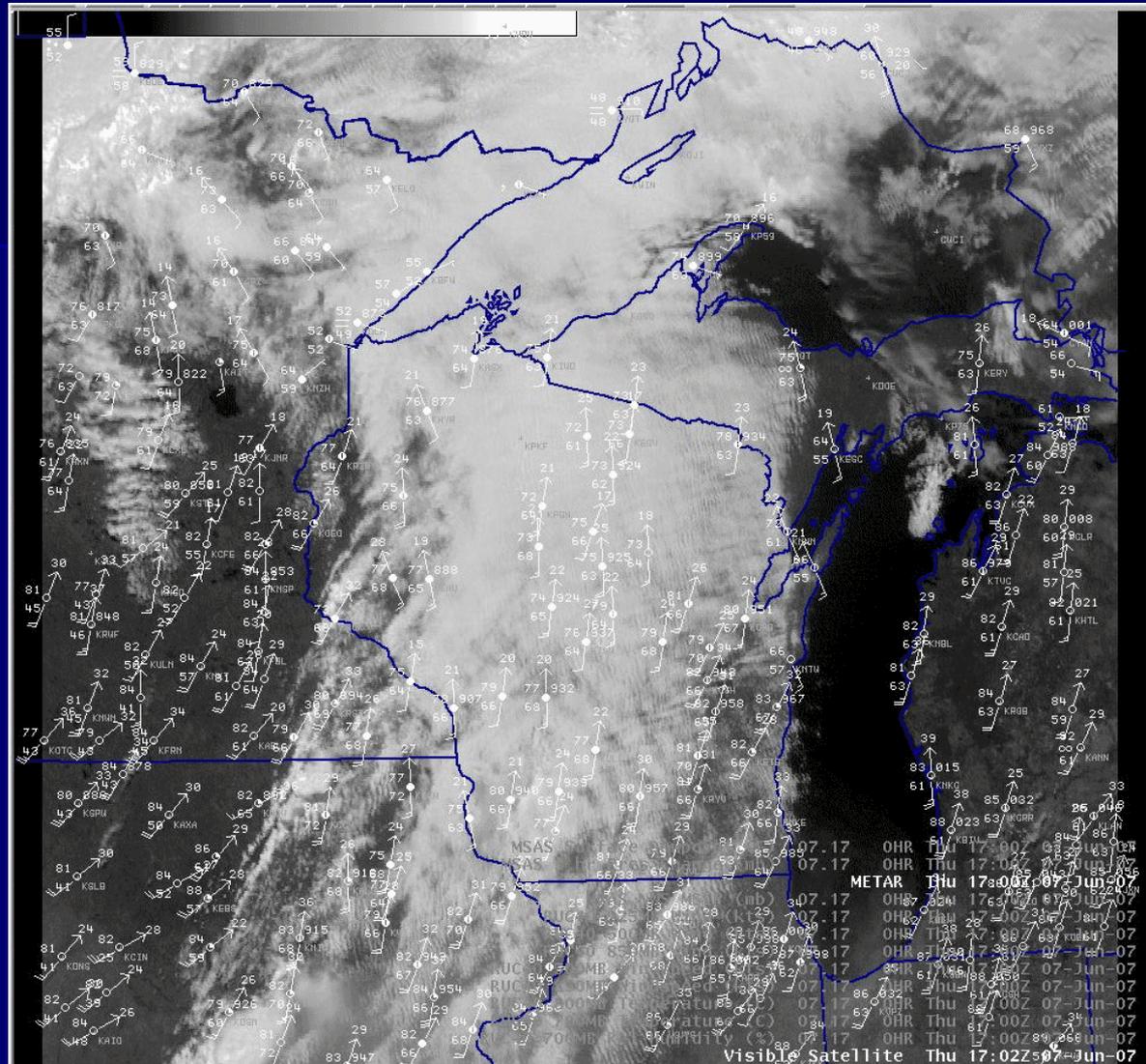
Strong deep layer shear.
0-6 km shear of
70-80 kts.



Visible satellite animation from 1700-2245Z

Despite morning cloud cover, surface temperatures were still able to rebound into the lower 80s. Dew points ranged from 65-70 F.

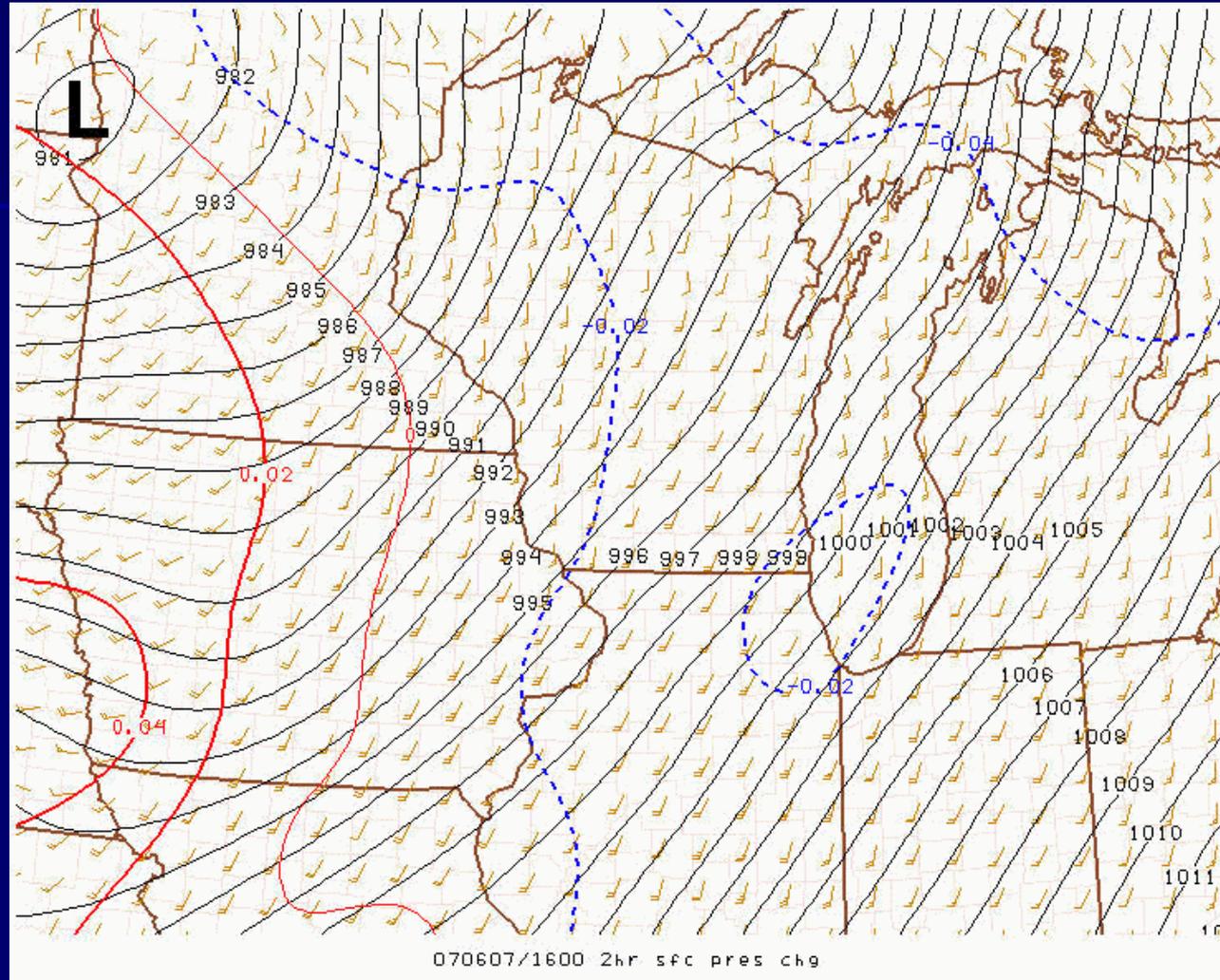
Strong dynamics and some clearing sufficient to overcome cap.



MSLP and 2-hr sfc pressure change 16-21Z

Deep surface low tracked northeast across northern Minnesota during the afternoon.

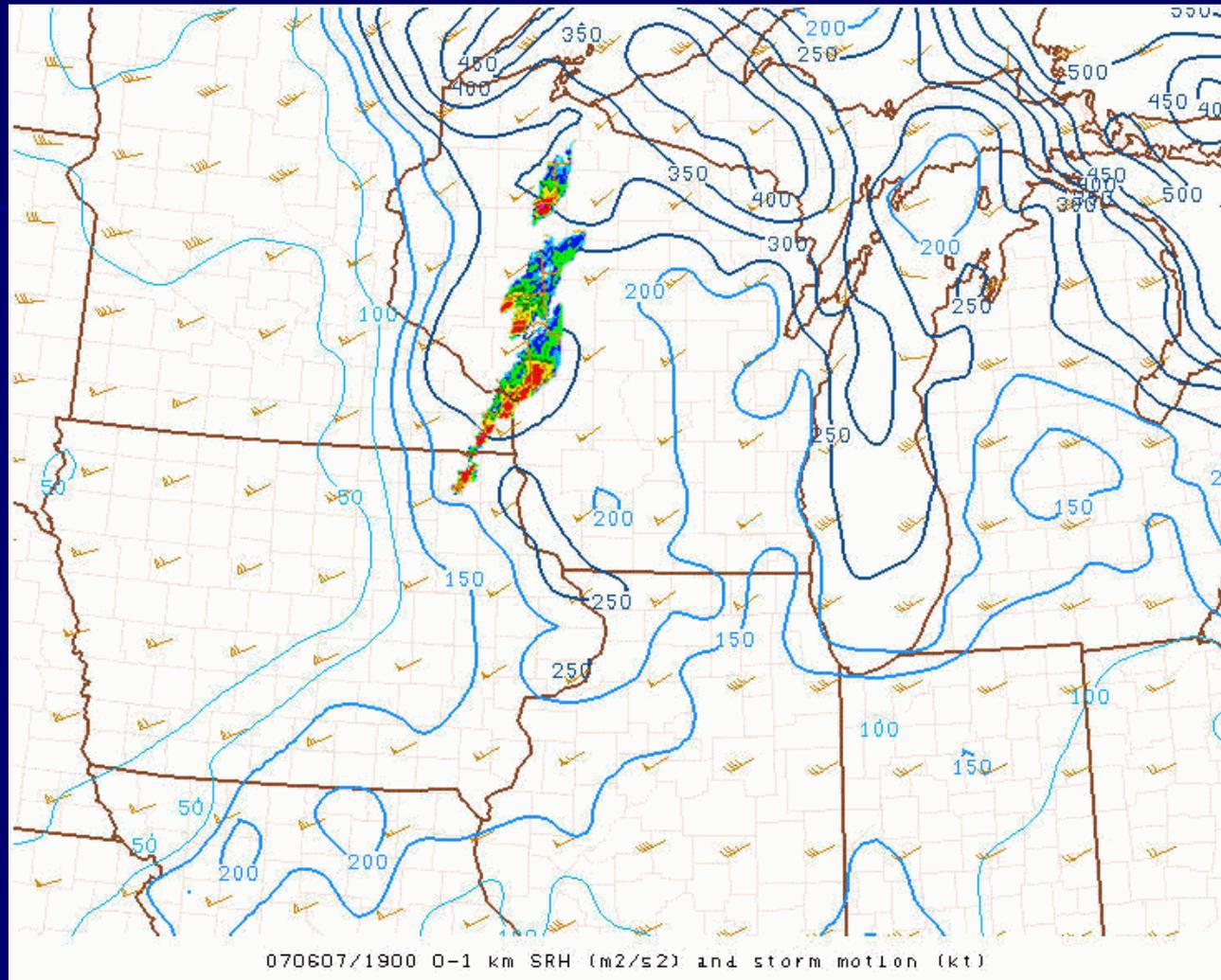
Surface pressure falls (blue dashed) from northern Minn to western Lake Superior helped back surface winds somewhat across northern Wisconsin.



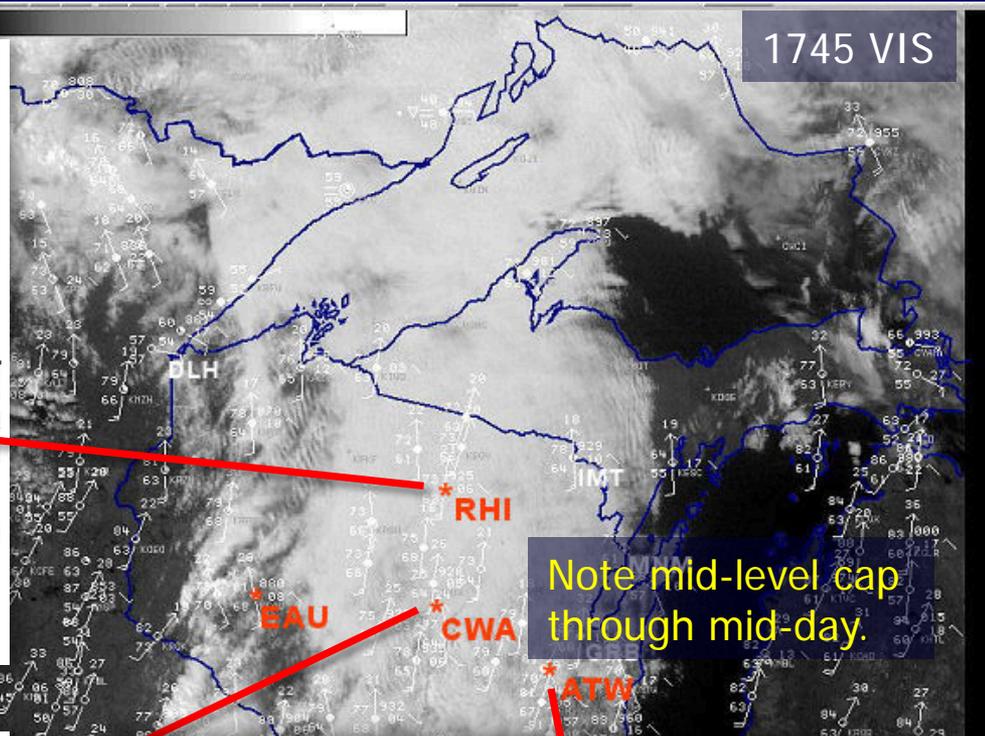
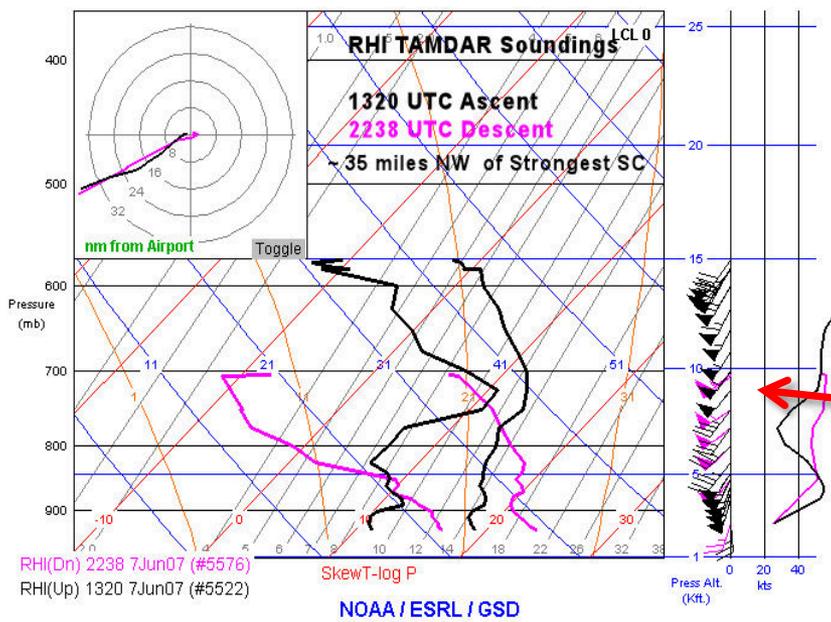
RUC 0-1 km SRH
1700-2300Z

Impressive low-level
SRH over northern
Wisconsin.

