



The Memorial Day 2022 Severe Weather Outbreak Across Northeastern Minnesota

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2023 Great Lakes Operational Meteorology Workshop
Madison, WI



Overview



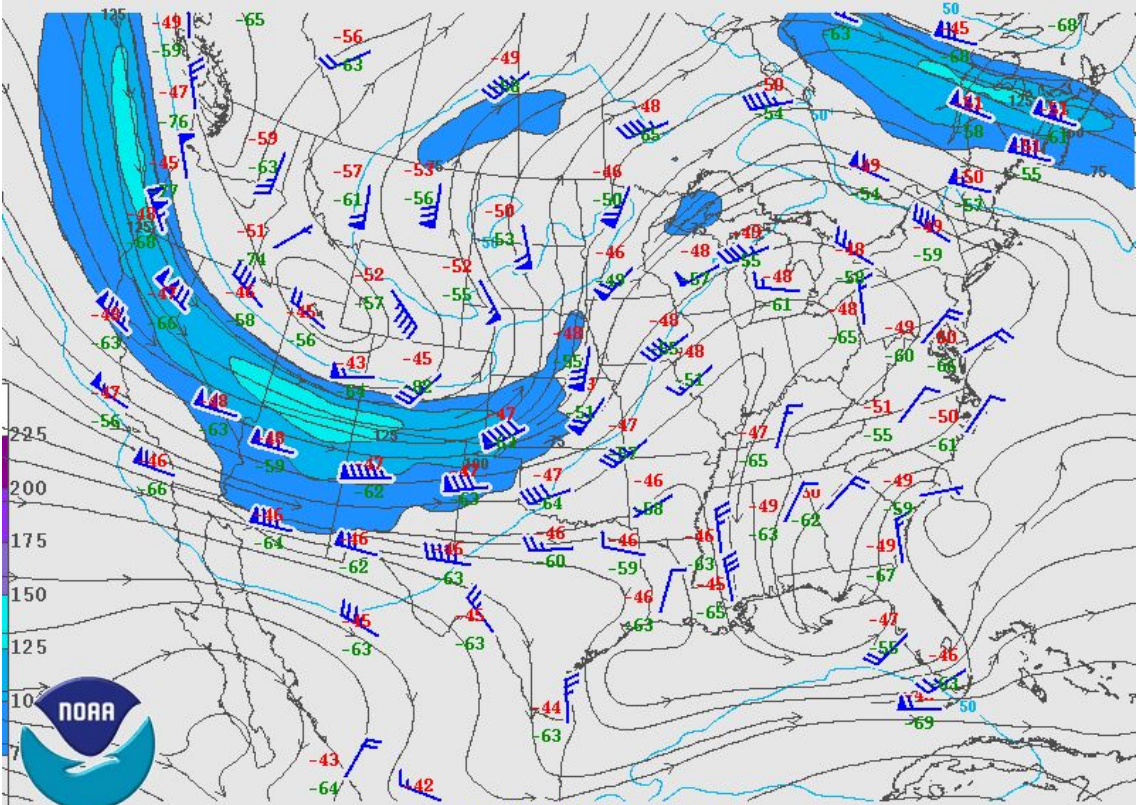
- Environment
- Radar Analysis
- Damage Assessment

Overview

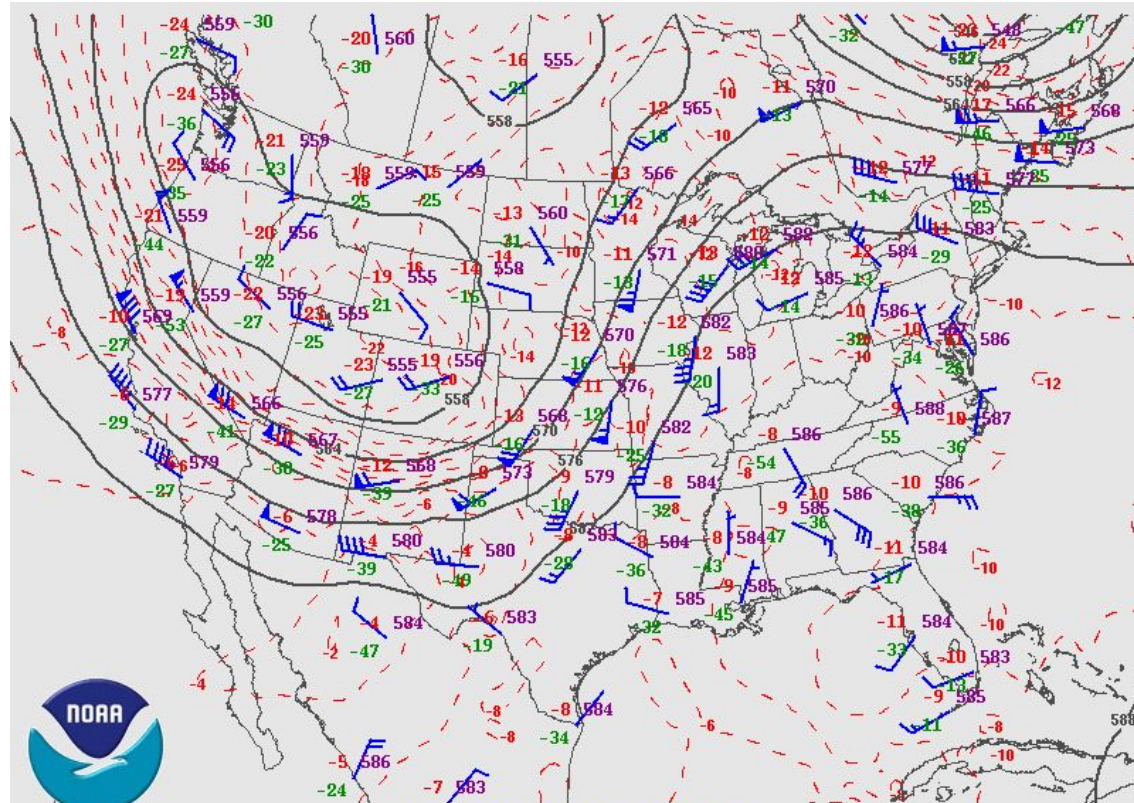


- **Environment**
- Radar Analysis
- Damage Assessment

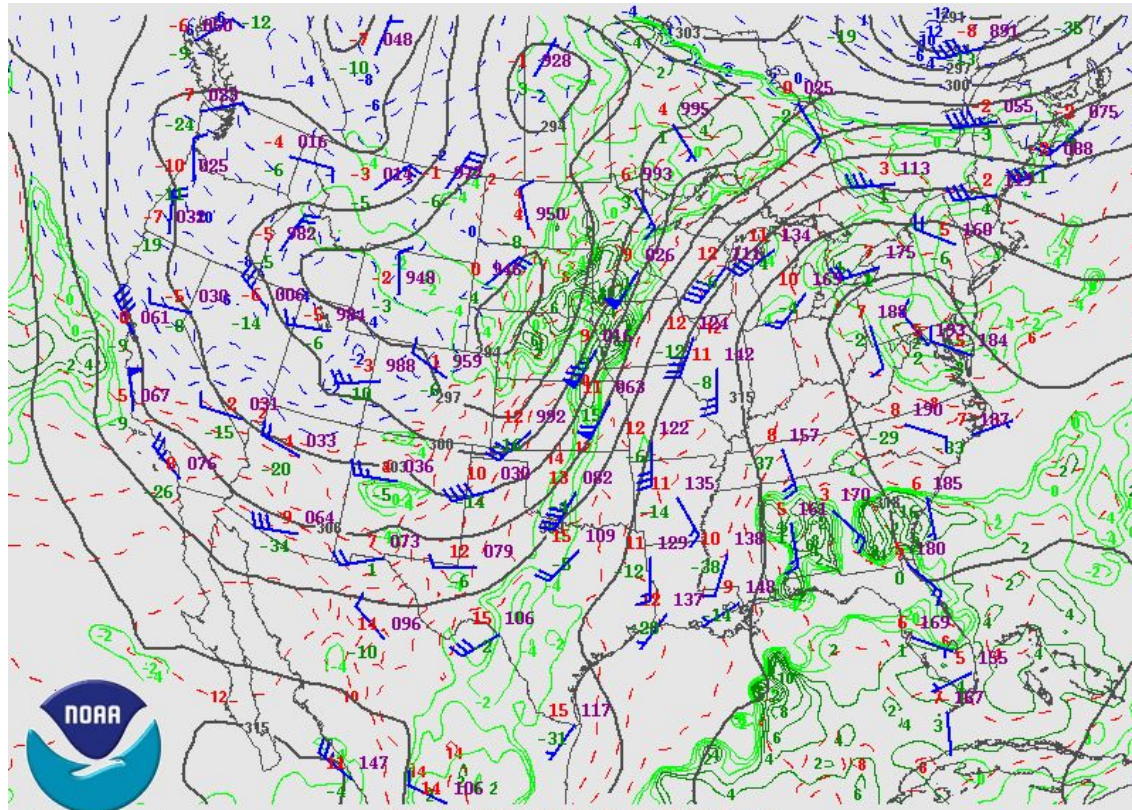
12Z 5/30 250mb Analysis



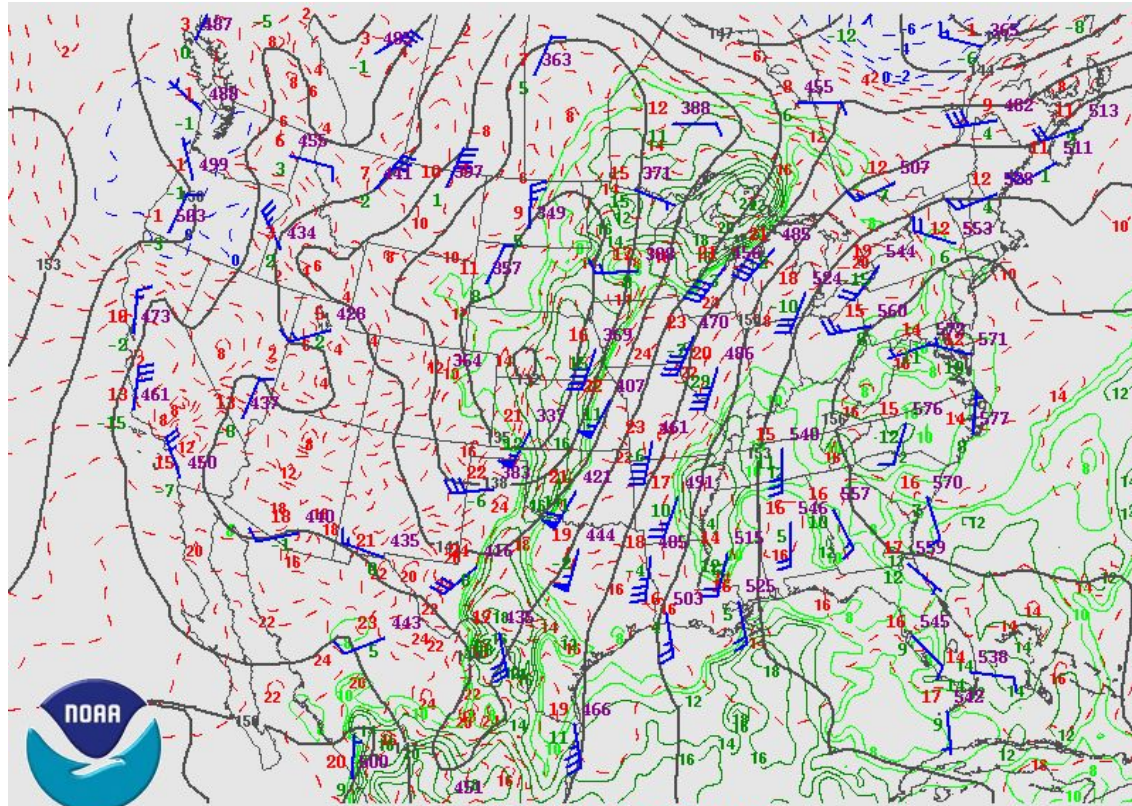
12Z 5/30 500mb Analysis



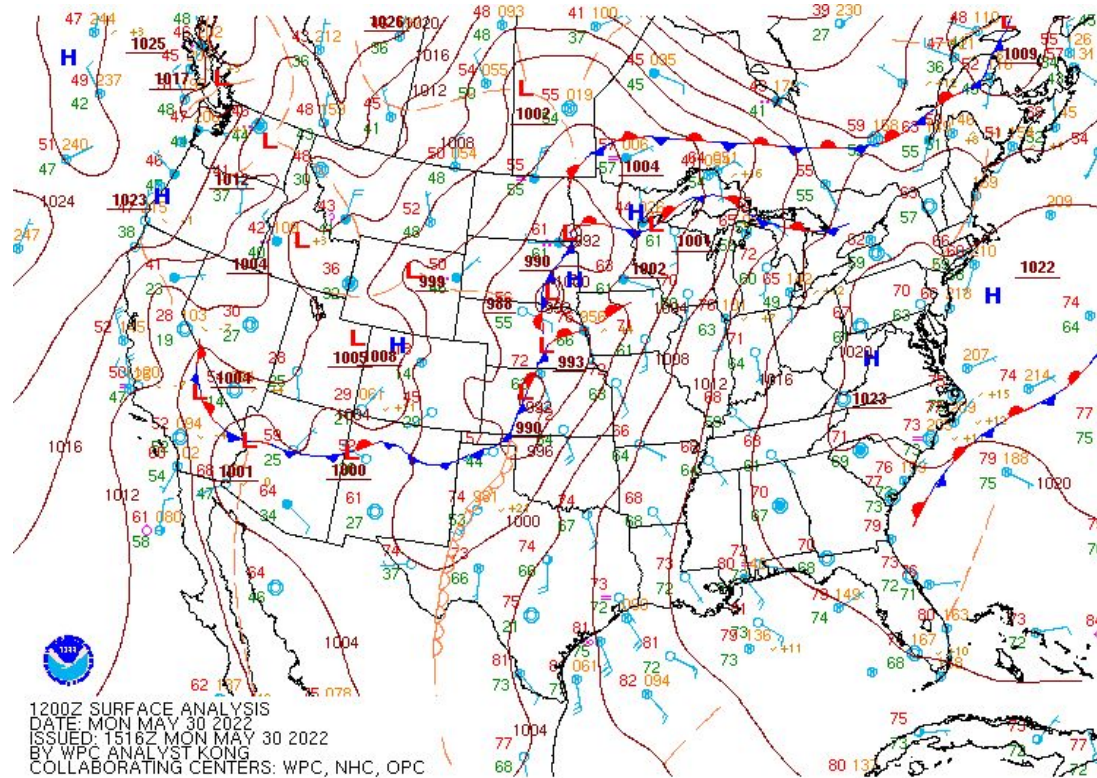
12Z 5/30 700mb Analysis



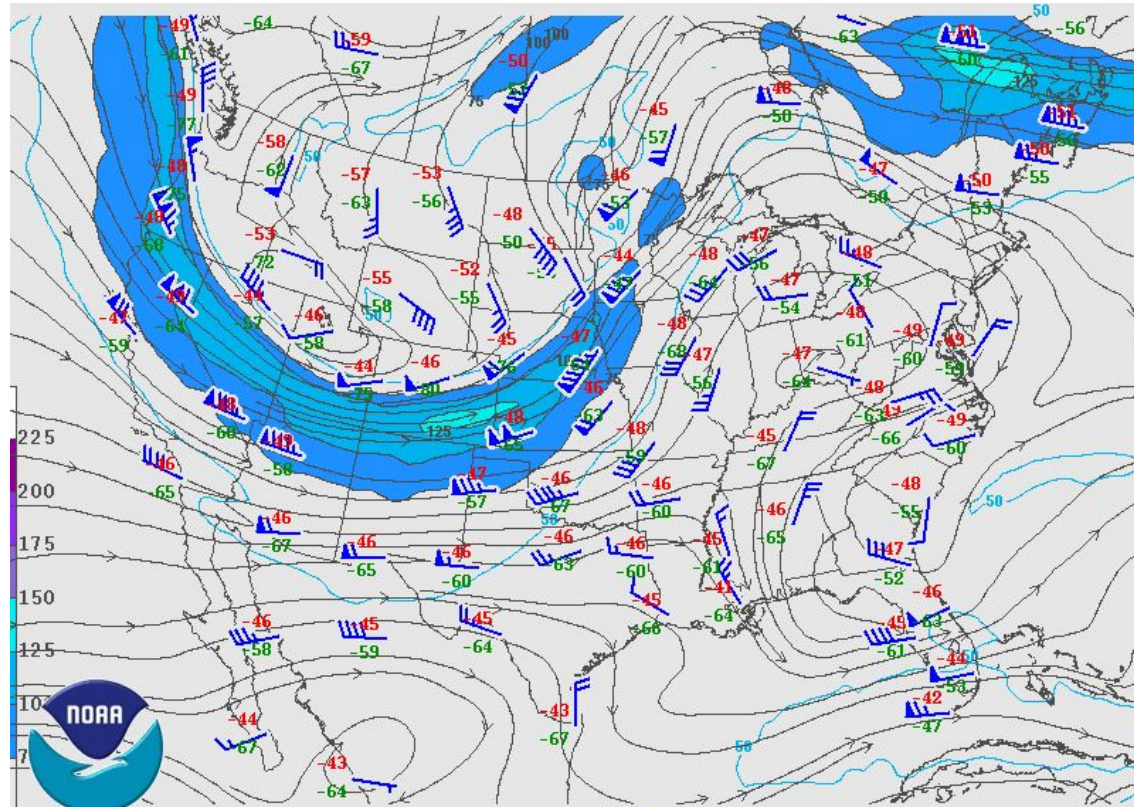
12Z 5/30 850mb Analysis



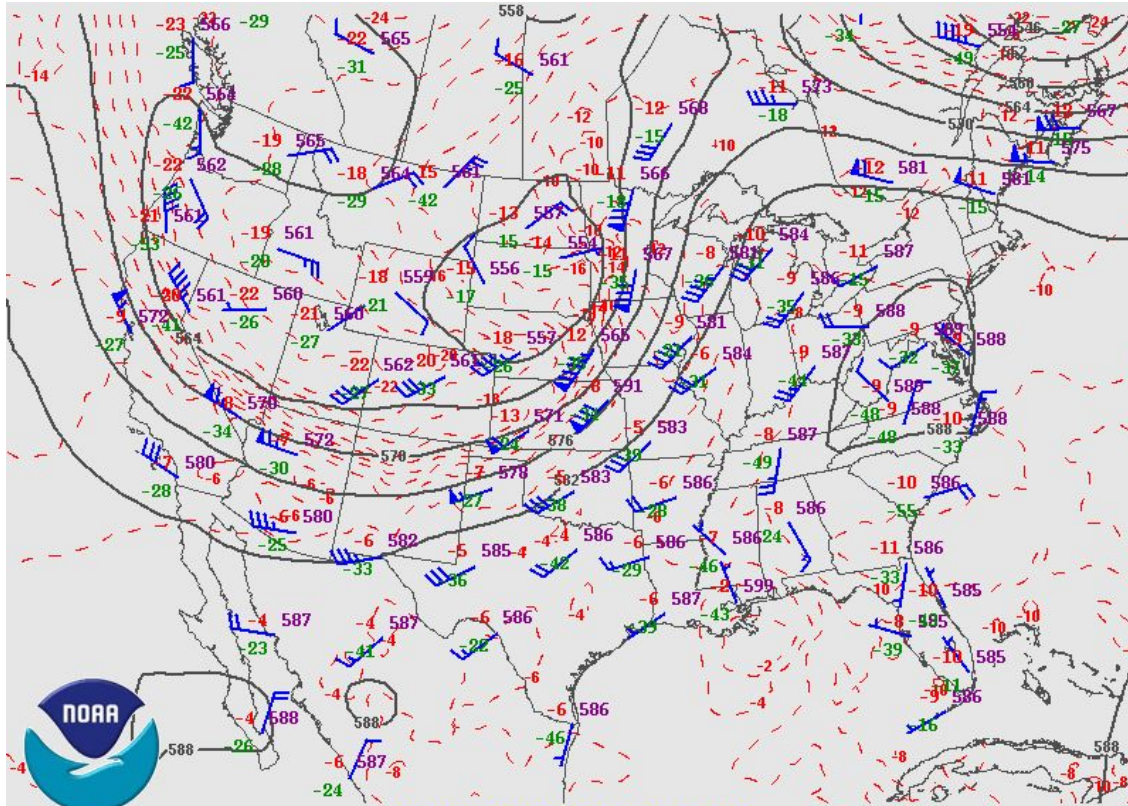
12Z 5/30 Surface Analysis



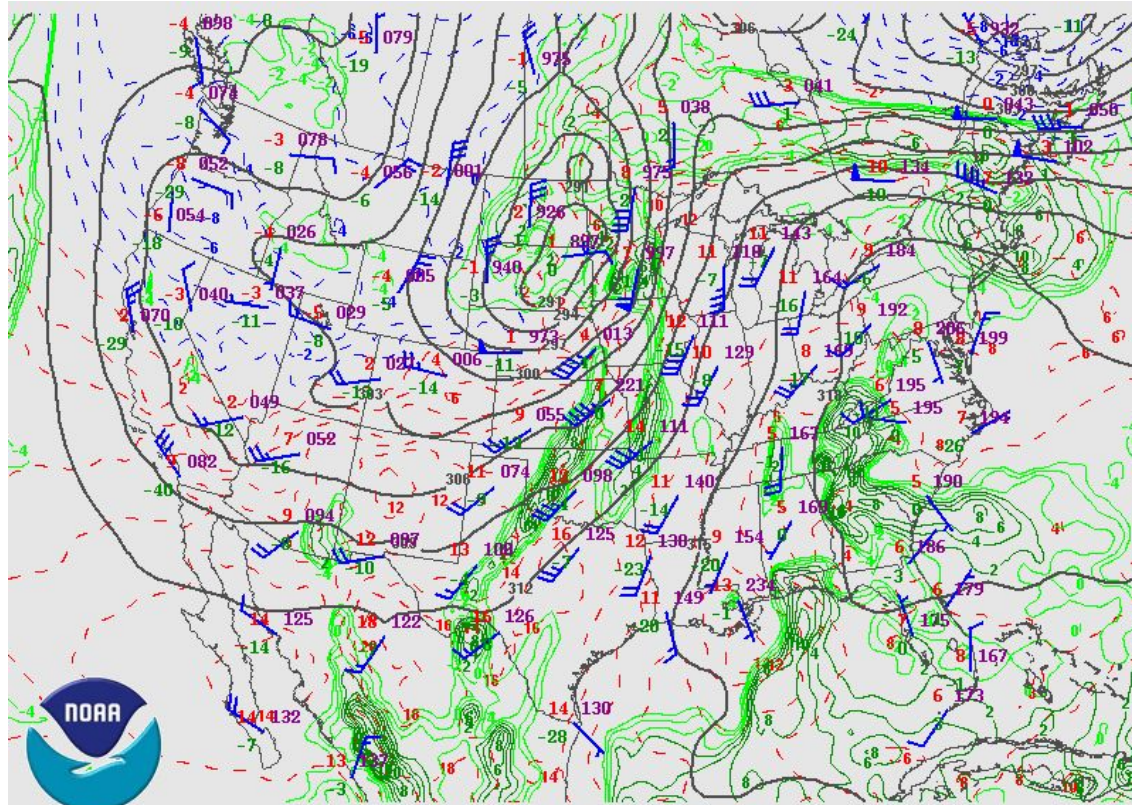
00Z 5/31 250mb Analysis



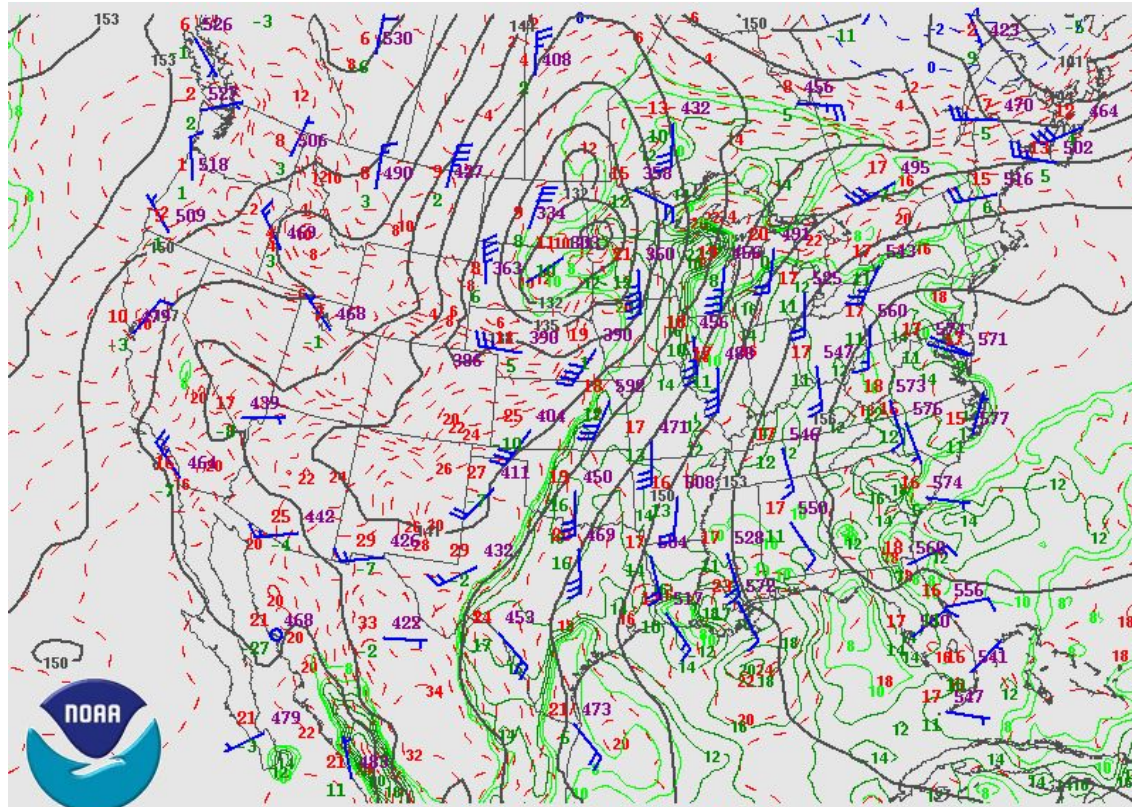
00Z 5/31 500mb Analysis