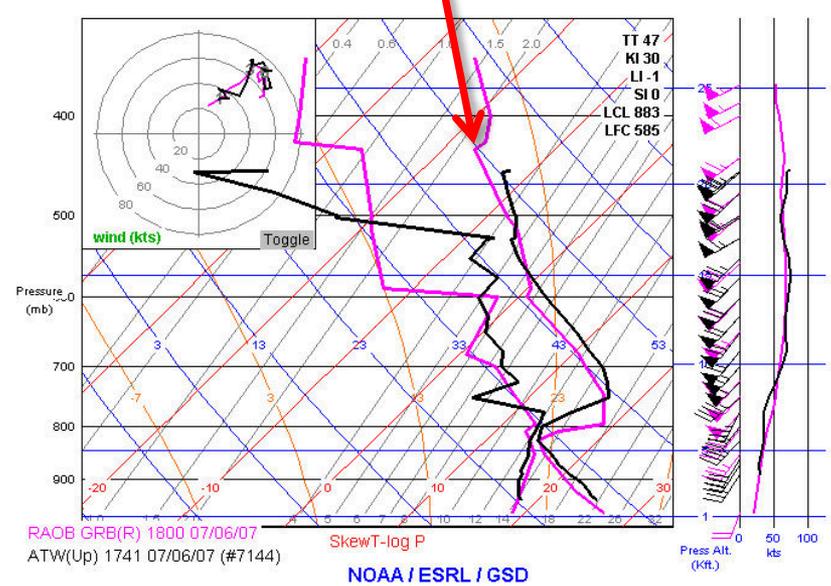
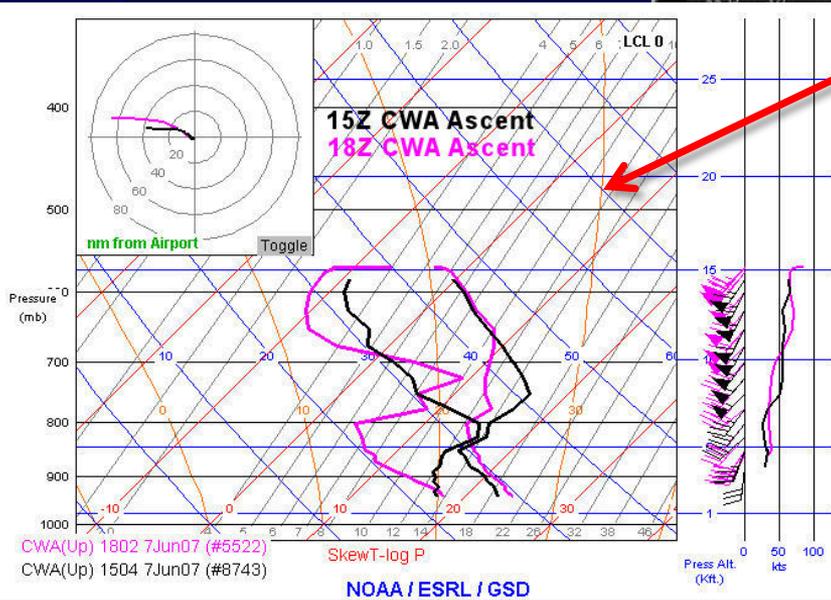
0-1 km SRH
increased
throughout the
day, approaching
500 m^2/s^2 .



1745 VIS

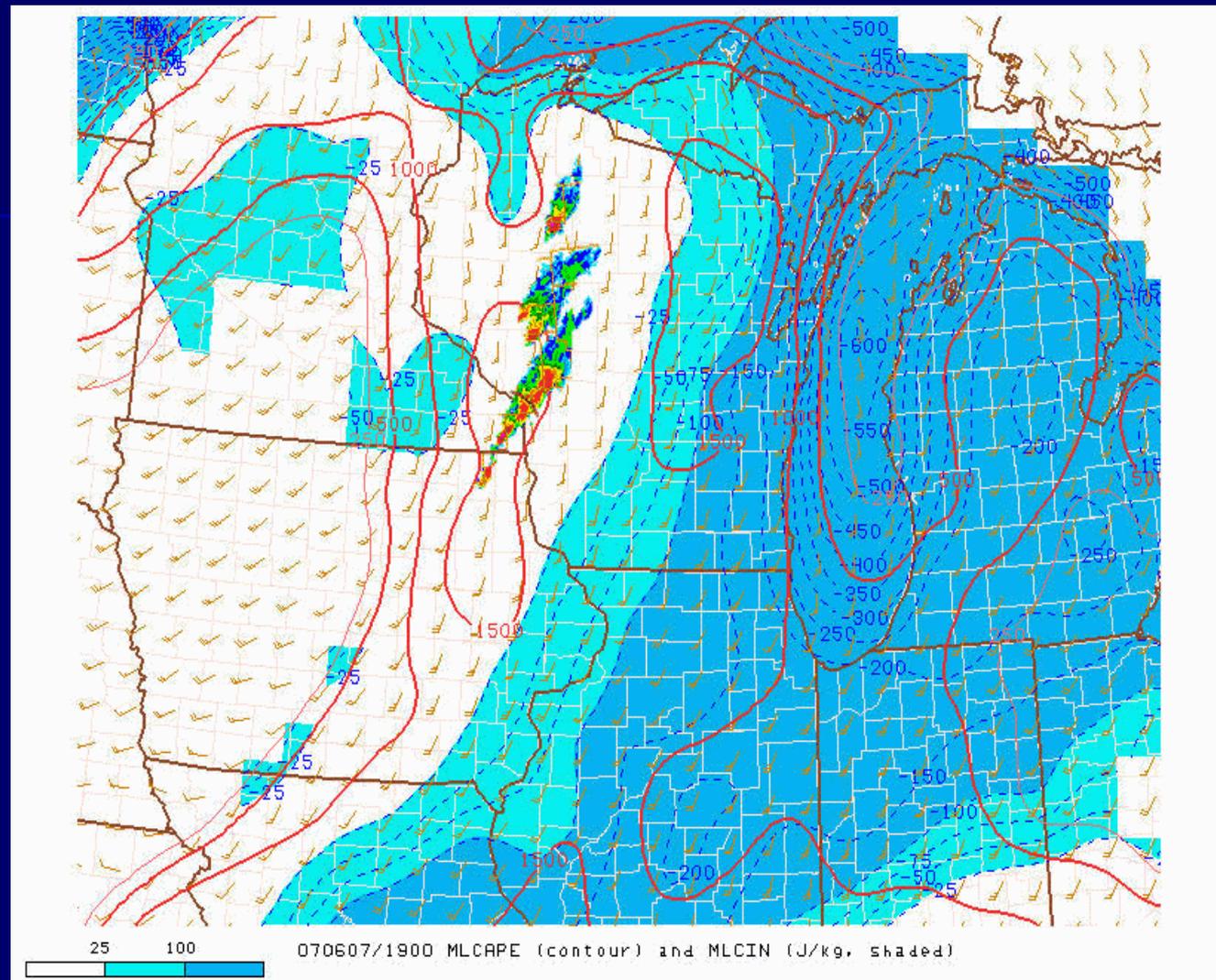


Note mid-level cap through mid-day.



RUC MLCAPE &
MLCIN (J/kg)
1700-2300Z

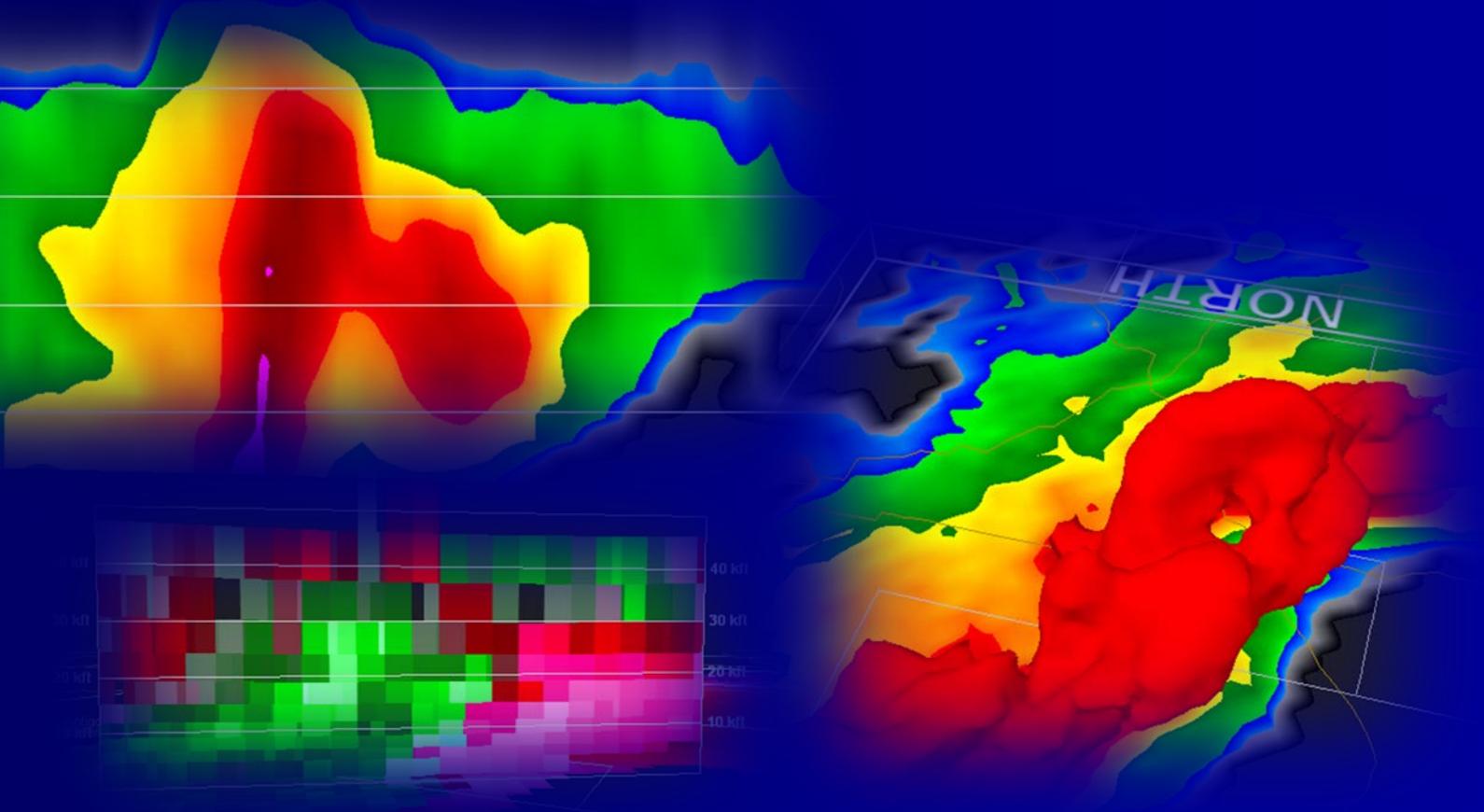
MLCAPE
1200-1500 J/kg



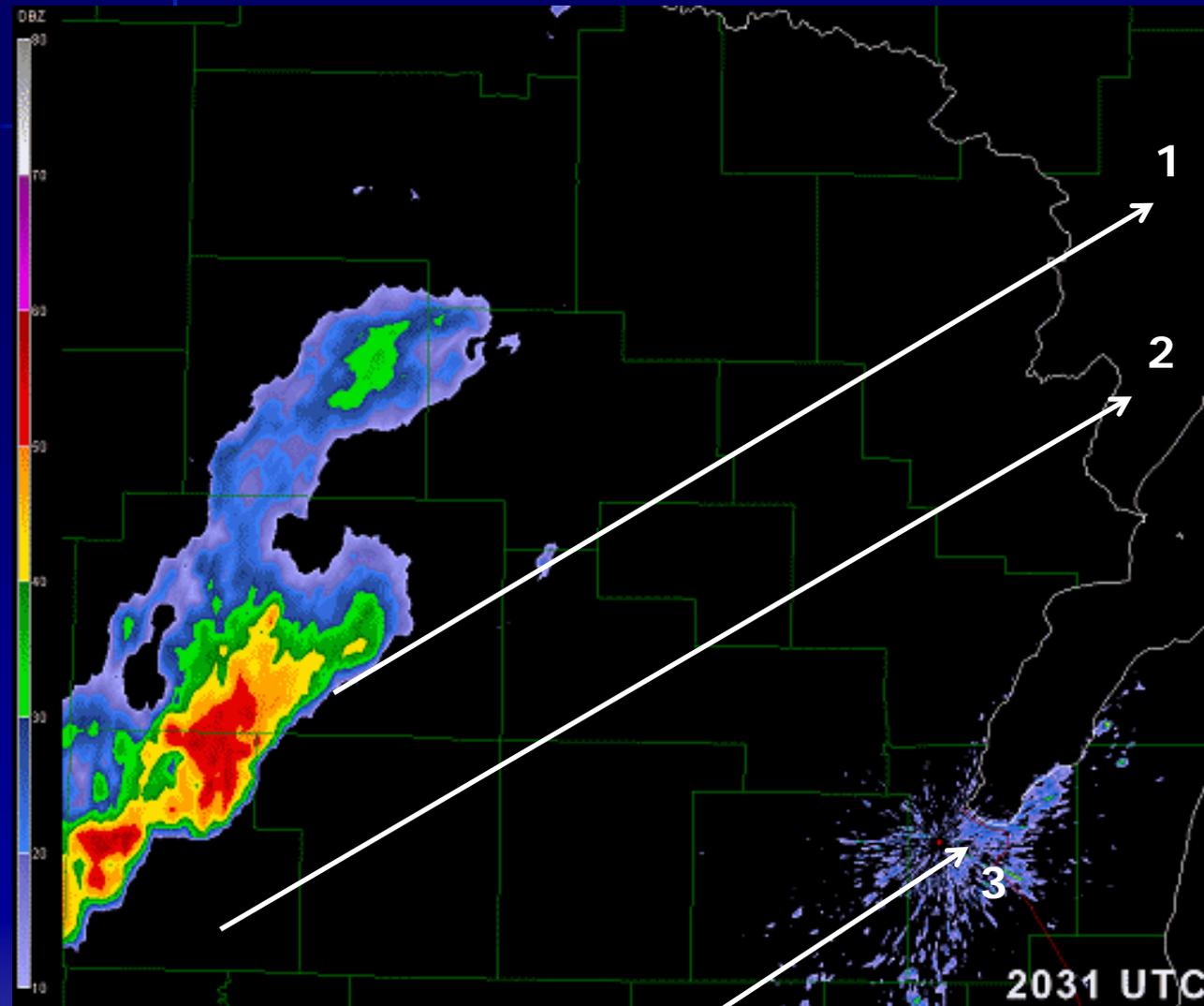
In summary, a high shear, modest instability scenario.



Storm Evolution and Structure



Supercell Tracks



Three primary supercells affected the GRB forecast area:

The two northern-most supercells (1 & 2) were tornadic.

The southern supercell (3) was not tornadic.