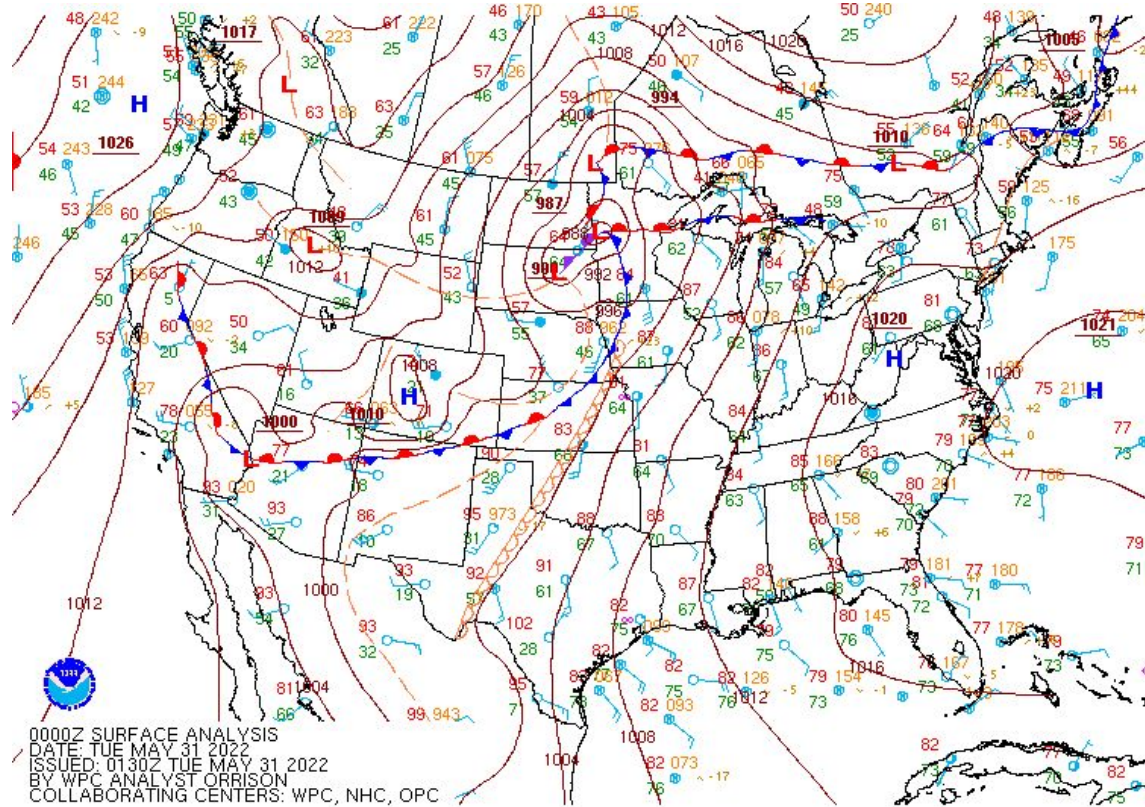
00Z 5/31 700mb Analysis



00Z 5/31 850mb Analysis

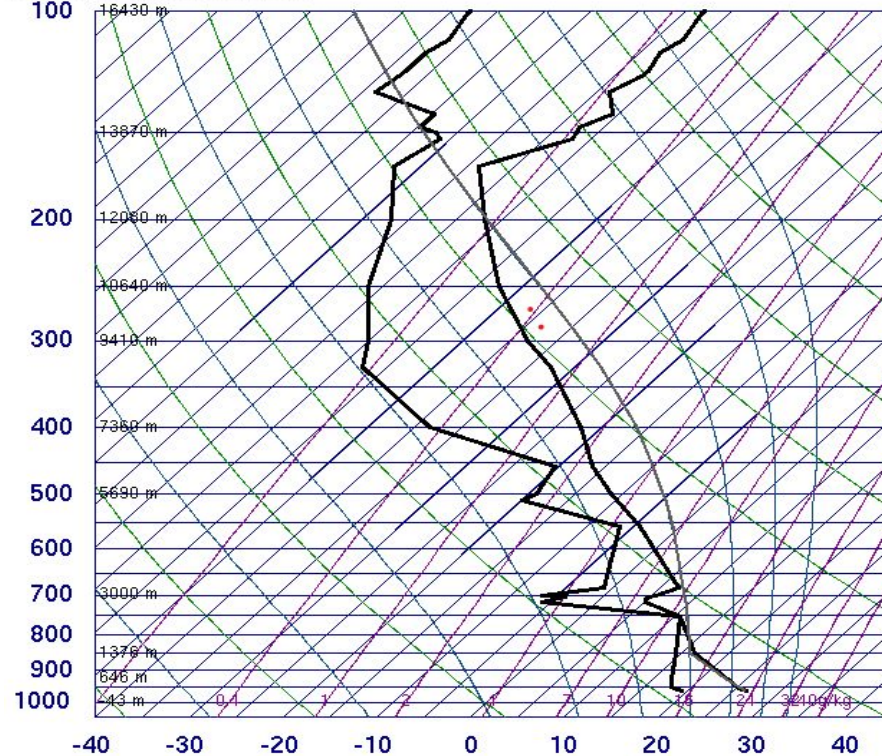


00Z 5/31 Surface Analysis



20z 5/30 KMPX Sounding

72649 MPX Chanhassen

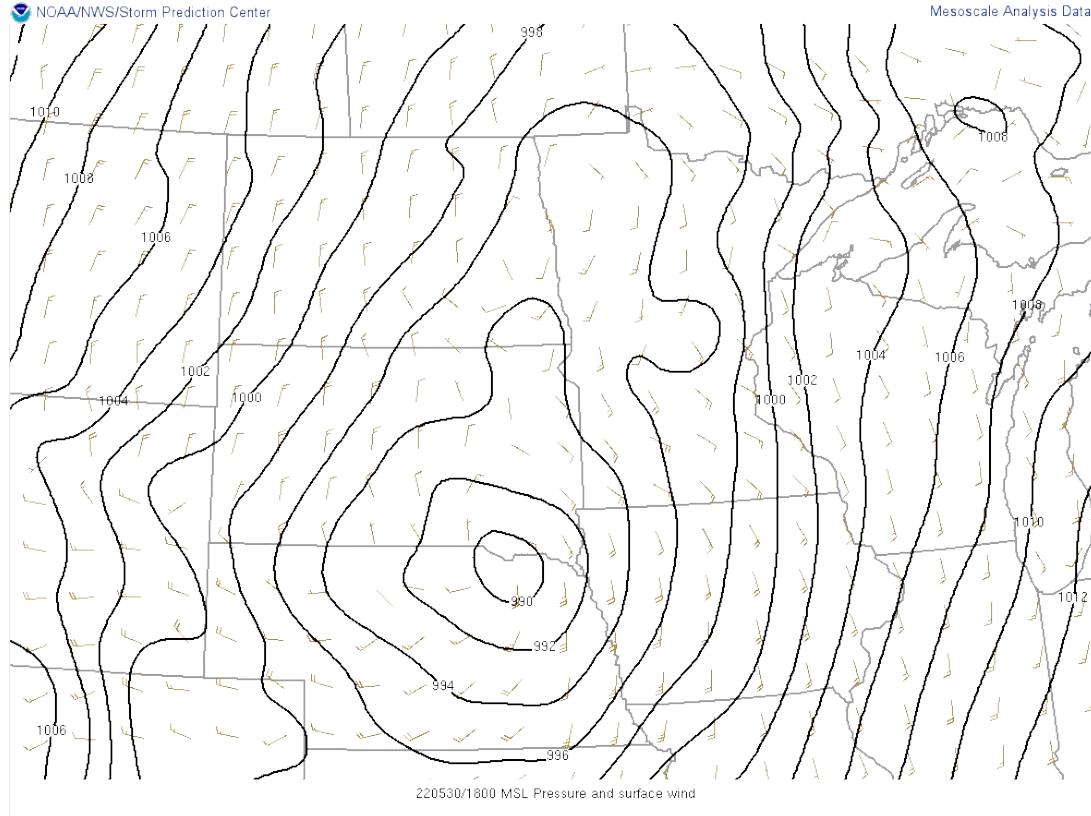


- SLAT 44.85
- SLOK -93.56
- SELV 287.0
- SHOW -4.30
- LIFT -5.54
- LFTV -6.10
- SWET 397.0
- KINX 30.00
- CTOT 25.60
- VTOT 27.50
- TOTL 53.10
- CAPE 1638.
- CAPV 1765.
- CINS -11.4
- CINV -6.39
- EQLV 197.8
- EQTV 197.7
- LFCT 812.2
- LFCV 826.7
- BRCH 7.63
- BRCV 8.22
- LCLT 289.2
- LCLP 852.8
- LCLE 343.2
- MLTH 302.6
- MLMR 13.67
- THCK 5733.
- PWAT 39.96

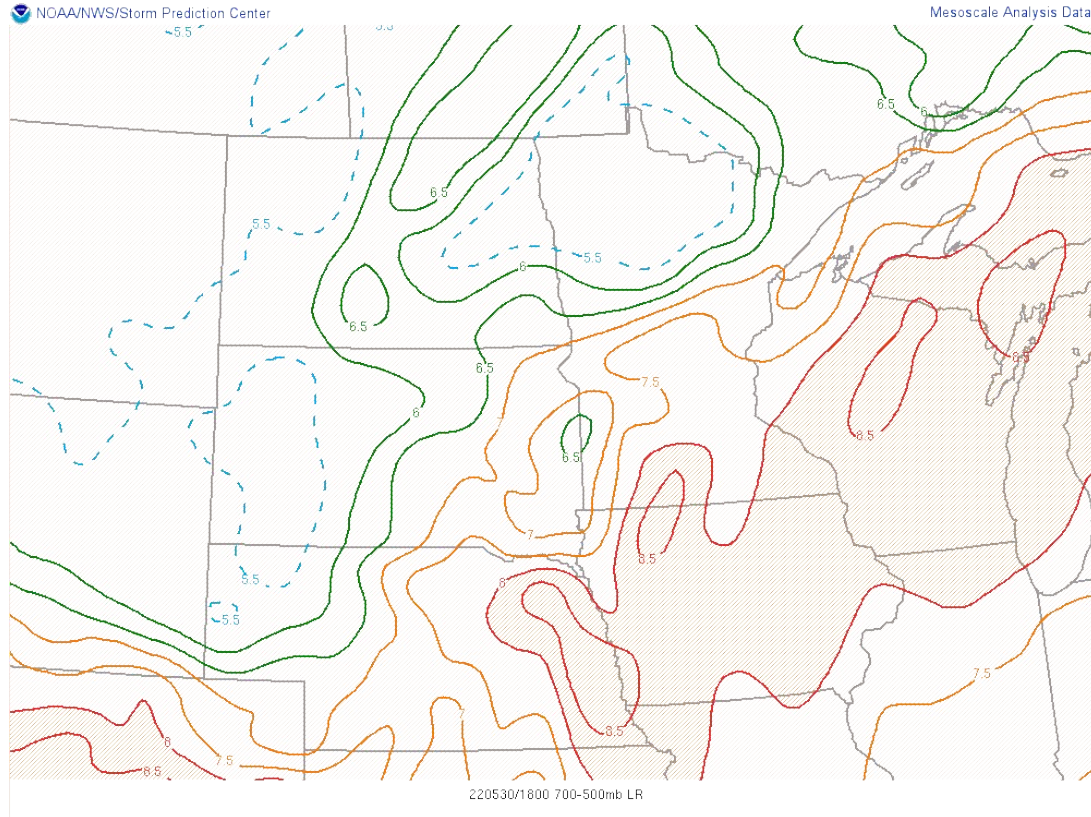
21Z 30 May 2022

University of Wyoming

22Z 5/30 MSL Pressure and Winds



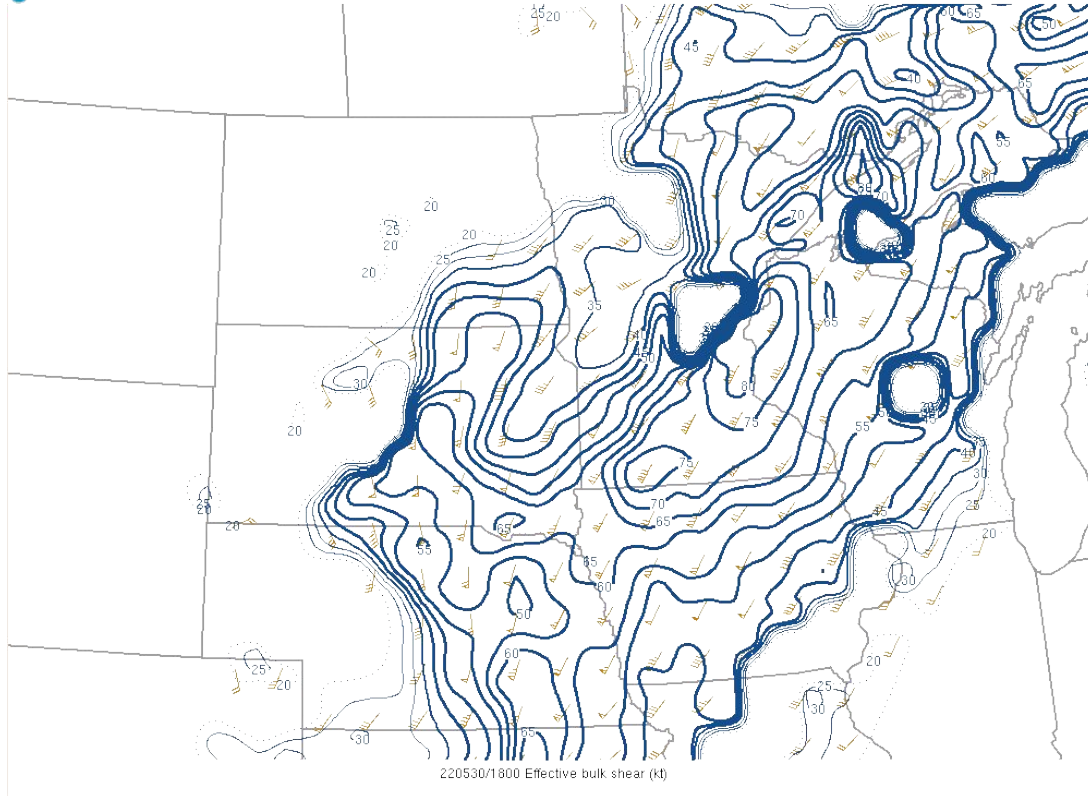
22Z 5/30 700-500mb Lapse Rates



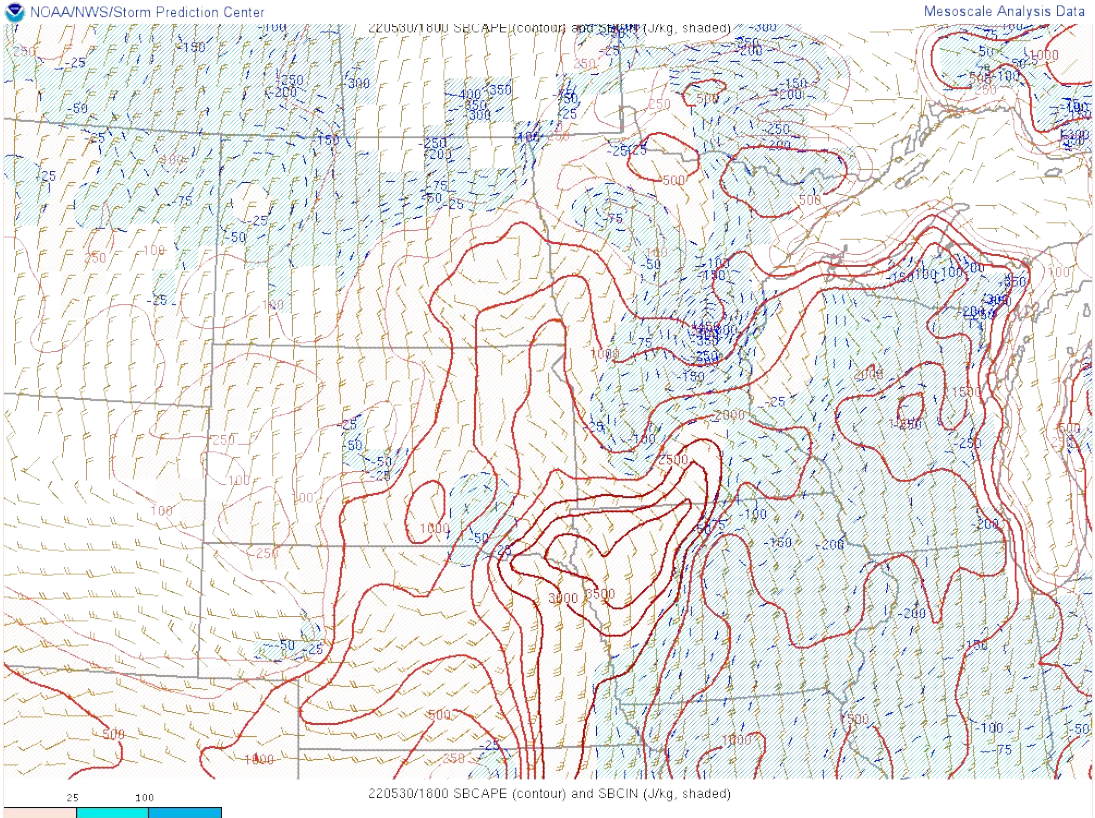
22Z 5/30 Effective Bulk Shear

NOAA/NWS/Storm Prediction Center

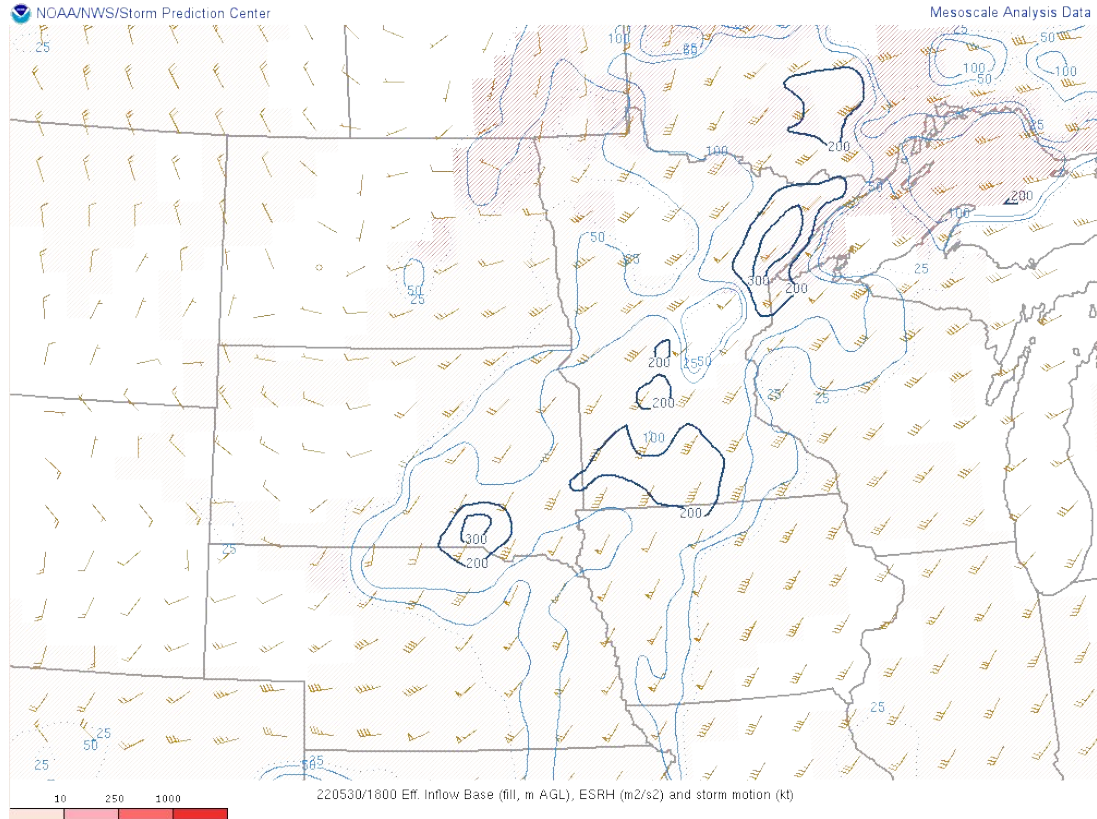
Mesoscale Analysis Data



22Z 5/30 SBCAPE and SBCIN



22Z 5/30 Effective SRH



22Z 5/30 WoFS

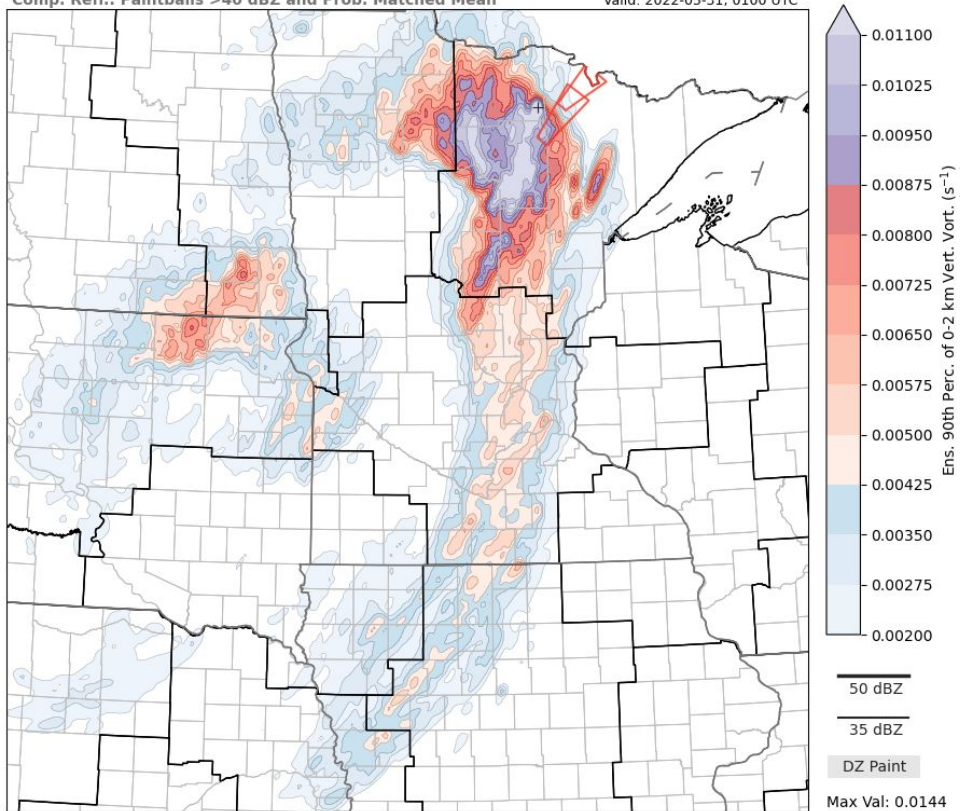


Ens. 90th Perc. of 0-2 km Vert. Vort. (s^{-1})

Comp. Refl.: Paintballs >40 dBZ and Prob. Matched Mean

Init: 2022-05-30, 2100 UTC

Valid: 2022-05-31, 0100 UTC

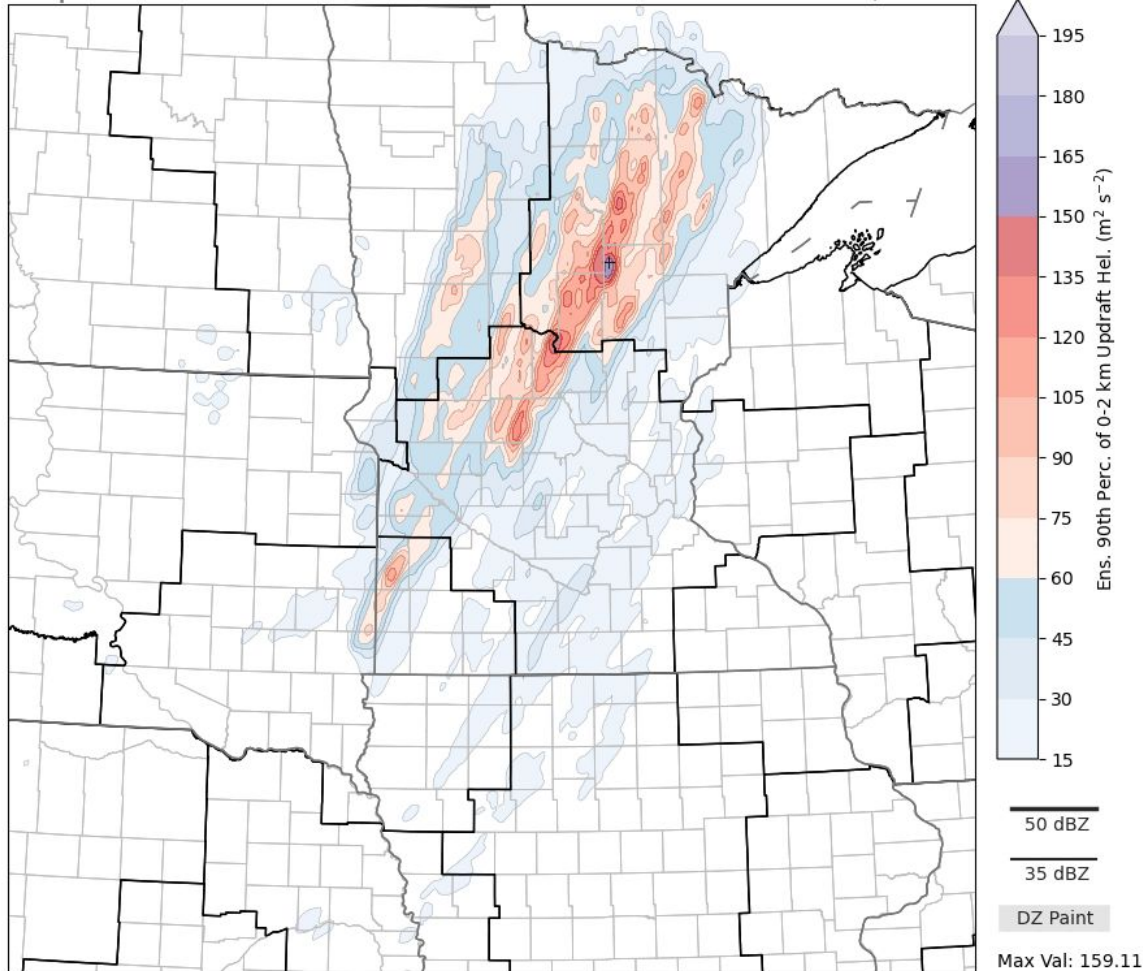


22Z 5/30 WoFS

- WoFS 90th Percentile 0-2km Updraft Helicity
 - Data assimilation locking in the area of strongest mesovortex potential
 - 20-22Z UH Track Iterations Shown

Ens. 90th Perc. of 0-2 km Updraft Hel. ($\text{m}^2 \text{s}^{-2}$)
Comp. Refl.: Paintballs >40 dBZ and Prob. Matched Mean