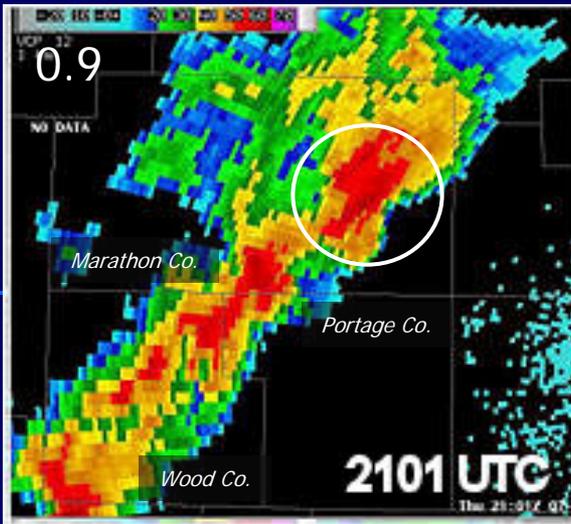
Storms were racing northeast around 50 mph.

We will briefly discuss the radar characteristics of each storm.

0.5 deg reflectivity animation 2031-2341Z

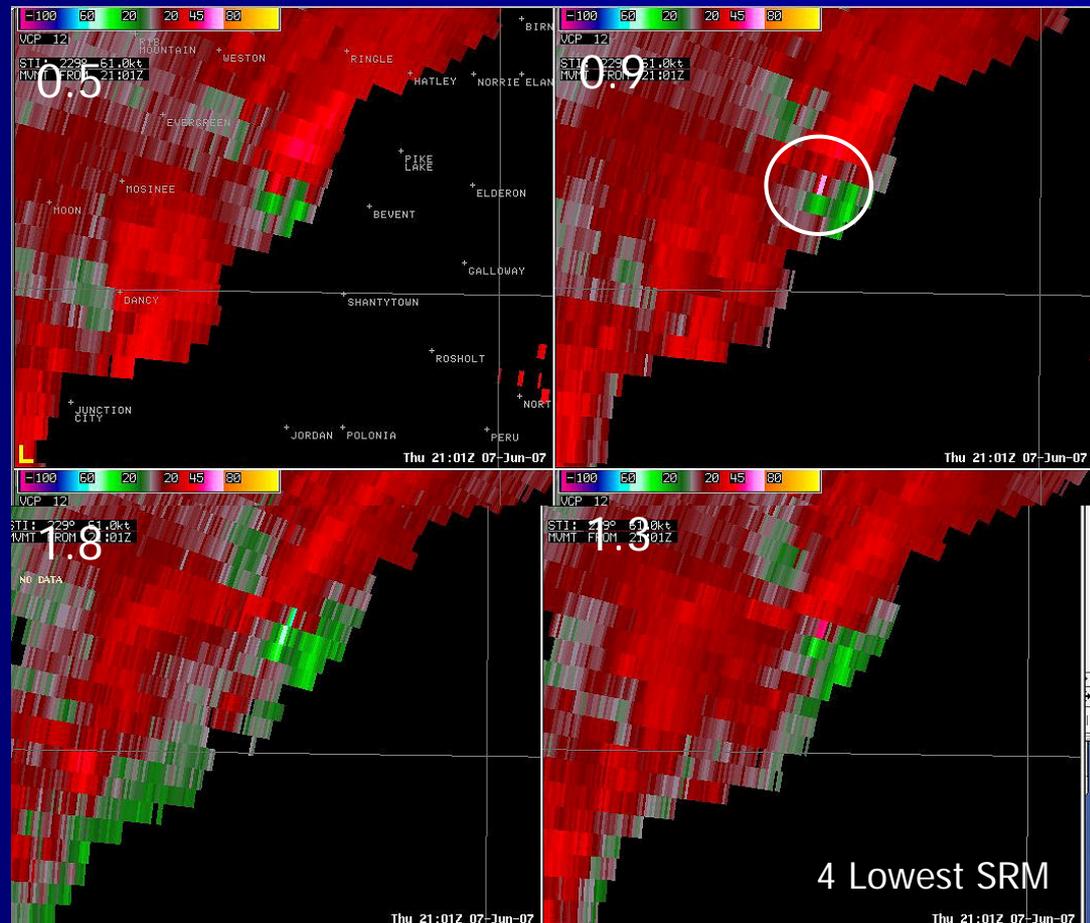
Supercell 1 – Marathon Co (EF2) Tornado

Lead storm produced first tornado in NWS Green Bay (GRB) forecast area with a path length of 7.3 miles, reaching max intensity of EF2 before dissipating.



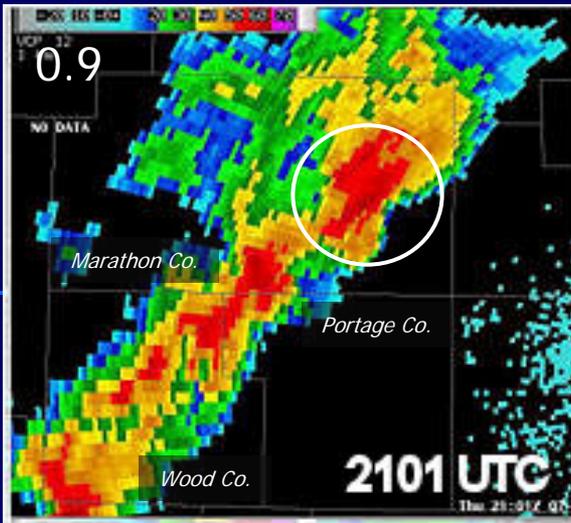
Storms about 60 nm WNW of GRB radar.

Strong mesocyclone –
Max V_r approx 47 kts
(.02 s^{-1} shear).



Supercell 1 – Marathon Co (EF2) Tornado

Lead storm produced first tornado in NWS Green Bay (GRB) forecast area with a path length of 7.3 miles, reaching max intensity of EF2 before dissipating.



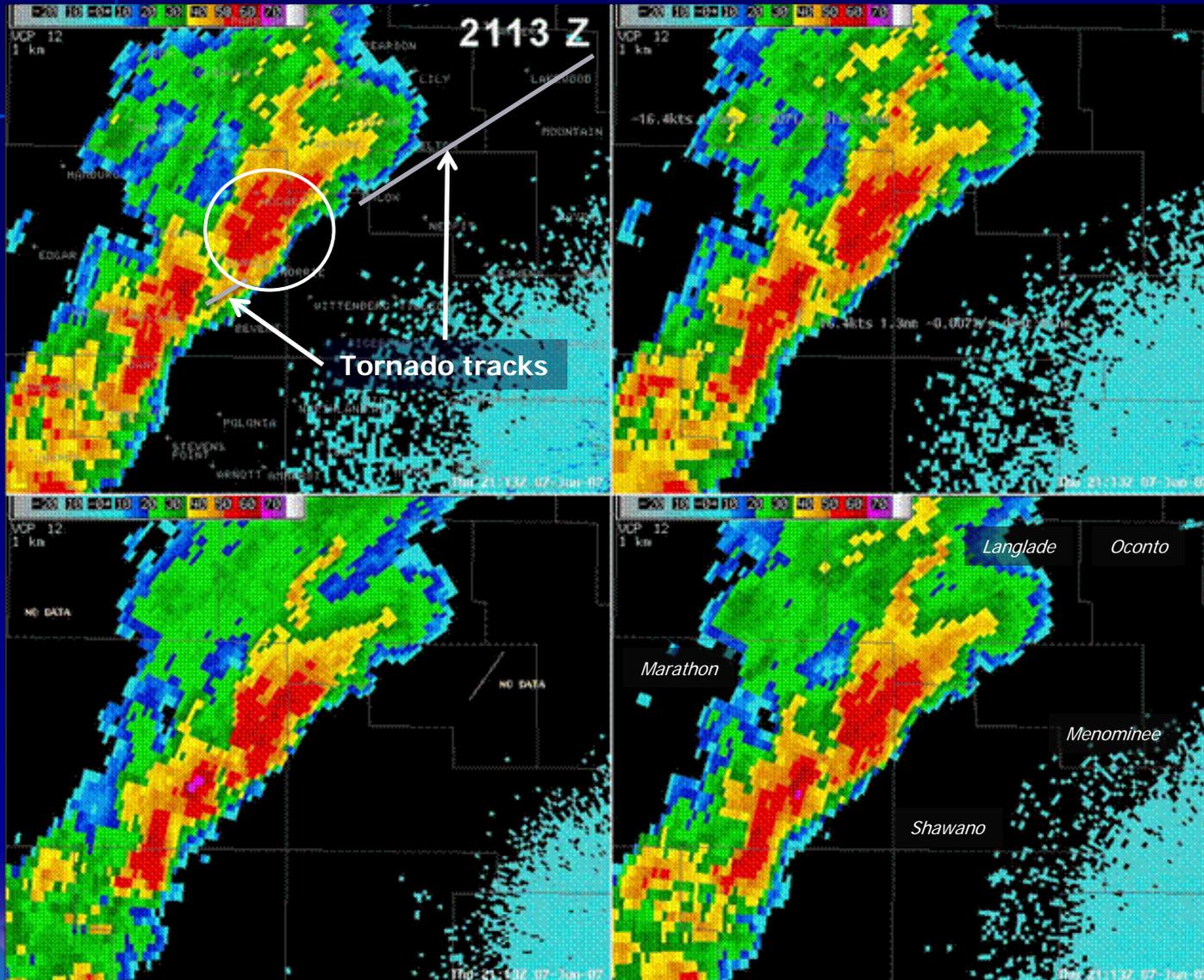
Storms about 60 nm WNW of GRB radar.

Strong mesocyclone –
Max V_r approx 47 kts
(.02 s^{-1} shear).



Supercell 1 – Long Track (EF3) Tornado

4 panel
reflectivity
2113-2151Z



Loop begins at time first tornado dissipates and ends around the time second tornado reaches EF3 intensity.

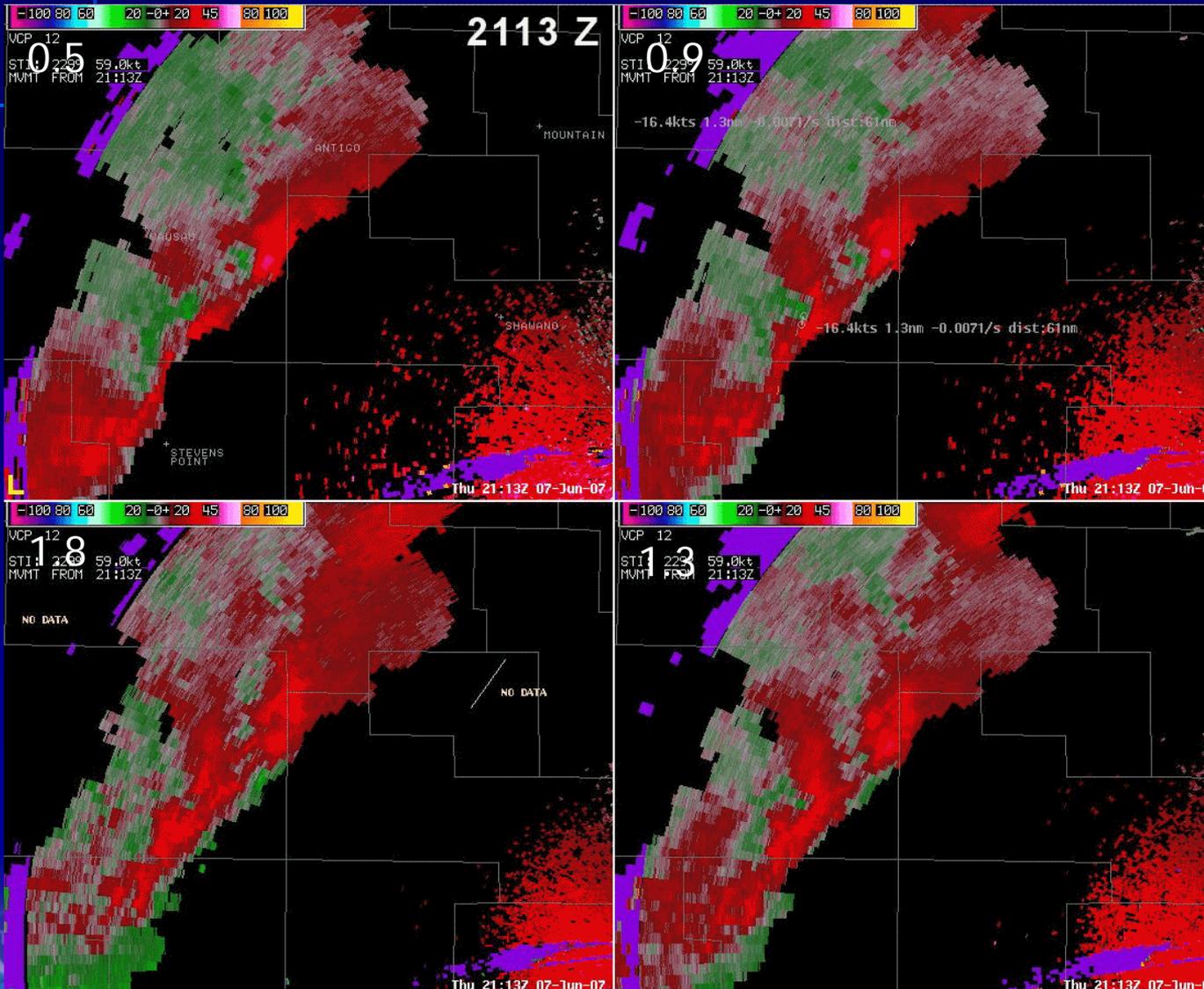
Note that this supercell produced a third tornado (not shown), which hit Marinette Co. about 20 minutes after long-track twister dissipated.