Init: 2022-05-30, 2000 UTC
Valid: 2022-05-31, 0200 UTC



Overview



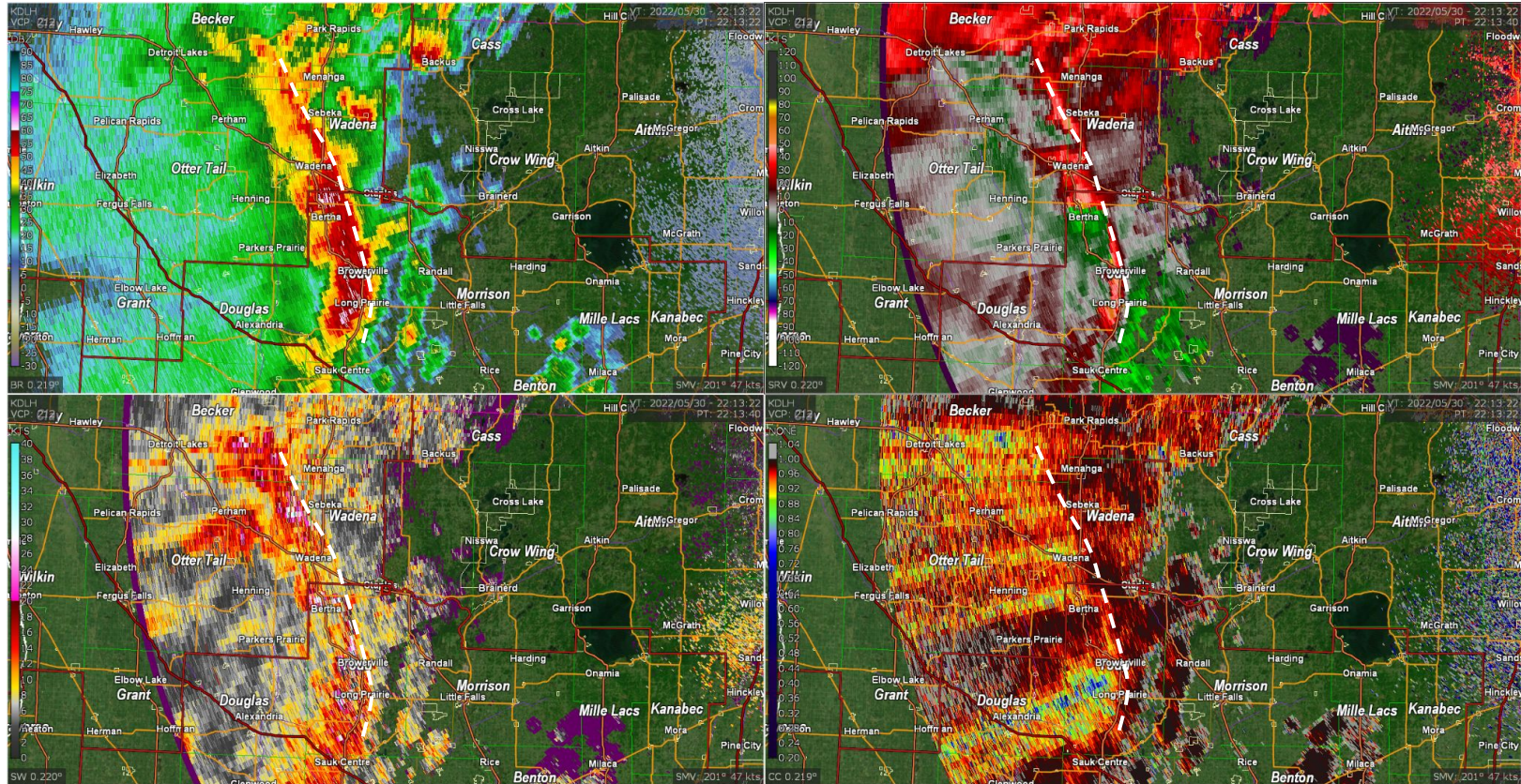
- Environment
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TWIP/CWIP QLCS Three Ingredients Method

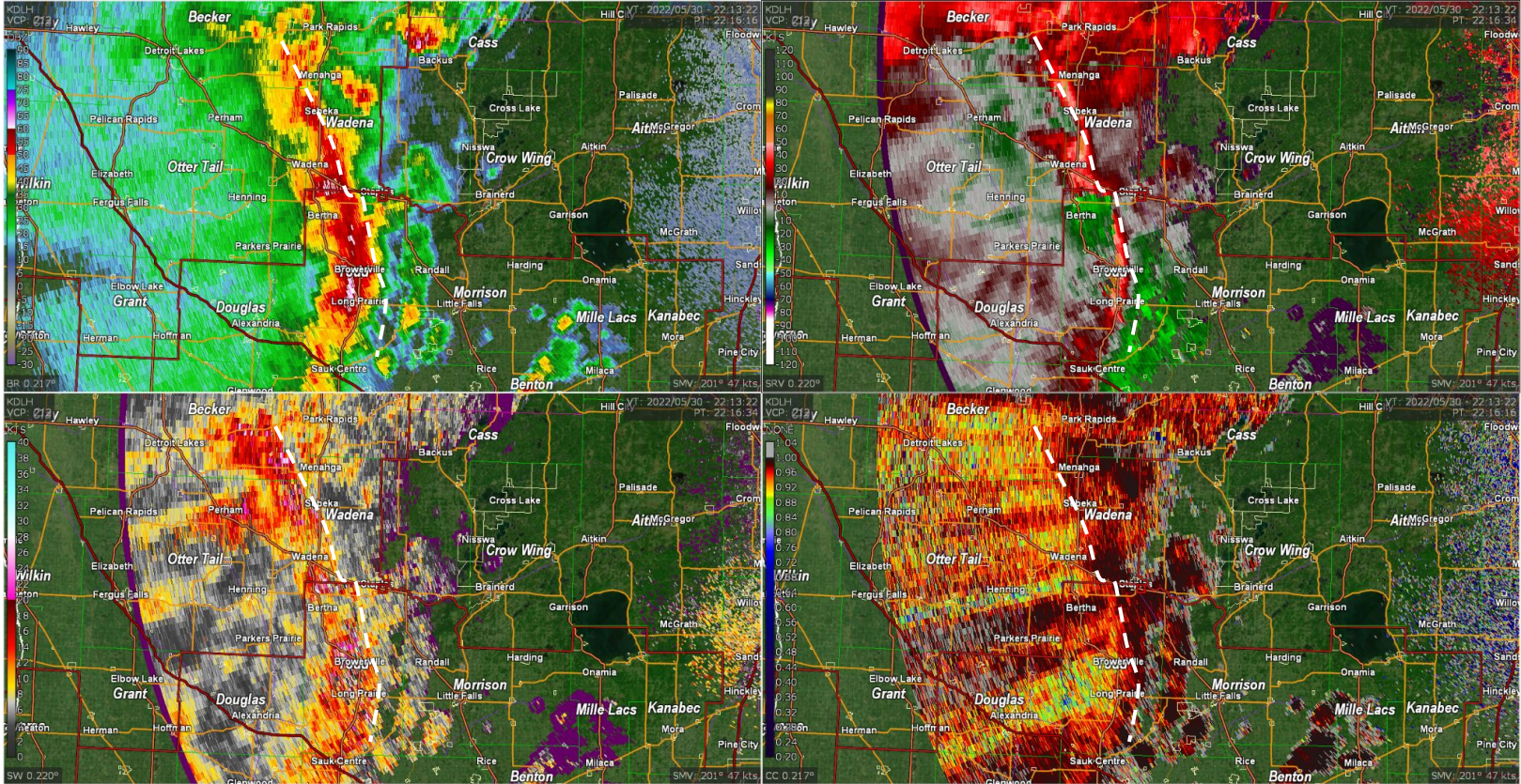


- Used to to anticipate areas where mesovortex genesis is likely over next 30-45 minutes
 - System cold pool and ambient low-level shear nearly balanced or slightly shear dominant AND
 - 0-3 km line-normal bulk shear magnitude > 30 kts AND
 - Rear-inflow jet (RIJ) or enhanced outflow causes surge or bow within a QLCS

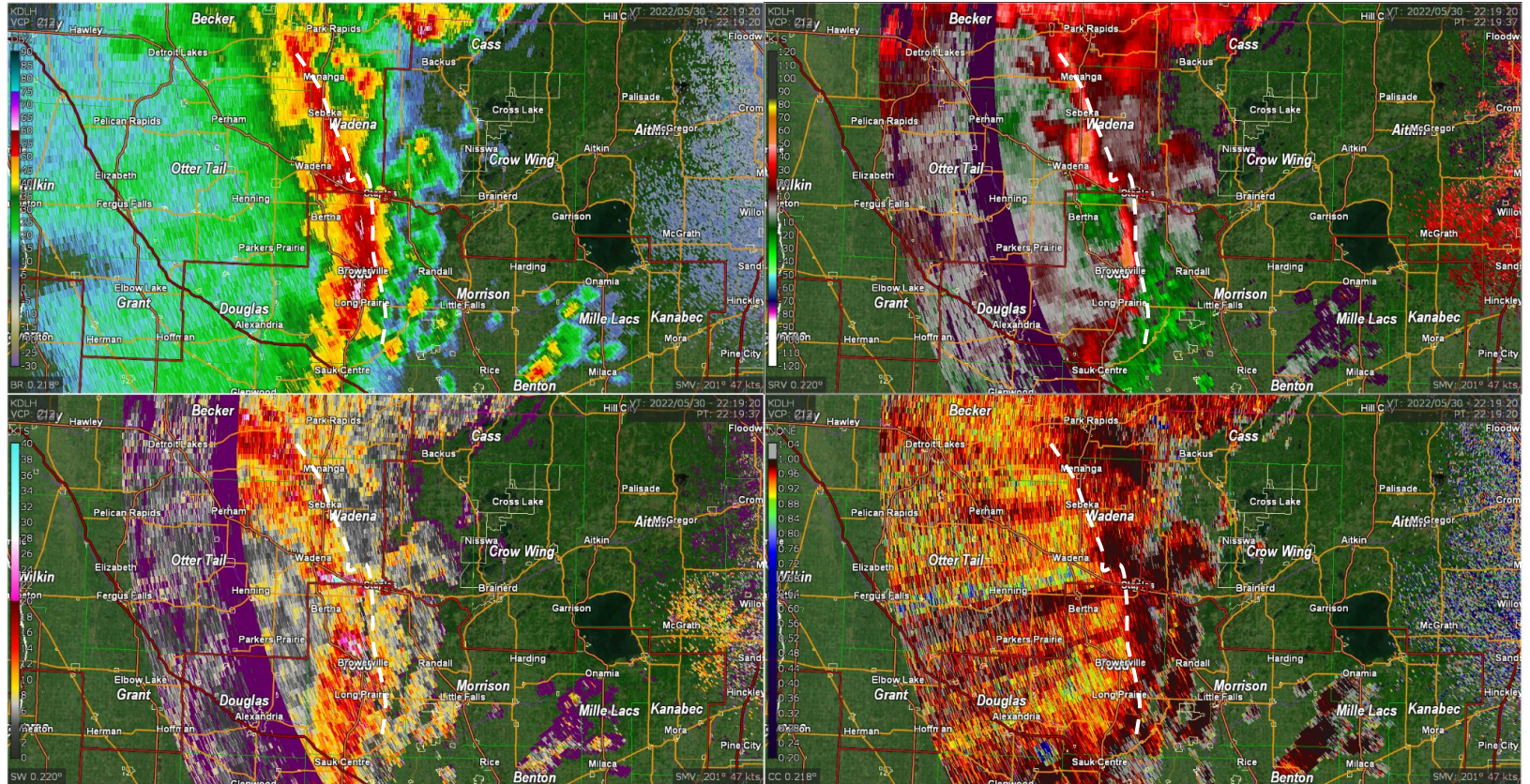
Tornado #1 - Poplar Township - 2213z



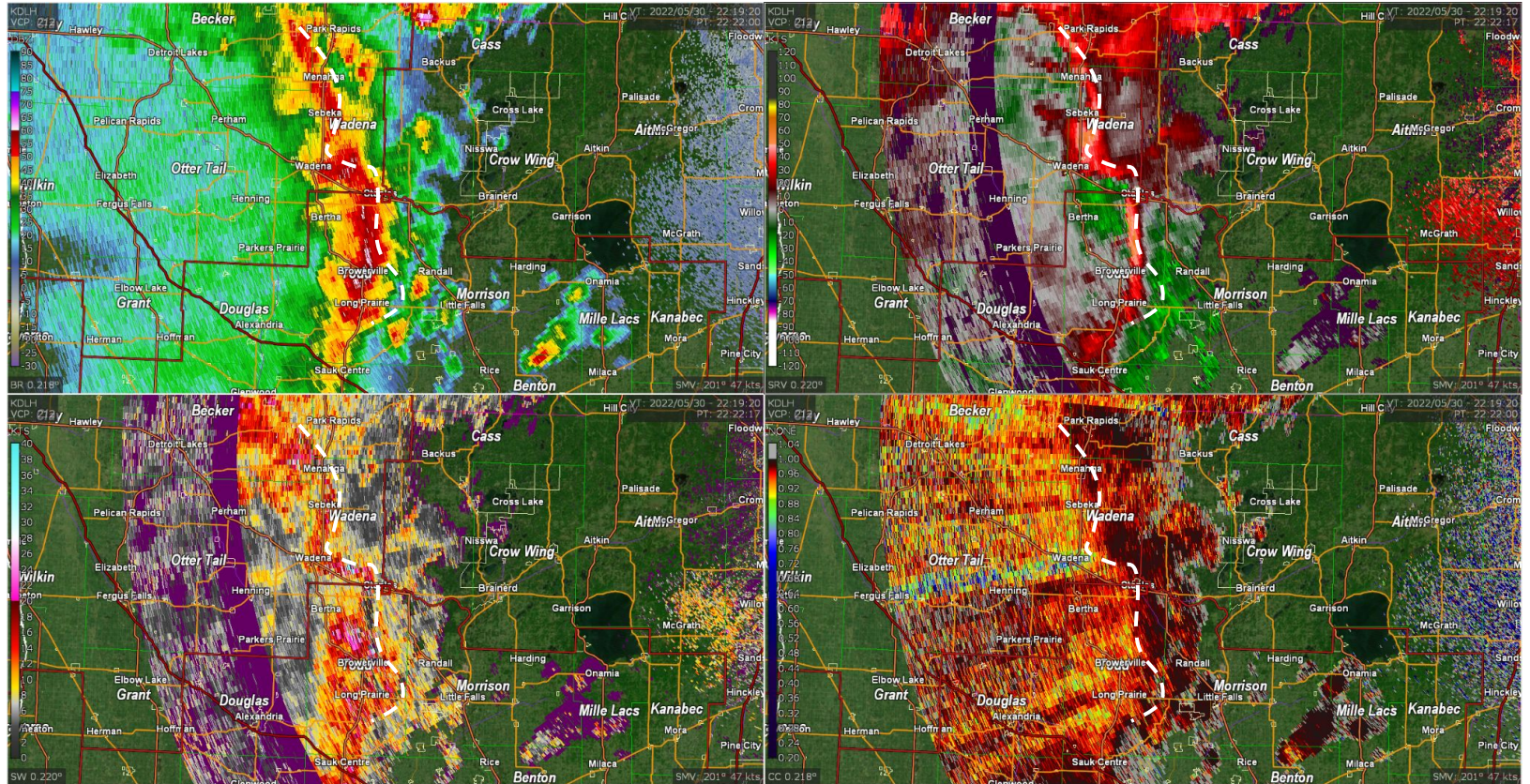
Tornado #1 - Poplar Township - 2216z



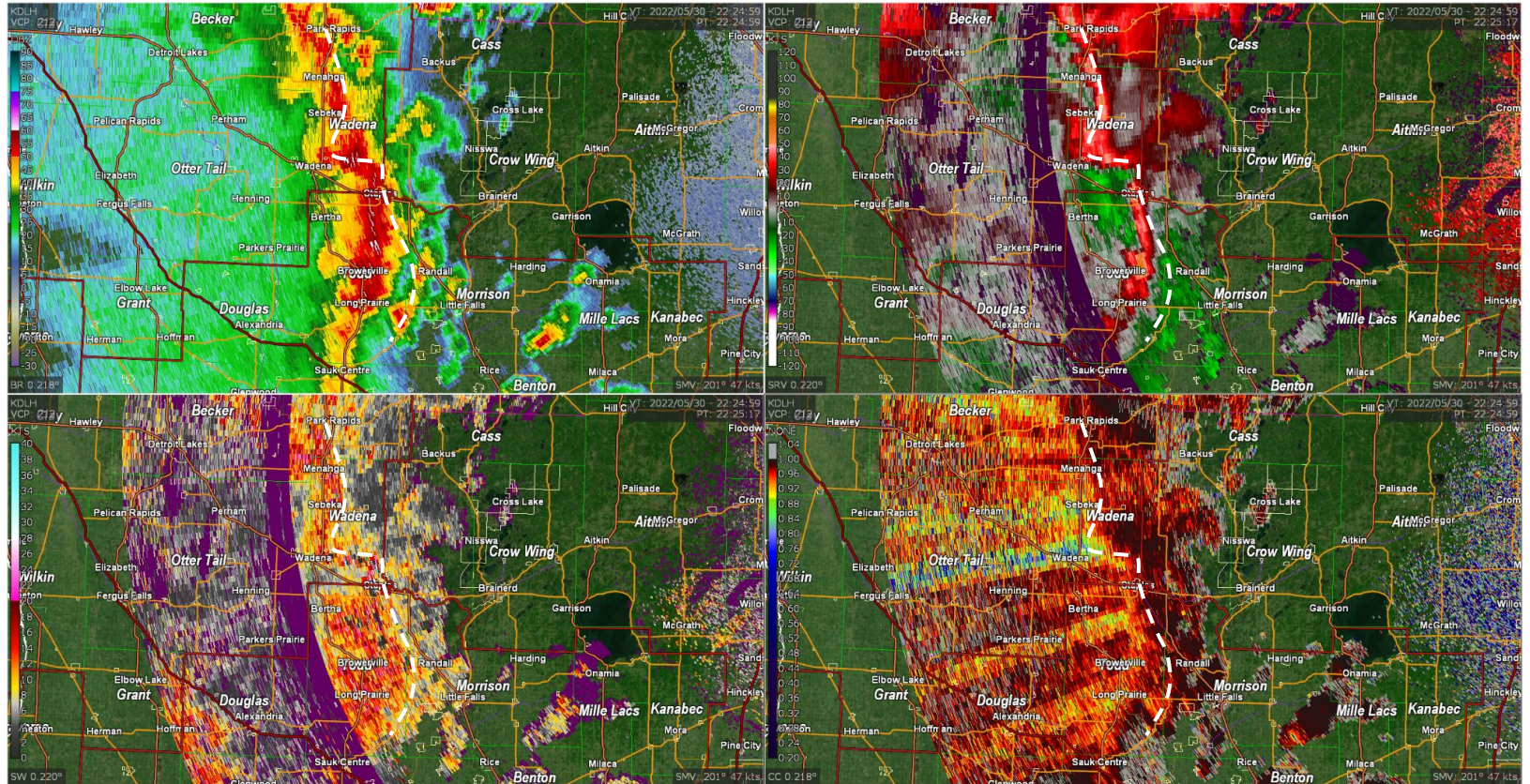
Tornado #1 - Poplar Township - 2219z



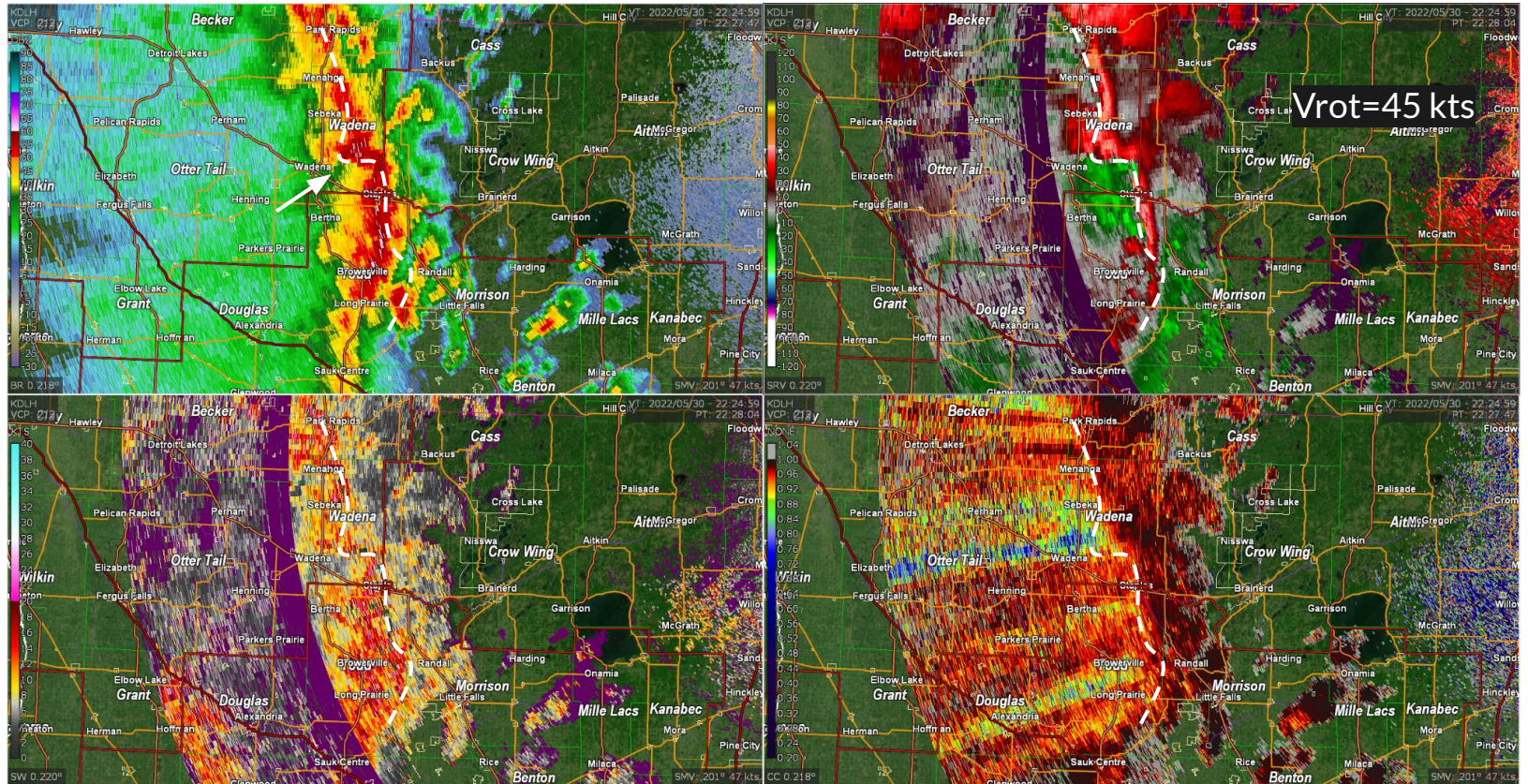
Tornado #1 - Poplar Township - 2222z



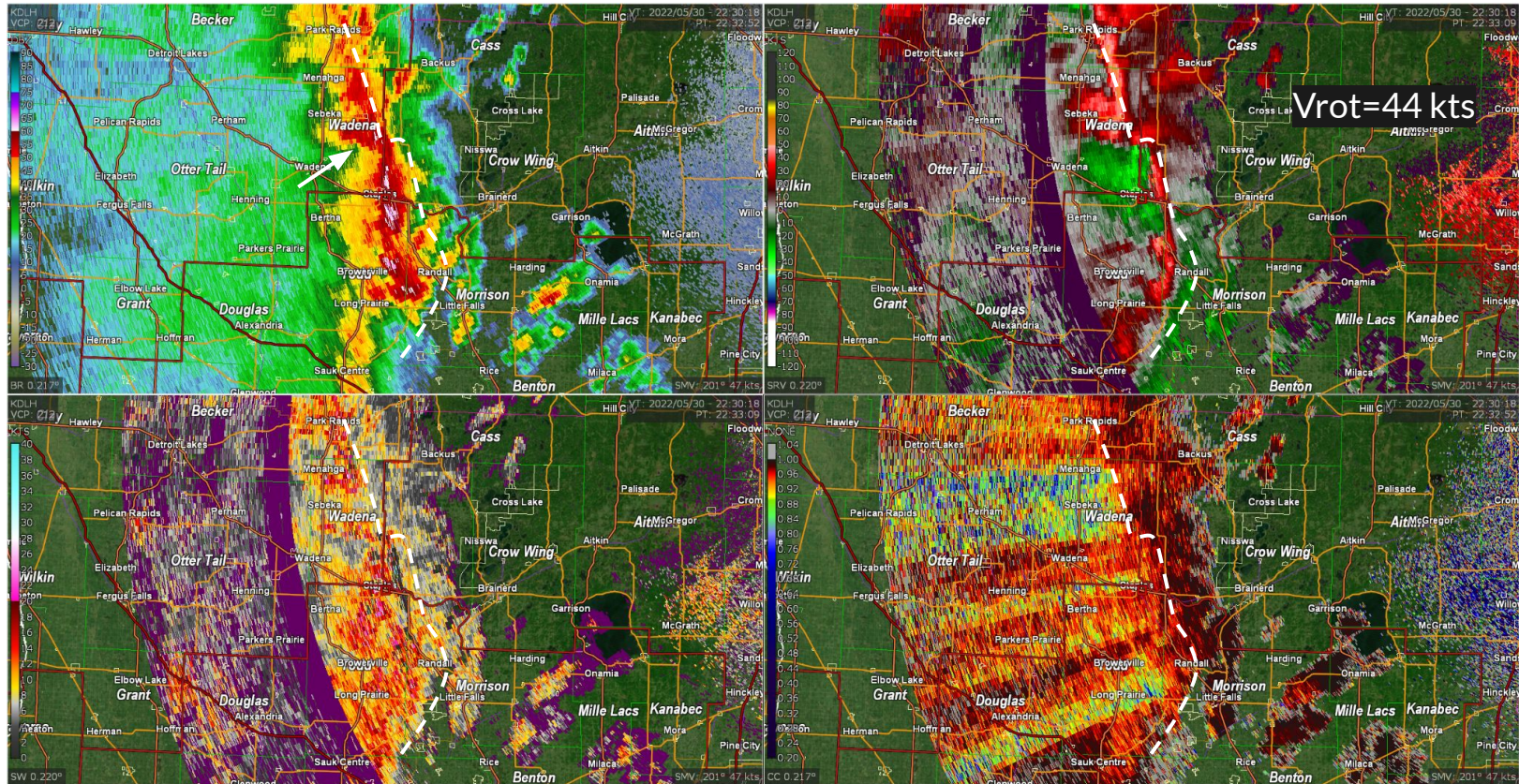