Supercell 1 – Long Track (EF3) Tornado

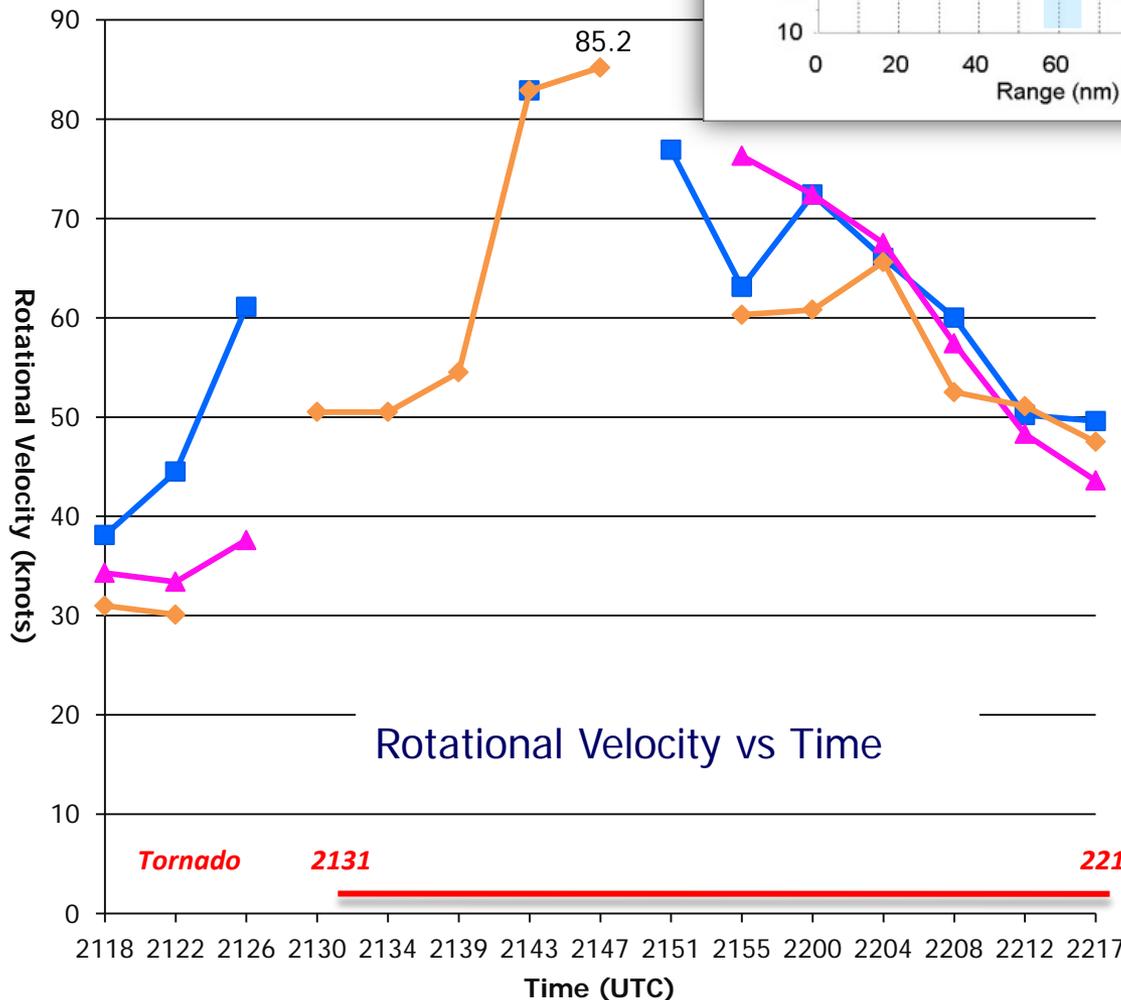
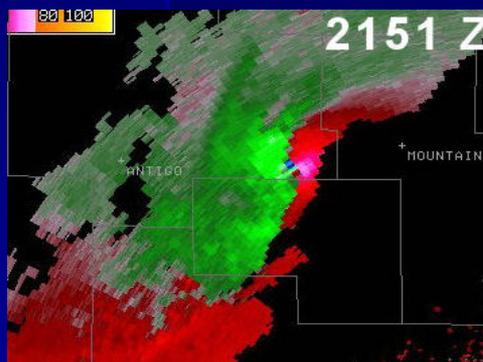
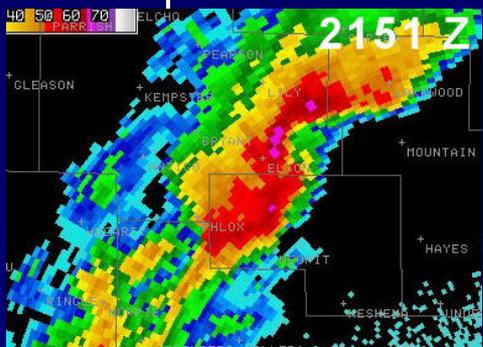
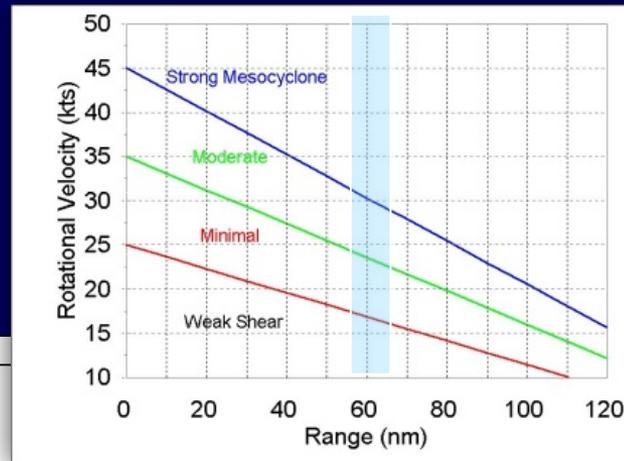
4 panel
storm relative
motion (SRM)
2113-2151Z

Tornado touched
down in extreme NE
Shawano County
around 2131Z and
reached EF3 intensity
by 2147Z

Velocity aliasing
became a problem
as rotational velocity
increased off the
charts.



Supercell 1 – Long Track (EF3) Tornado

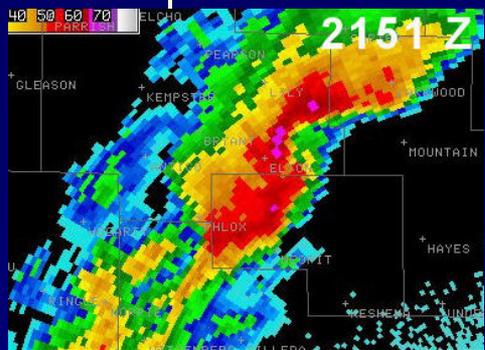


Distance from GRB radar ranged from 50-60 nm.

Some missing data due to velocity dealiasing issues.



Supercell 1 – Long Track (EF3) Tornado



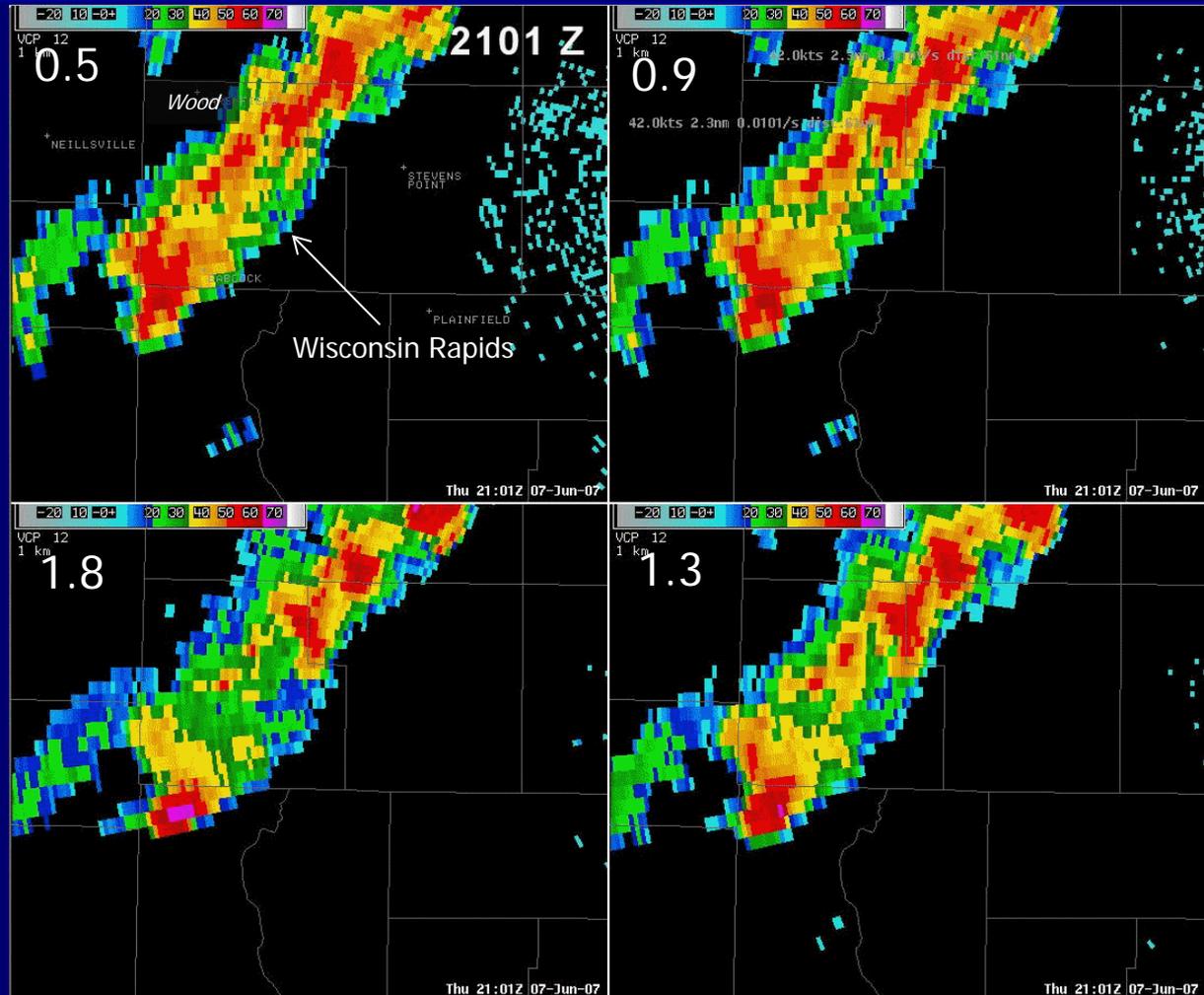
Supercell 2 – Near Record Hail and Weak Tornado in Wood County

4 panel reflectivity 2101-2130Z

Supercell 2 tracked about 30 nm south of lead supercell.

Storm produced near record hail size (5.5 inches) near Wisconsin Rapids at 426 pm CDT. (Note TBSS.)

Storm about 70 nm from radar.

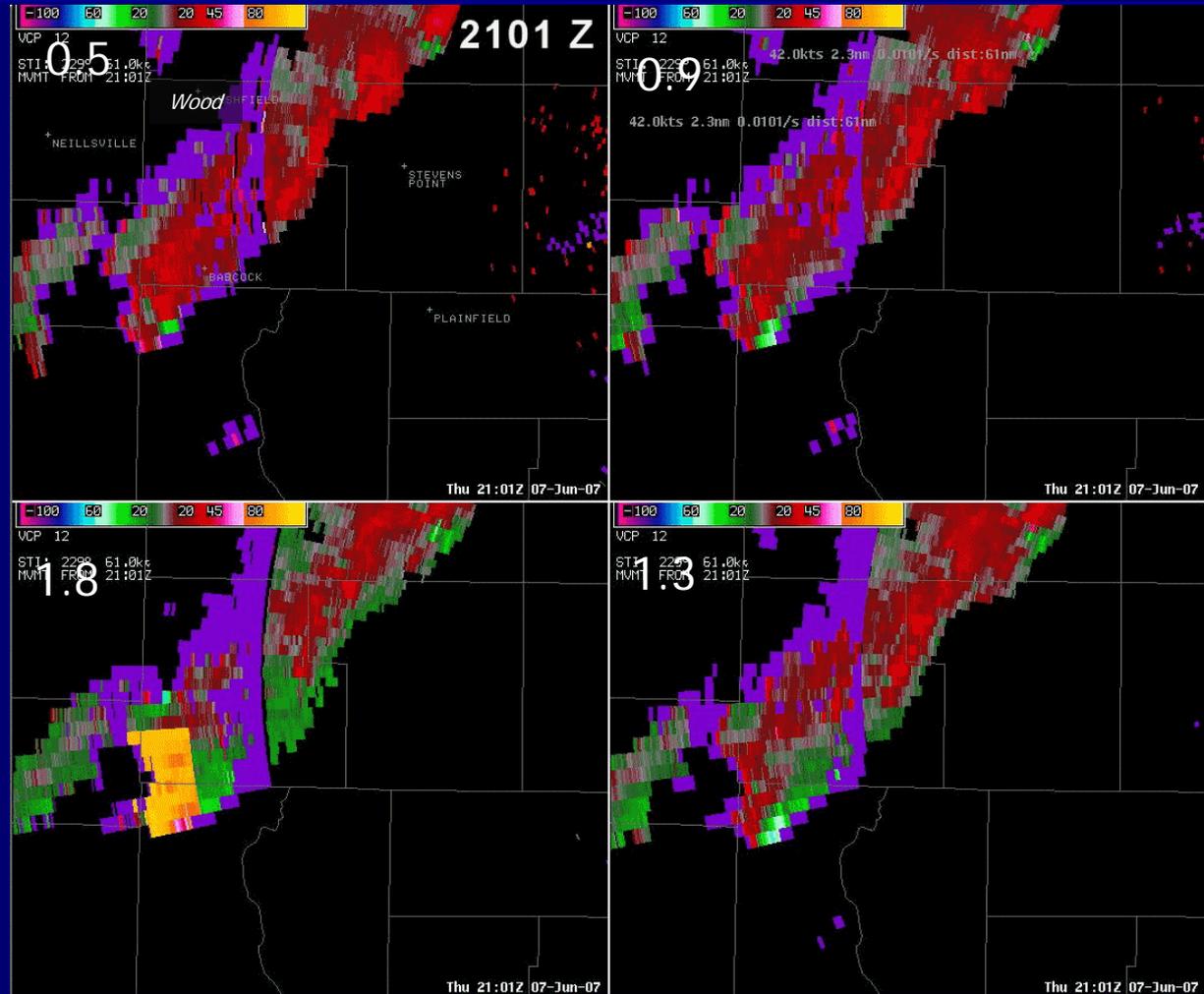


Supercell 2 – Near Record Hail and Weak Tornado in Wood County

4 panel SRM 2101-2130Z

Also produced brief
(EF0) Tornado near
Wisconsin Rapids

Aspect ratio, range
folding and velocity
aliasing created
challenges for the
warning decision
meteorologist.



Supercell 2 – Near Record Hail and Weak Tornado in Wood County



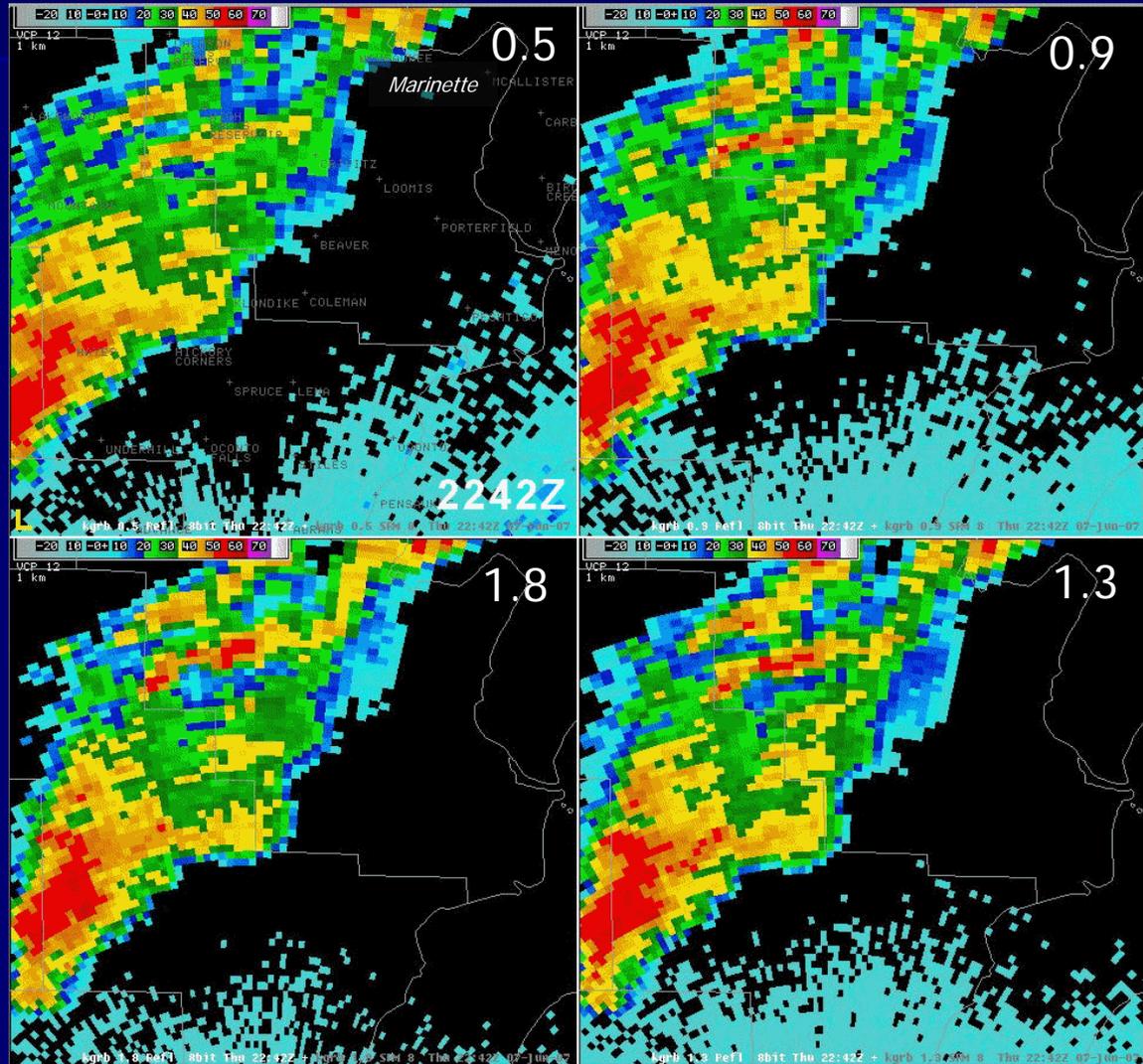
Supercell 2 – The Porterfield Tornado (EF1)

About 1 ½ hours later...

4 panel reflectivity
2242-2320Z

Supercell 2 about 50
miles north of GRB radar

Supercell 2 continued to
track NE for nearly 100
miles producing virtually
no severe weather, until
it entered Marinette
County 1 ½ hrs later.



Supercell 2 – The Porterfield Tornado (EF1)

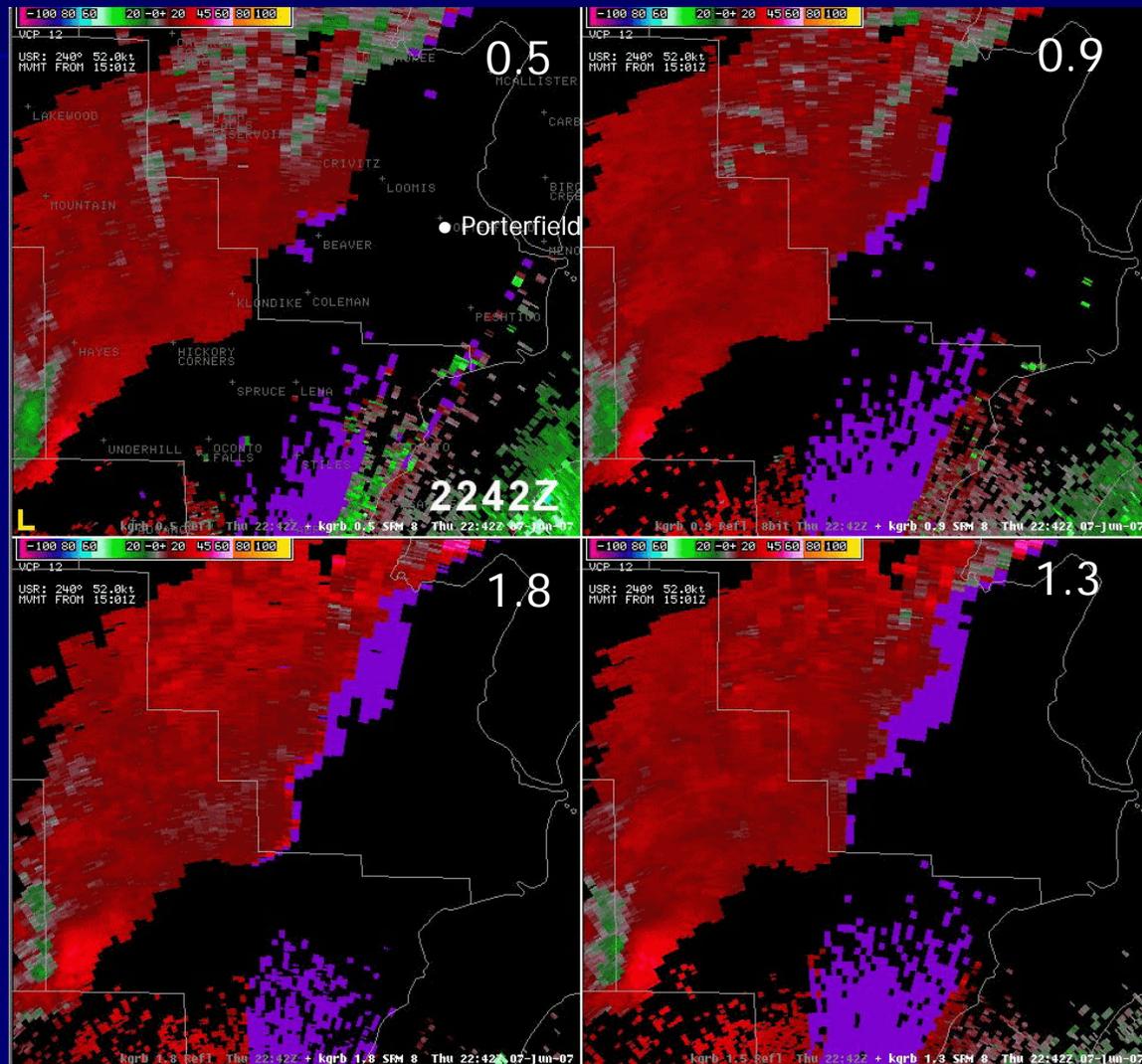
4 panel SRM
2242-2320Z

Prior to 2242Z, the storm rotation struggled to organize. Velocity signature was generally broad and convergent.

After 2242Z, mesocyclone showed classic evolution prior to tornadogenesis.

Tornado reaching EF1 intensity touched down 6 miles southwest of Porterfield at 2316Z.

Significant velocity aliasing just prior to tornadogenesis.

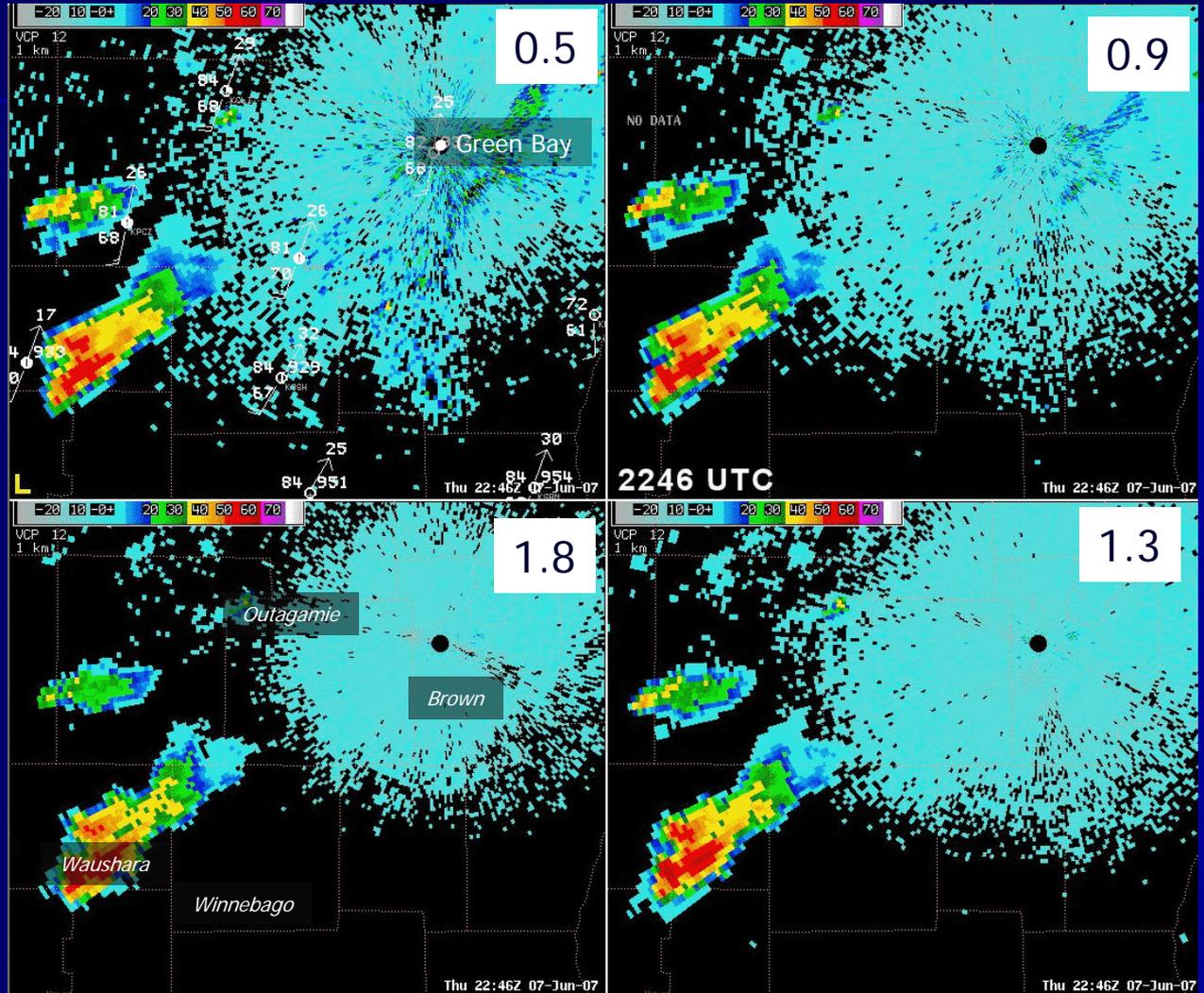


Supercell 3 – “A Close Call”

4 panel reflectivity
2246-2316Z

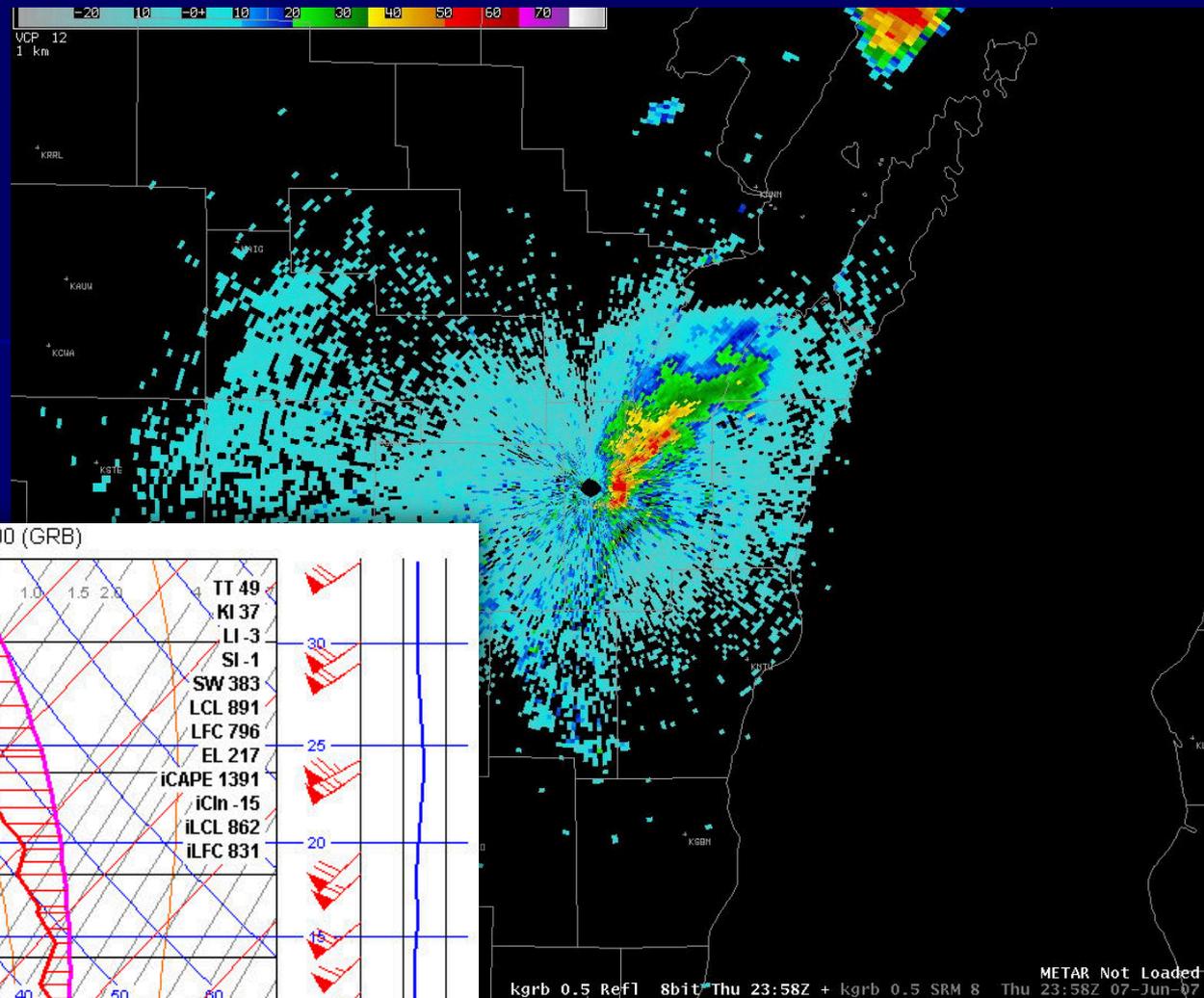
Supercell #3
approached
northeast Wisconsin
by 6 pm.

Storm produced hail
up to 1 inch and
wind gusts over 50
mph in Waushara,
Winnebago and
Outagamie counties.

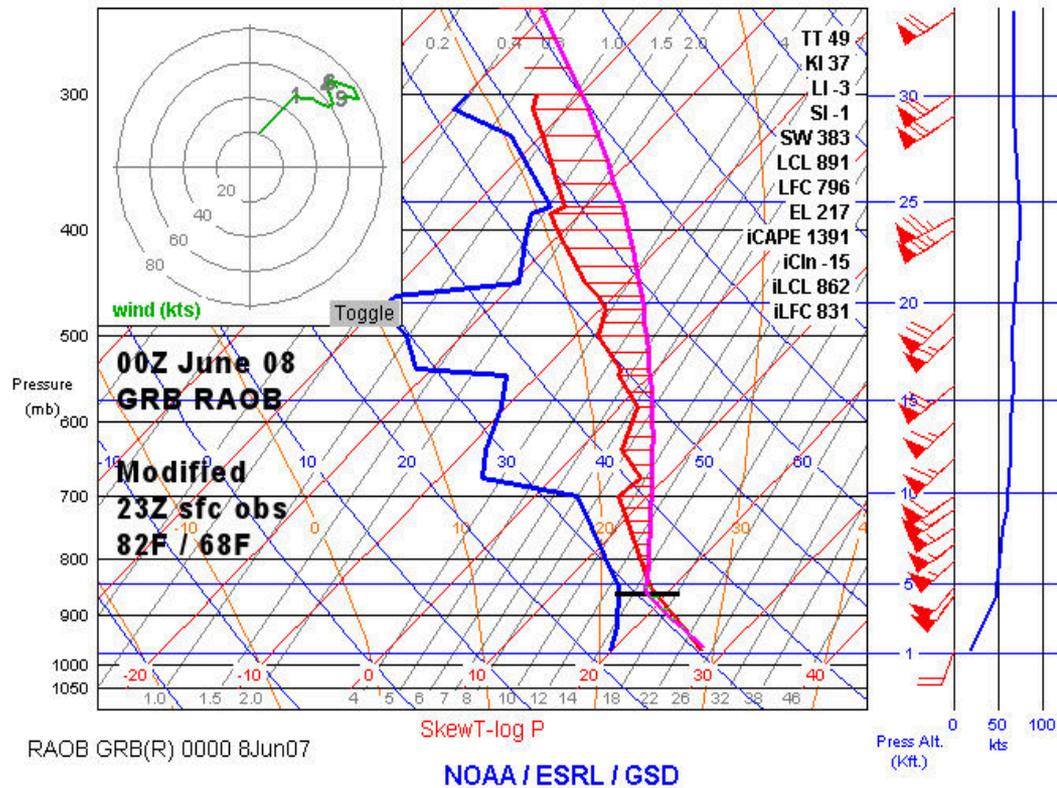


Supercell 3 – “A Close Call”

Storm spotters
were all over this
storm.