Tornado #1 - Poplar Township - 2225Z



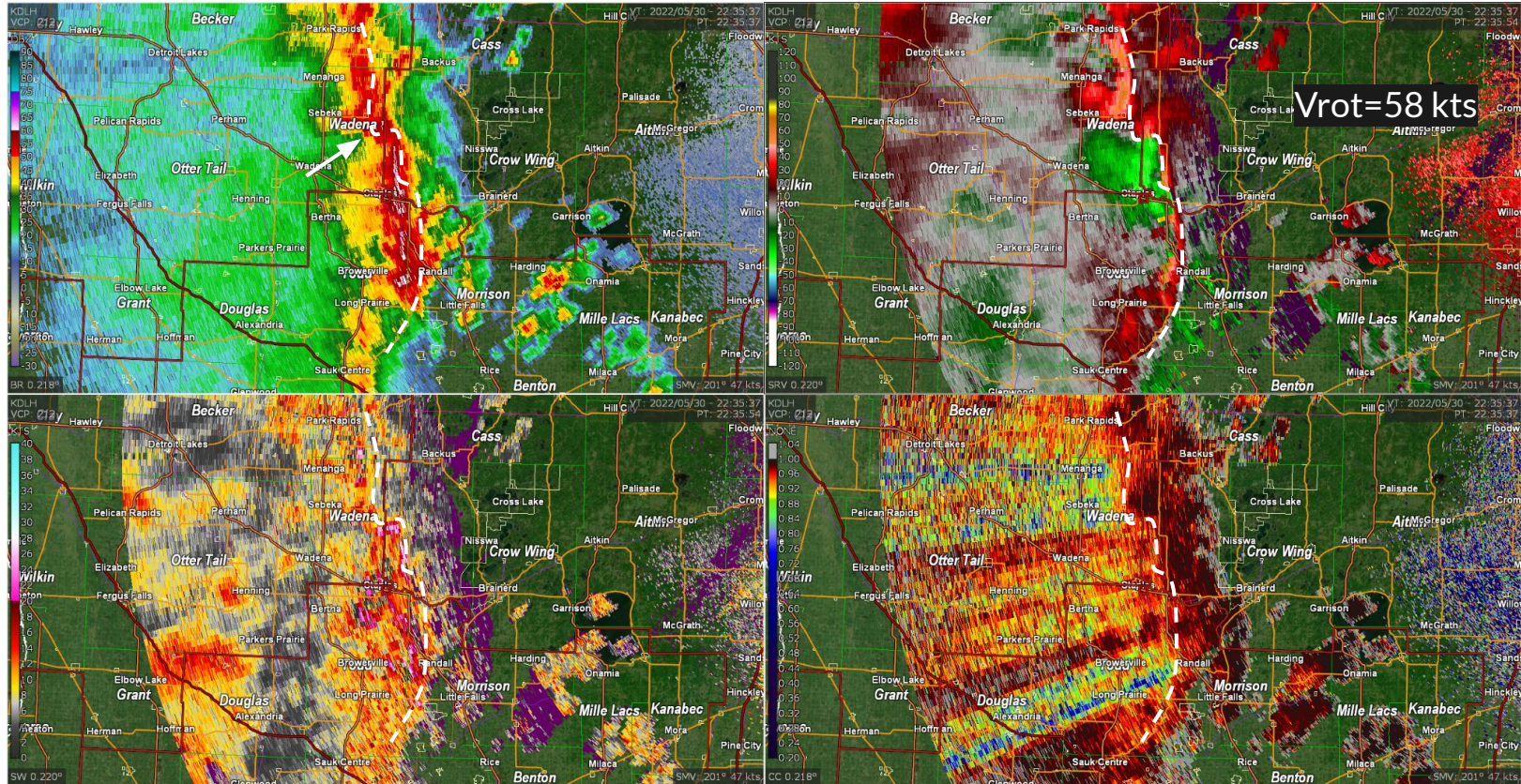
Tornado #1 - Poplar Township - 2228z



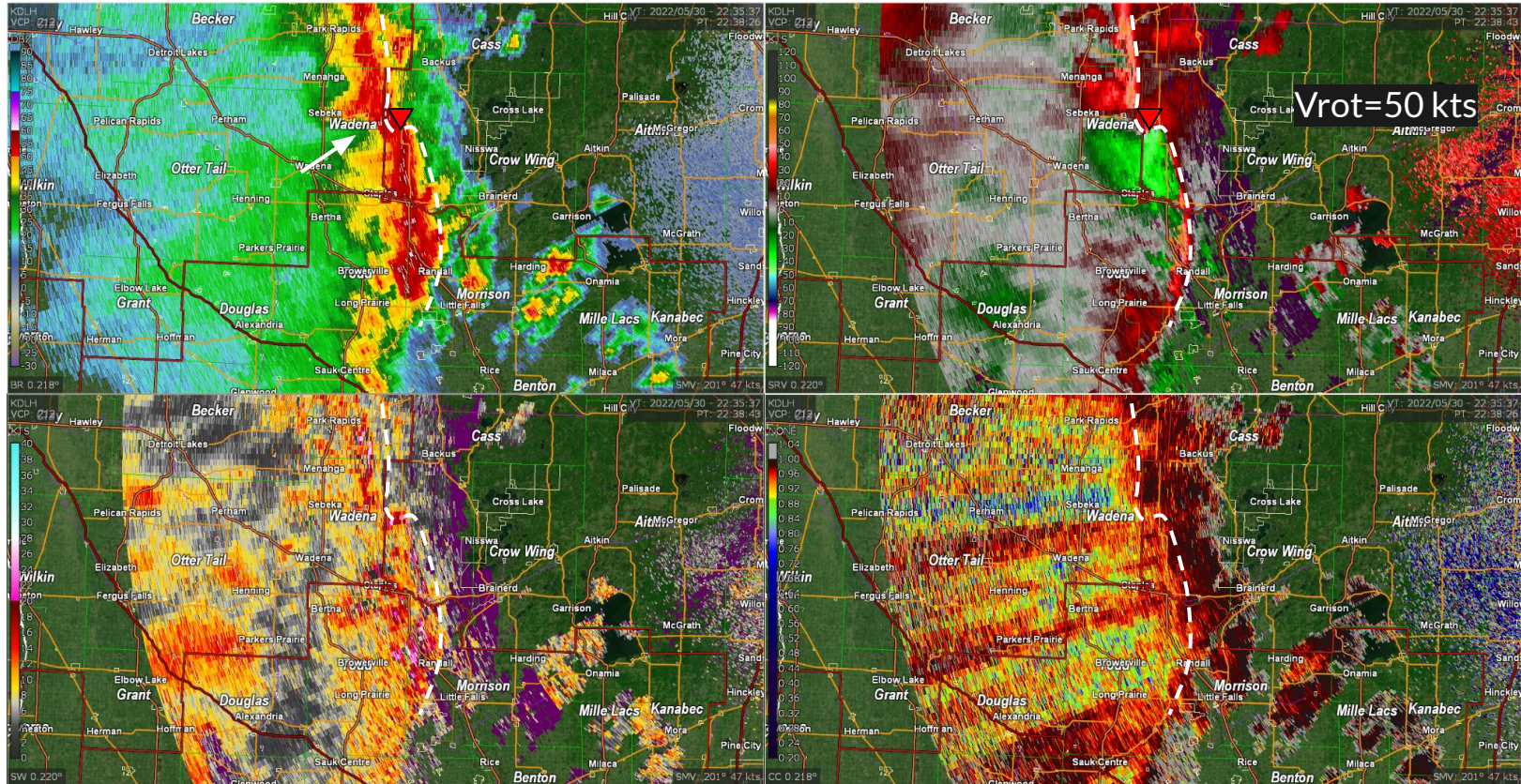
Tornado #1 - Poplar Township - 2233z



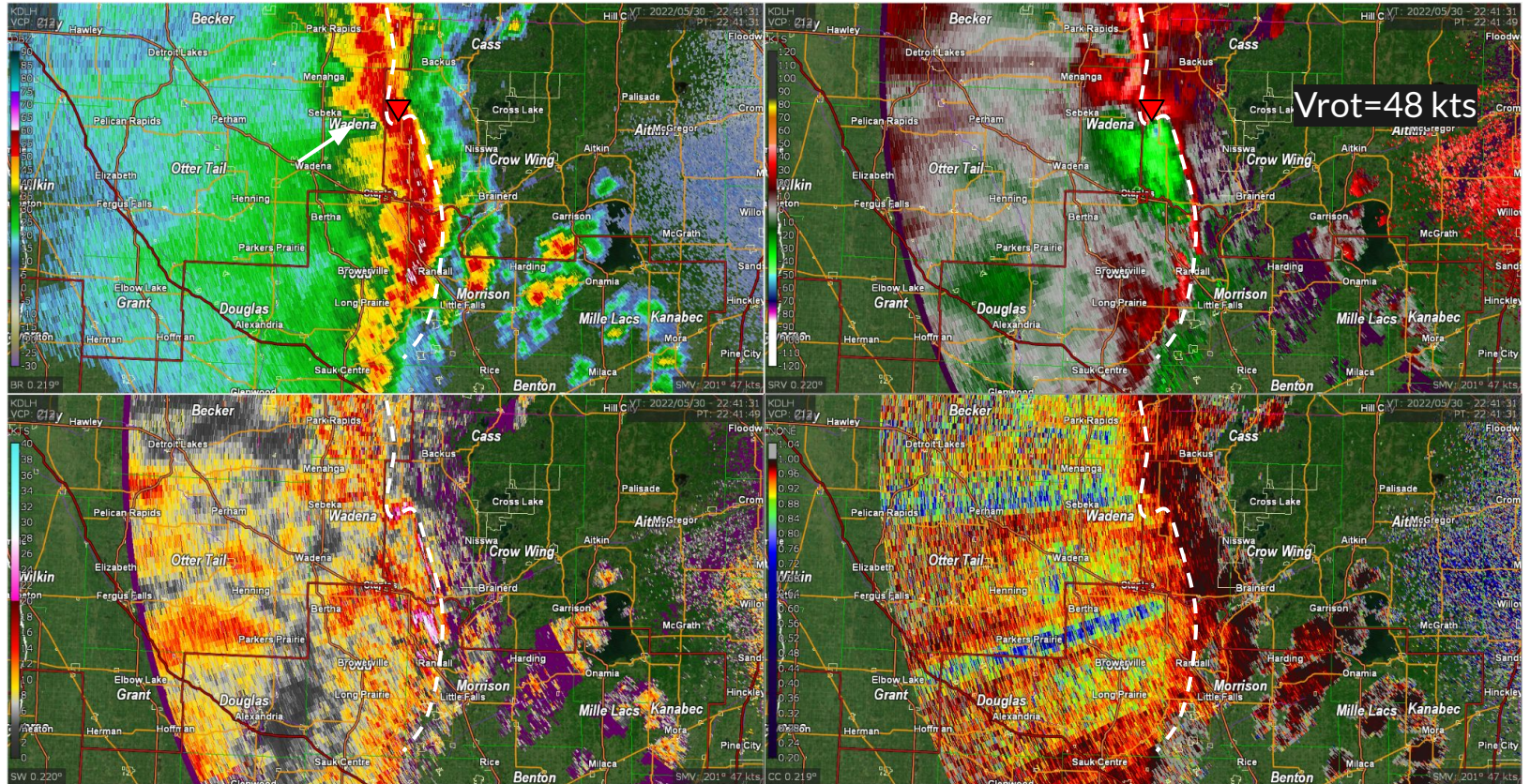
Tornado #1 - Poplar Township - 2235z



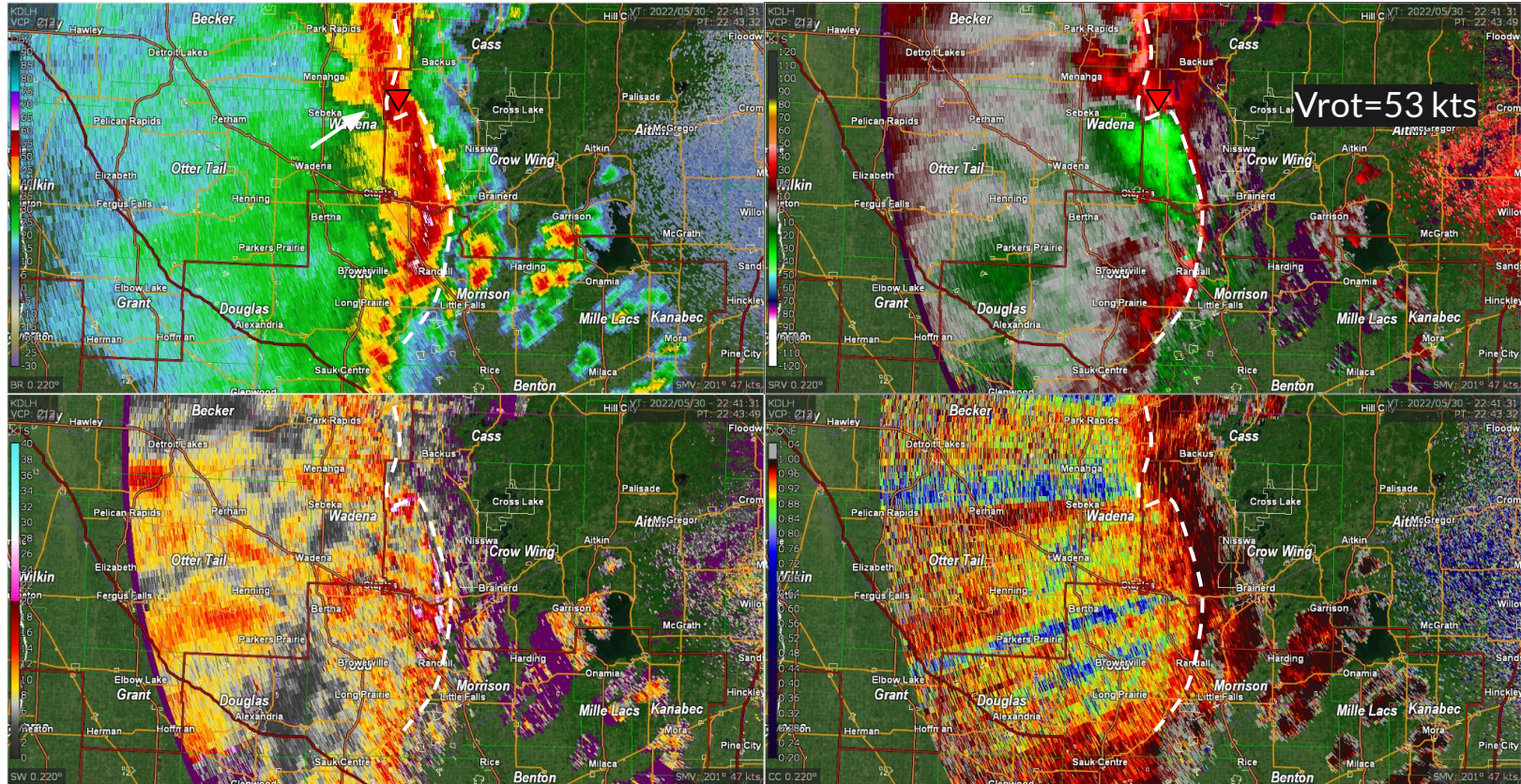