RAOB, 08-Jun-2007 00:00:00 (GRB)



METAR Not Loaded

kgrb 0.5 Ref1 8bit Thu 23:58Z + kgrb 0.5 SRM 8 Thu 23:58Z 07-Jun-07

Another possible explanation for the demise of the supercell...

"Divine Intervention"



Packer Fans have connections in high places!!!

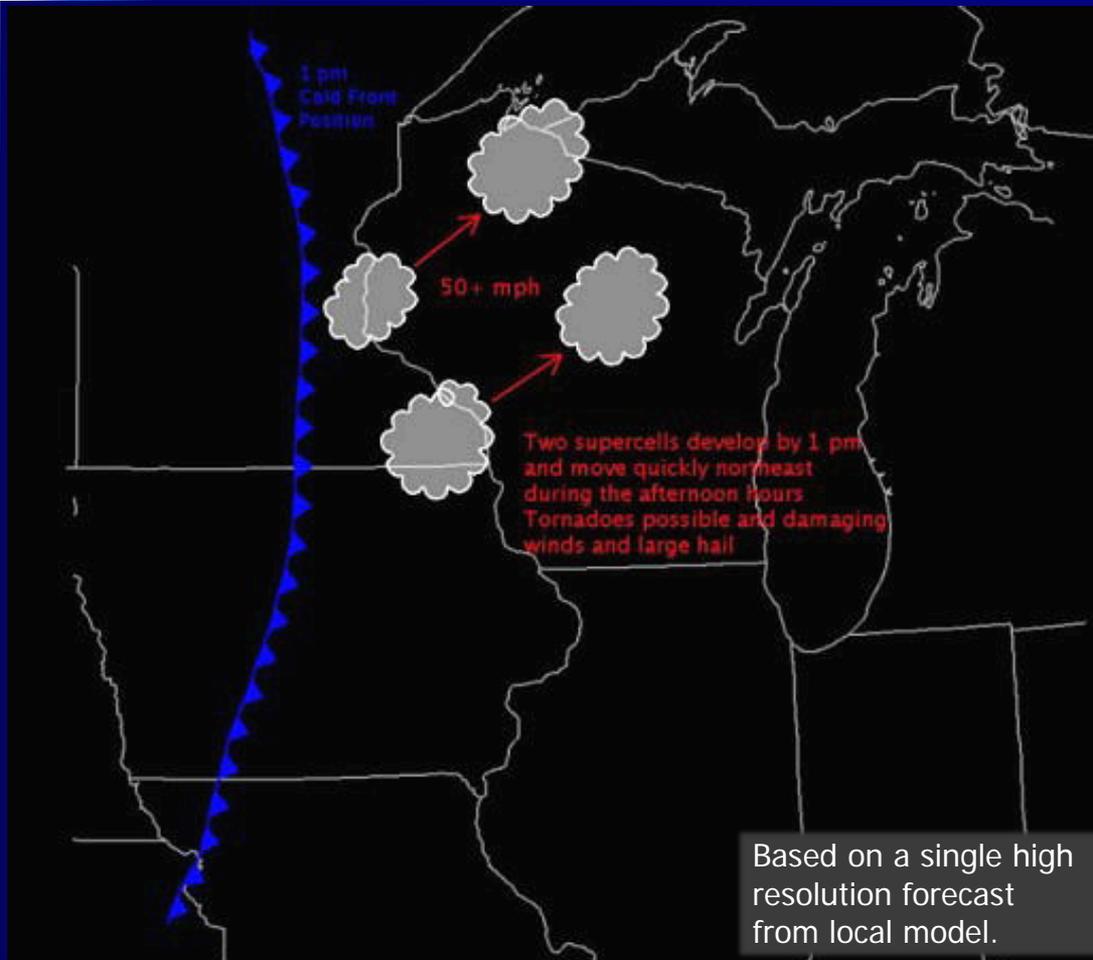
Lambeau Field is "Hallowed Ground"



Service and Customer Response



Coordination Prior to the Event



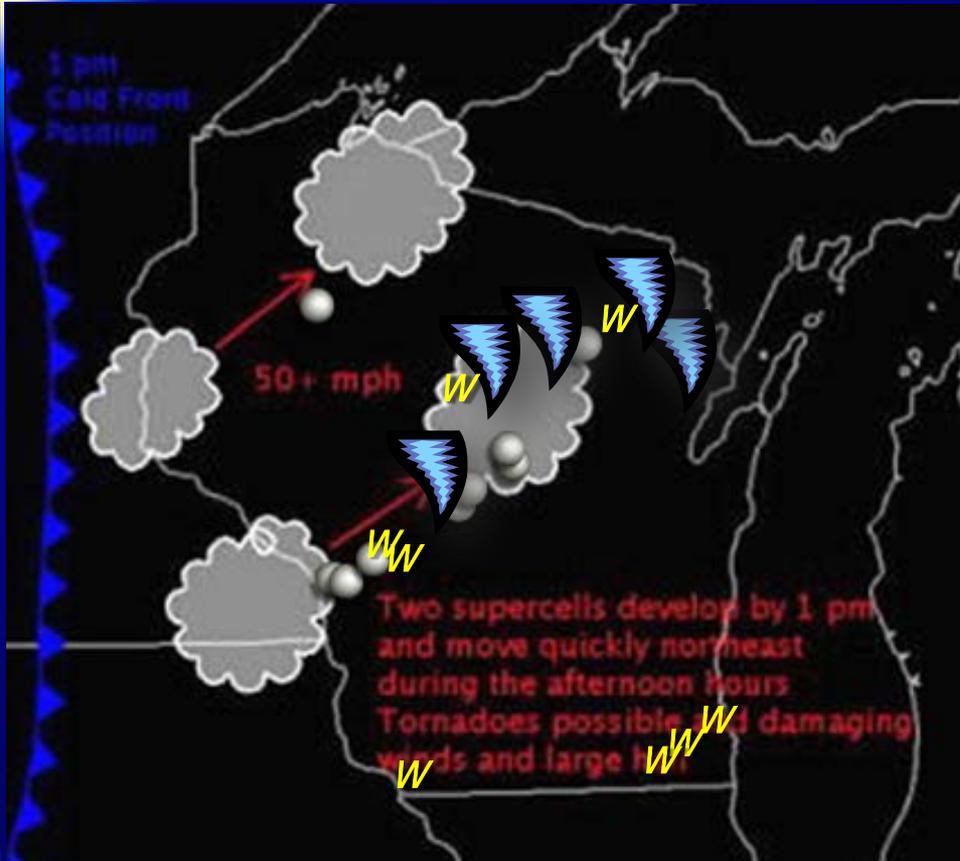
Coordination calls were made with emergency managers the day prior to and day of the event.

This graphic was utilized during call the day before the event.

Officials shared info with school districts and other emergency planners.

Several businesses and a few school districts closed due to the threat!

Coordination Prior to the Event



Overlay of actual tornadoes, very large hail, and damaging wind gusts.



Tornado



T-storm Wind – 55+ kts

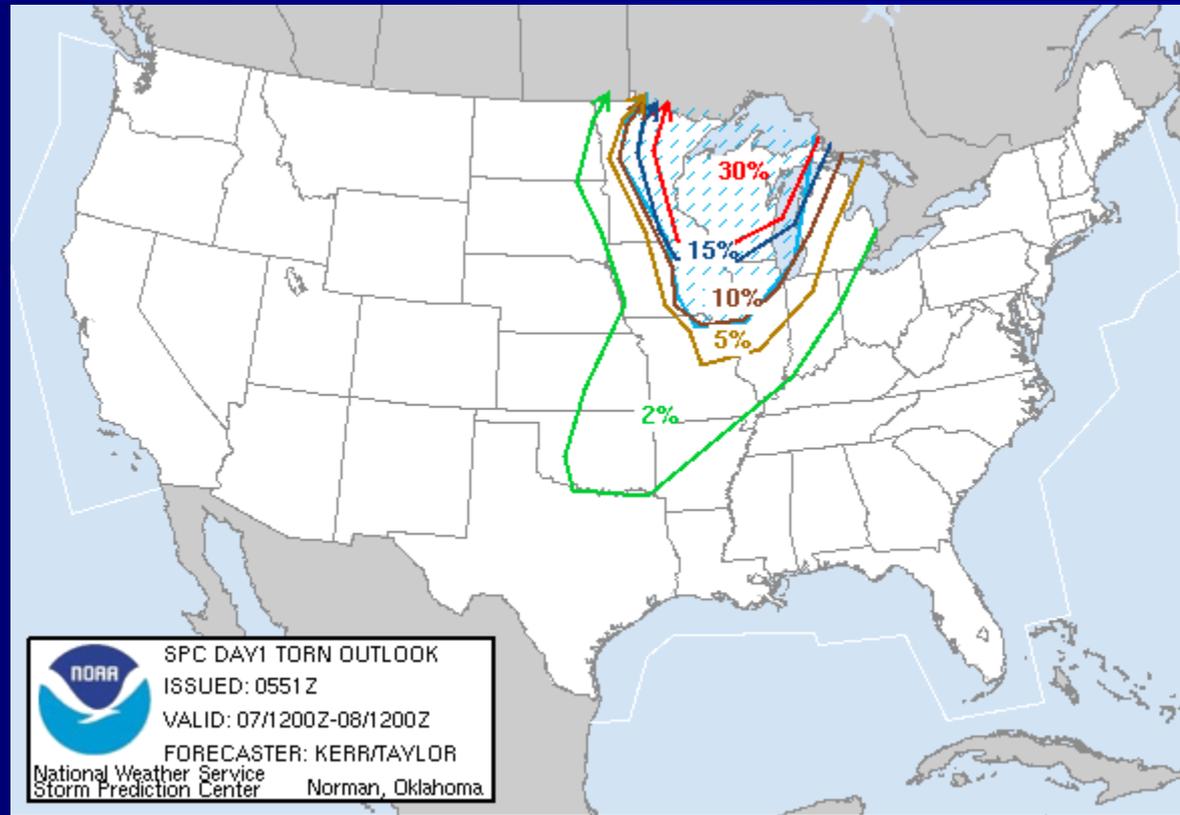


Hail – 1.75"+

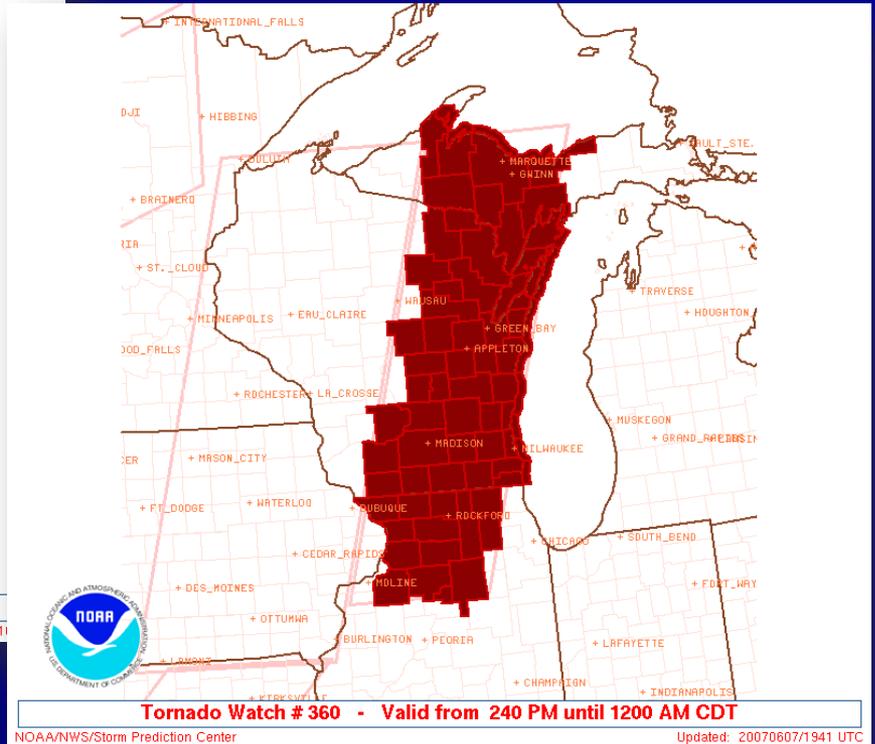
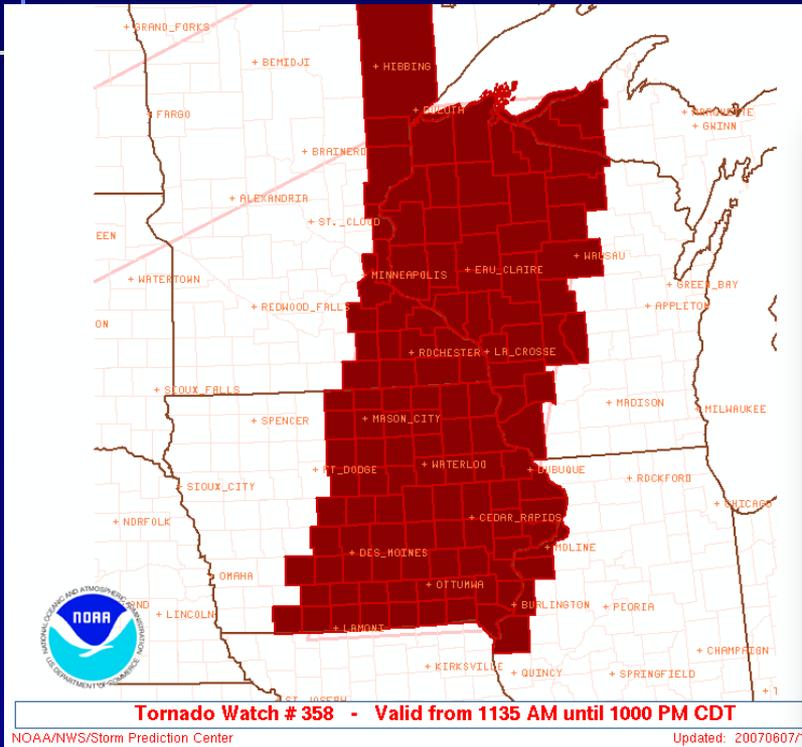
Day of the Event – Early AM Convective Outlook

High Risk area
across portions
of the western
Great Lakes.

Probabilistic
Tornado Graphic
shows high
probability of a
tornado with
10% or greater
probability of
EF2-EF5 (w/in 25
miles of a point)
in hatched area.



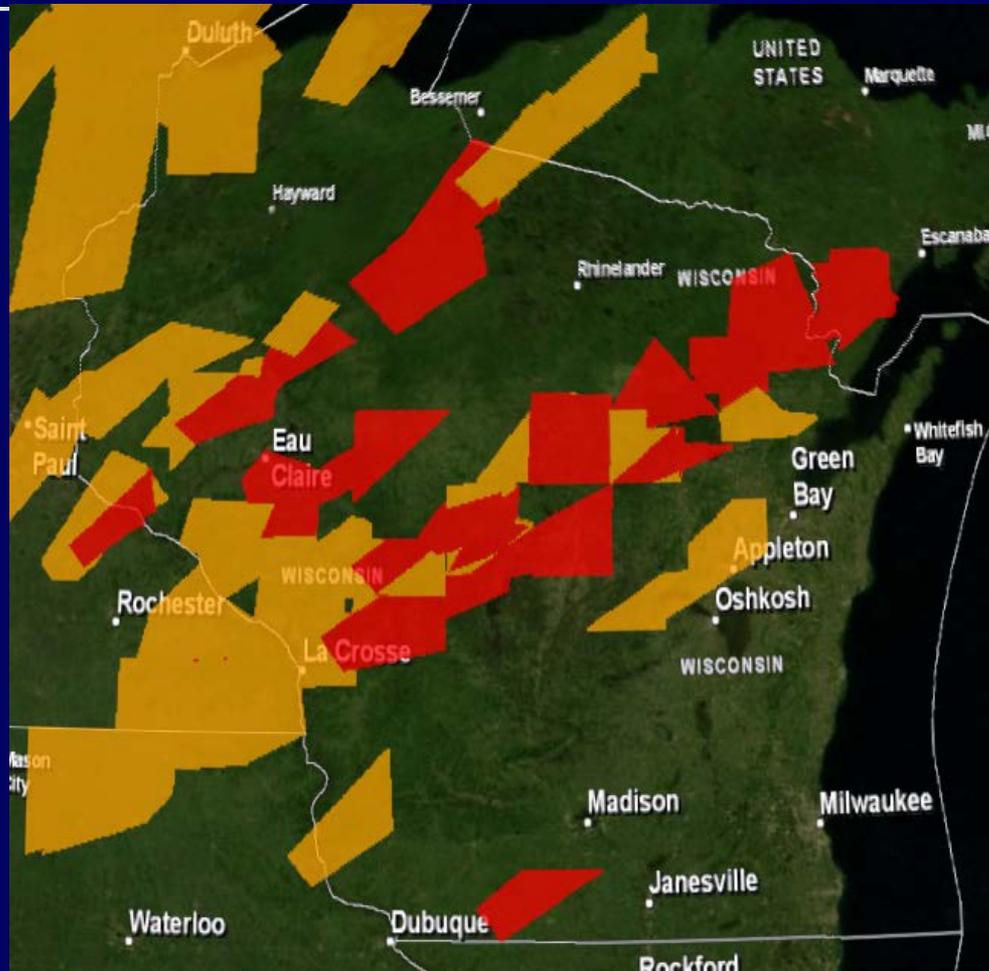
Day of the Event – Tornado Watches



“PDS” Tornado Watches
issued at 11:35 am and 2:40 pm



Day of the Event – Warnings



Tornado Warning

Severe T-storm Warning



Day of the Event – Warnings

NWS Green Bay County Warning Area

- 5 Tornadoes
- 19 reports of large hail or damaging straight-line wind
- Warning lead time for significant events:
 - Marathon Co. EF2 – 6 min
 - Long track EF3 – 22 min
 - Wood Co. giant hail – 31 min



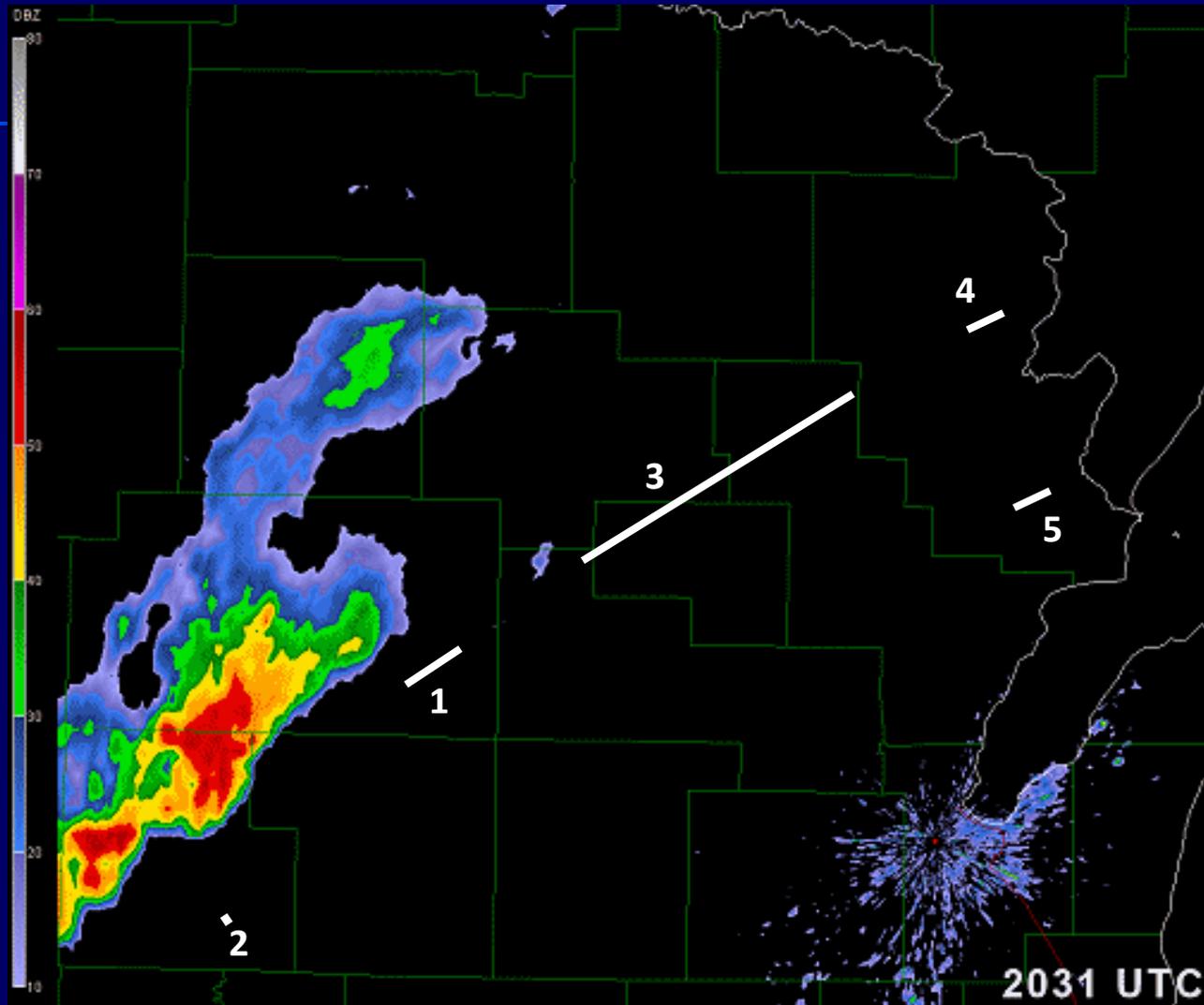
The Aftermath



Tornado and Storm Reports

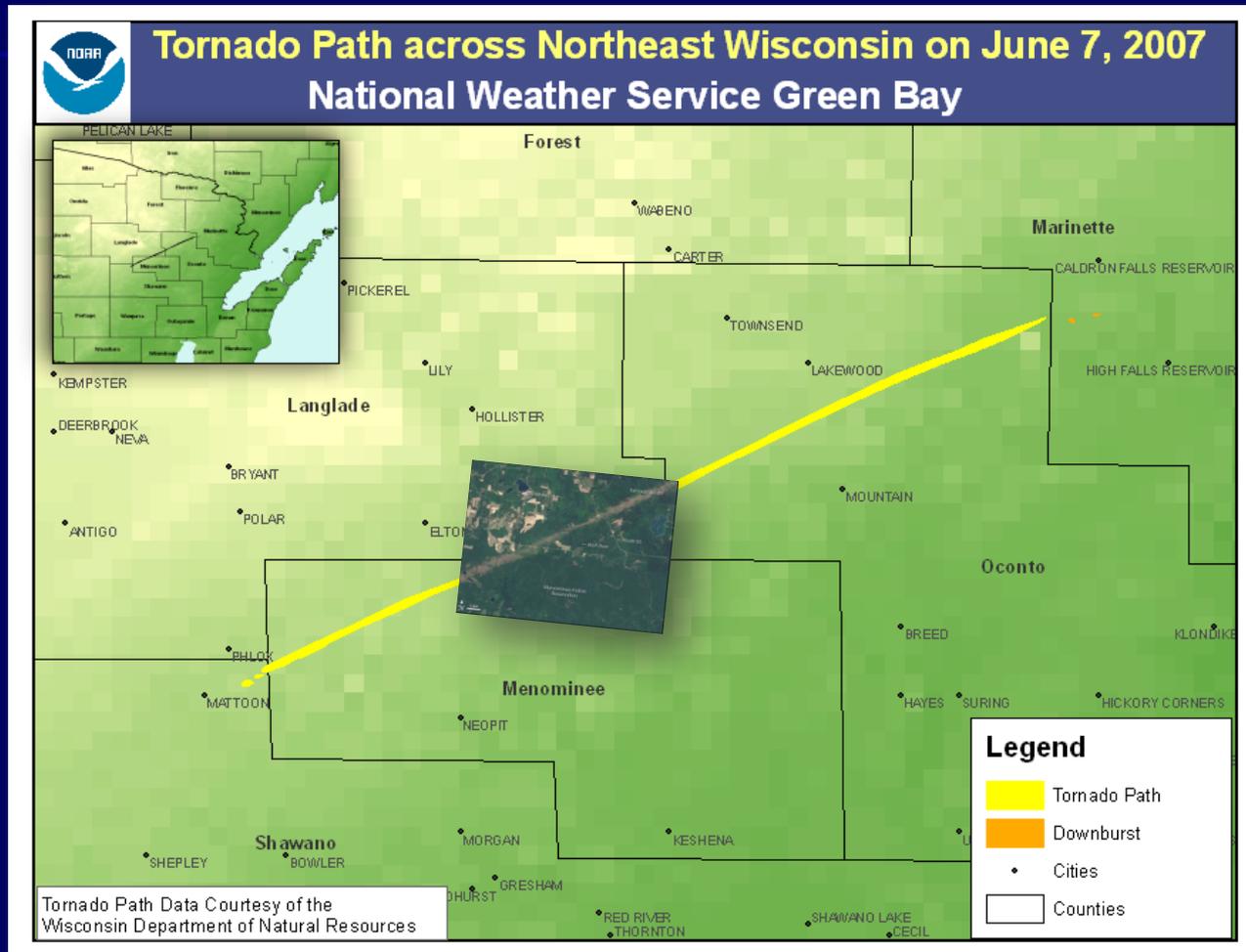


Supercell and Tornado Tracks

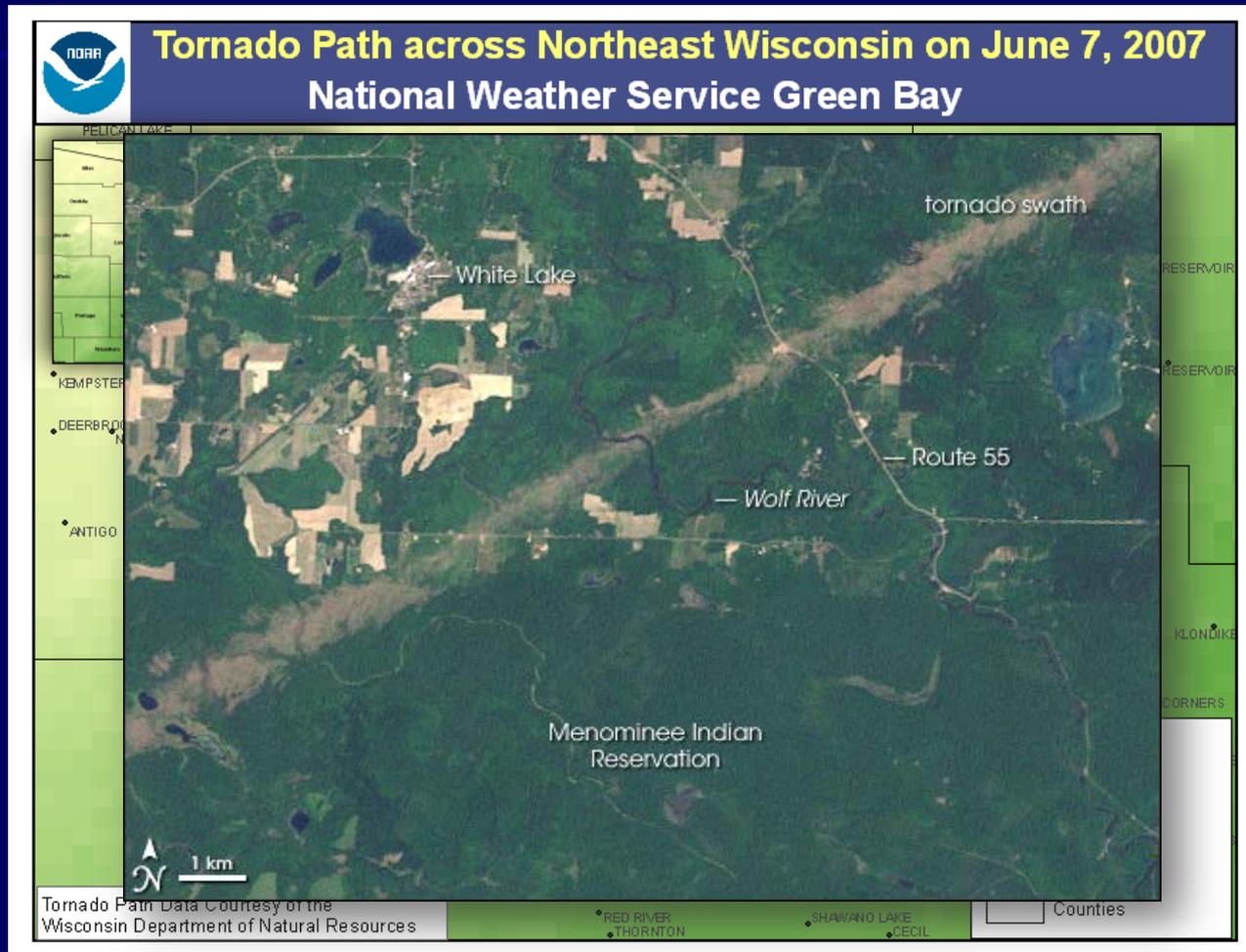


0.5 deg reflectivity animation 2031-2341Z

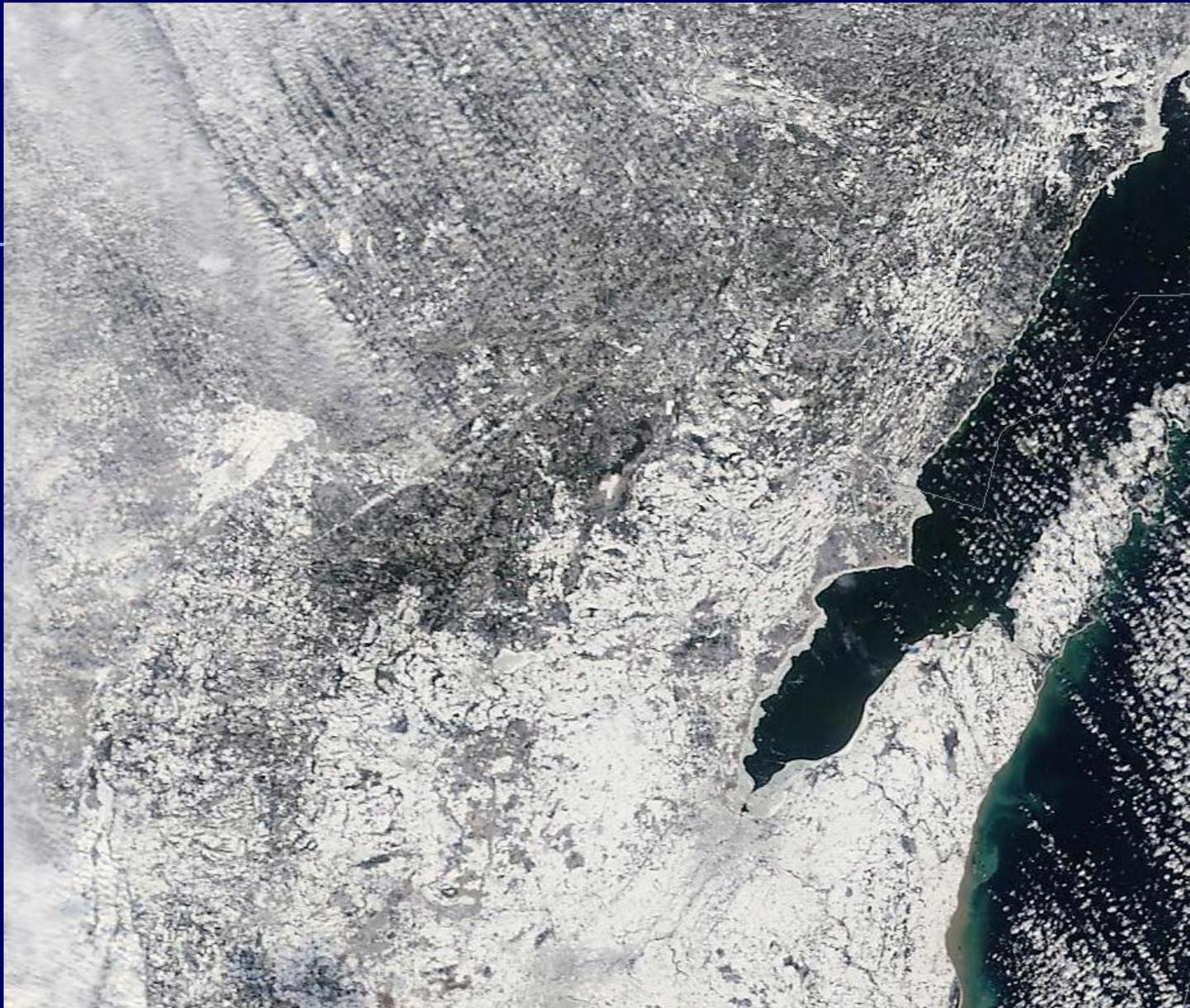
Long-Track EF3 Tornado



Long-Track EF3 Tornado



Landsat 7 - Enhanced Thematic Mapper Plus (ETM+)



December 3, 2007 MODIS – Courtesy UW-SSEC



Long-Track EF3 Tornado



Langlade County



Oconto County

Long-Track Tornado

Damage Near White Lake

Langlade County



Phil Kurimski
NWS Green Bay



Phil Kurimski
NWS Green Bay



Long-Track Tornado

Tornado Track in Oconto Co.



Long-Track Tornado

Damage in Town of Riverview

Oconto County



Long-Track Tornado

Tornado Damage

Even though the tornado hit a remote part of Wisconsin, damage was significant:

- 40.1 mile long track, the longest track tornado in Wisconsin since 1985, and the longest in the U.S. in 2007.
- $\frac{3}{4}$ mile wide damage path, the widest Wisconsin tornado since 1985.
- 14,400 acres of forest flattened.
- 30 homes/businesses damaged or destroyed.
- Estimated damage was \$15.4 million.



Wood County Hail



Bart McCarthy
Port Edwards, WI

Wood County Hail

Port Edwards / Wisconsin Rapids Hail

- 5.5 inch diameter hailstone in Port Edwards was second largest hailstone ever reported in Wisconsin weather history.
 - Wisconsin record is 5.7 inch stone in Wausau in May 1921
- \$45 million in damage



Questions?

The 7 June 2007 Tornadic Supercell Outbreak in Northern and Central Wisconsin

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American Meteorological Society



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NOAA NWS Green Bay

www.weather.gov/grb



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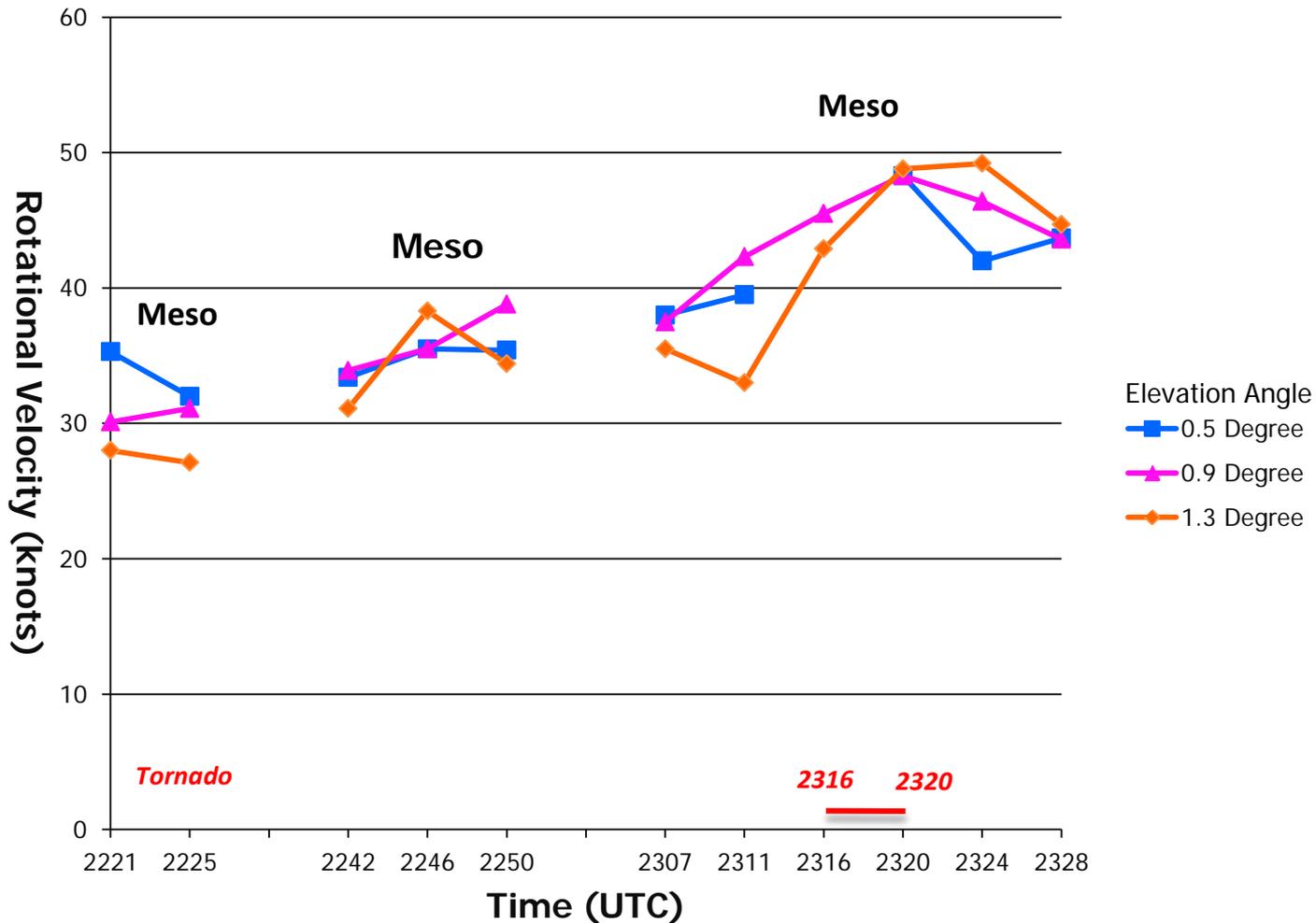


Extra slides

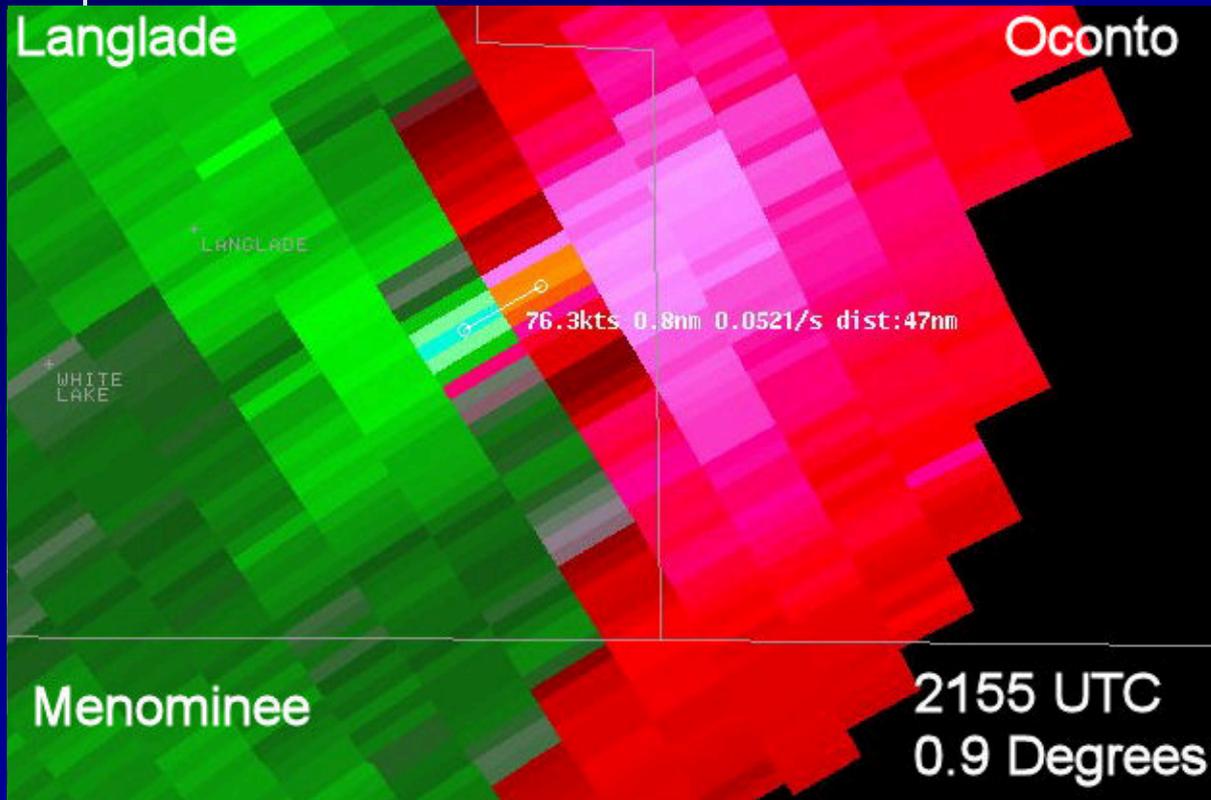


VrShear Chart – Porterfield (EF1)

- VrShear Values of the storm that produced a tornado near Porterfield.
- No tornado until values exceeded 40 knots.



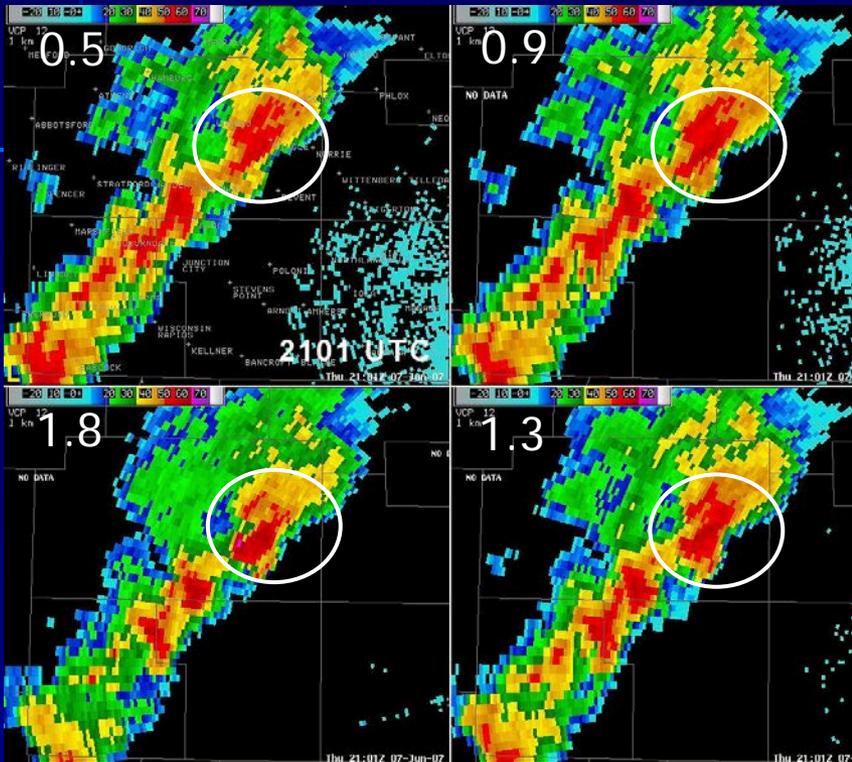
Supercell 1 – Long Track (EF3)



A look at the SRM data during the height of the storm.

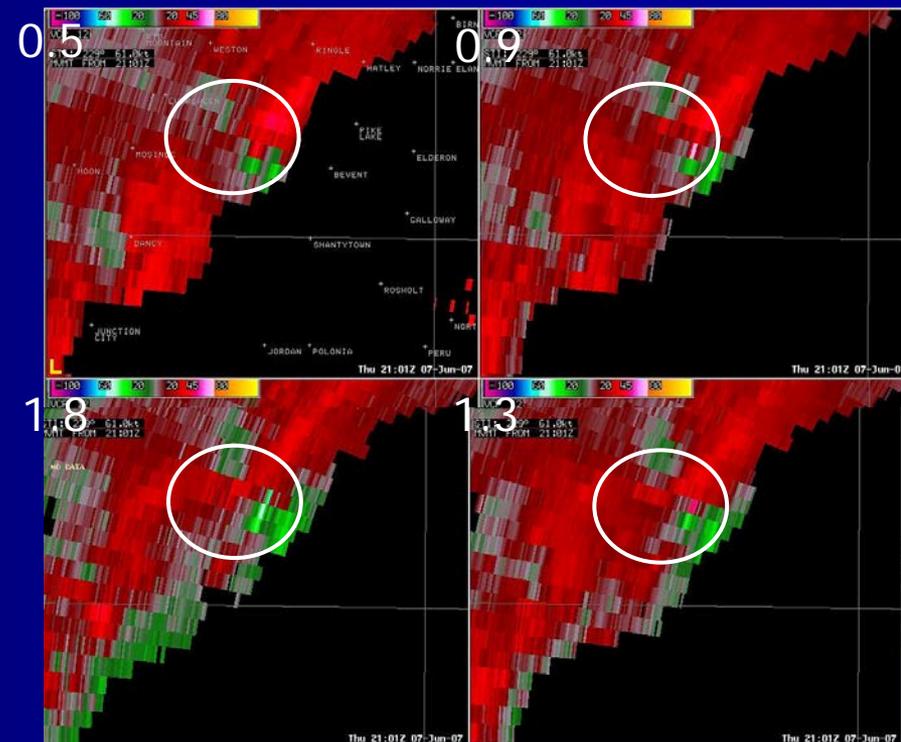
WDM had to rely on higher elevation slices due to velocity aliasing problem.

Supercell 1 – Marathon County (EF2) Tornado



4 lowest elevation slices – reflectivity (left) and SRM (below) at 2101 UTC around time of tornado touchdown.

Lead storm produced first tornado in GRB forecast area with a path length of approximately 7.3 miles reaching max intensity of EF2.



Storms ~ 60 nm WNW of GRB radar

Strong Mesocyclone - Max Vr ~ 47 kts
(.02 /s shear)