Tornado #1 - Poplar Township - 2238z



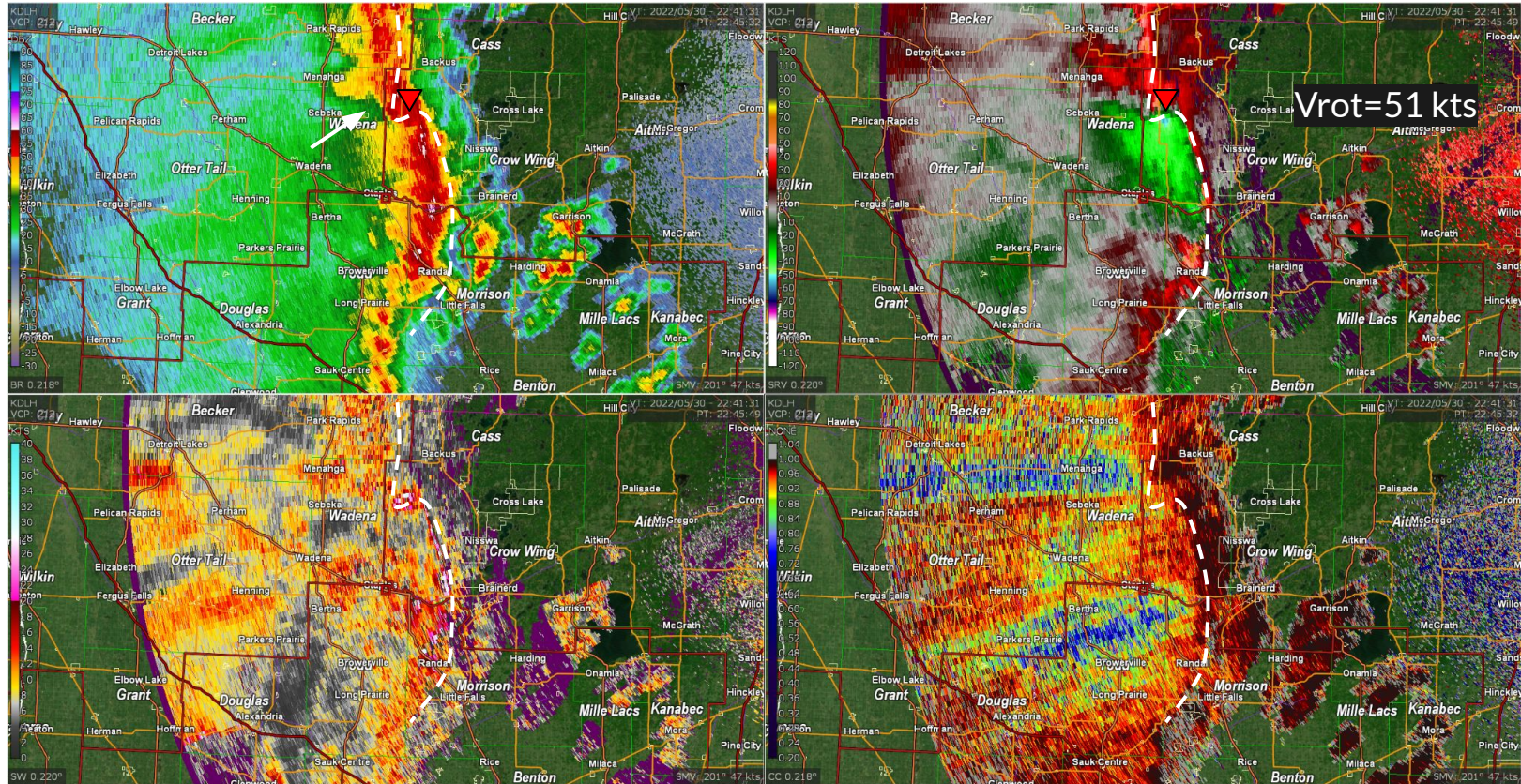
Tornado #1 - Poplar Township - 2241Z



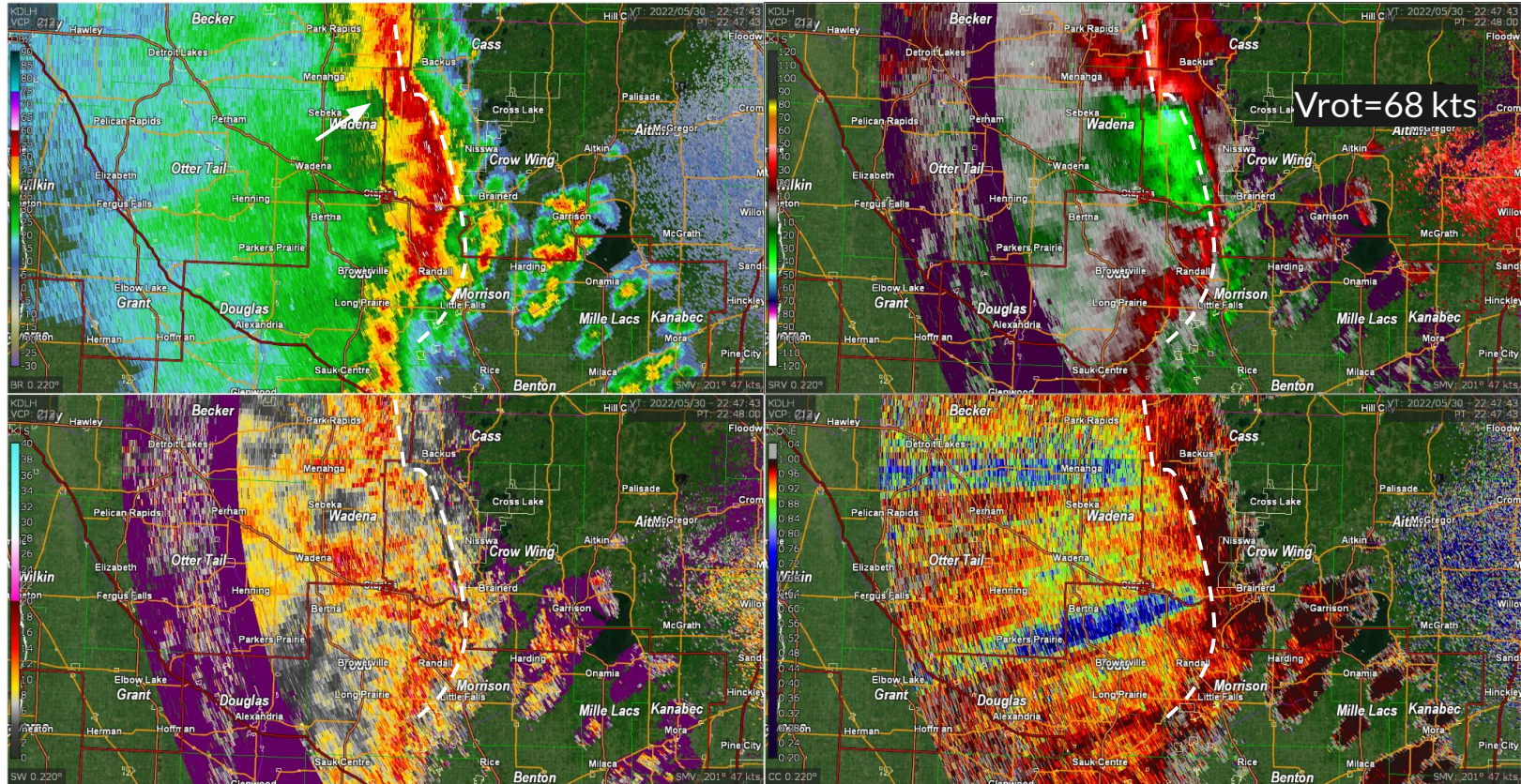
Tornado #1 - Poplar Township - 2243Z



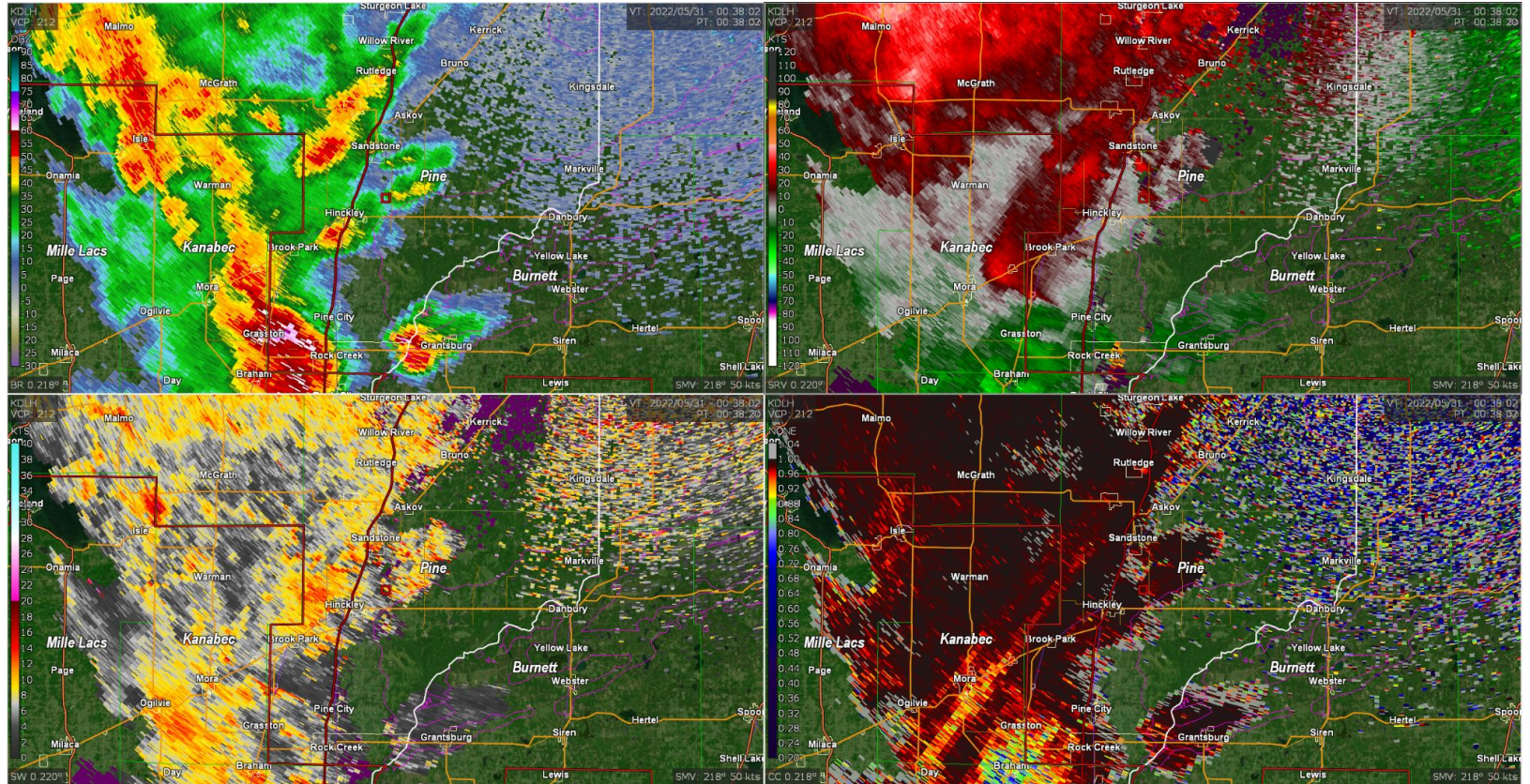
Tornado #1 - Poplar Township - 2245Z



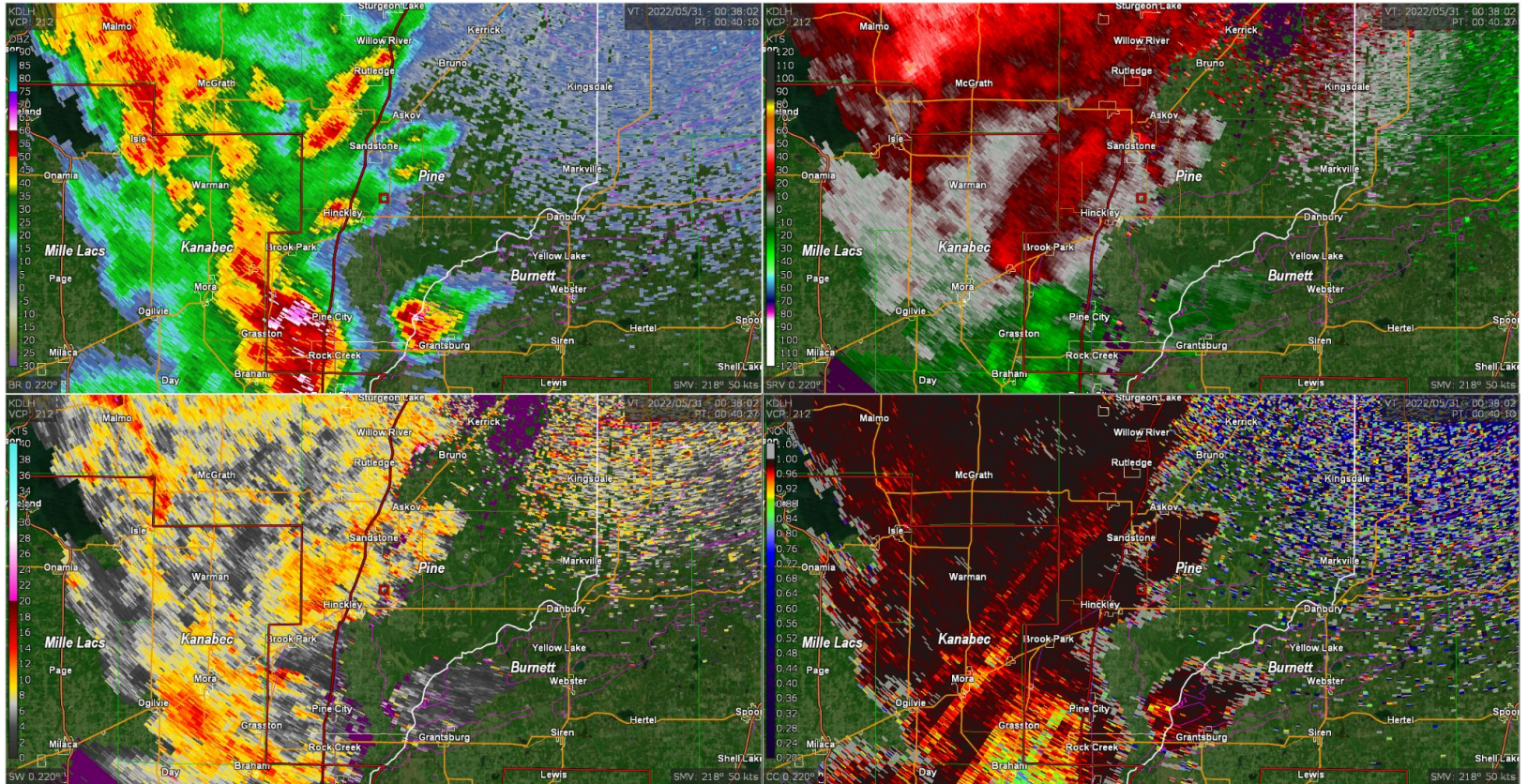
Tornado #1 - Poplar Township - 2248z



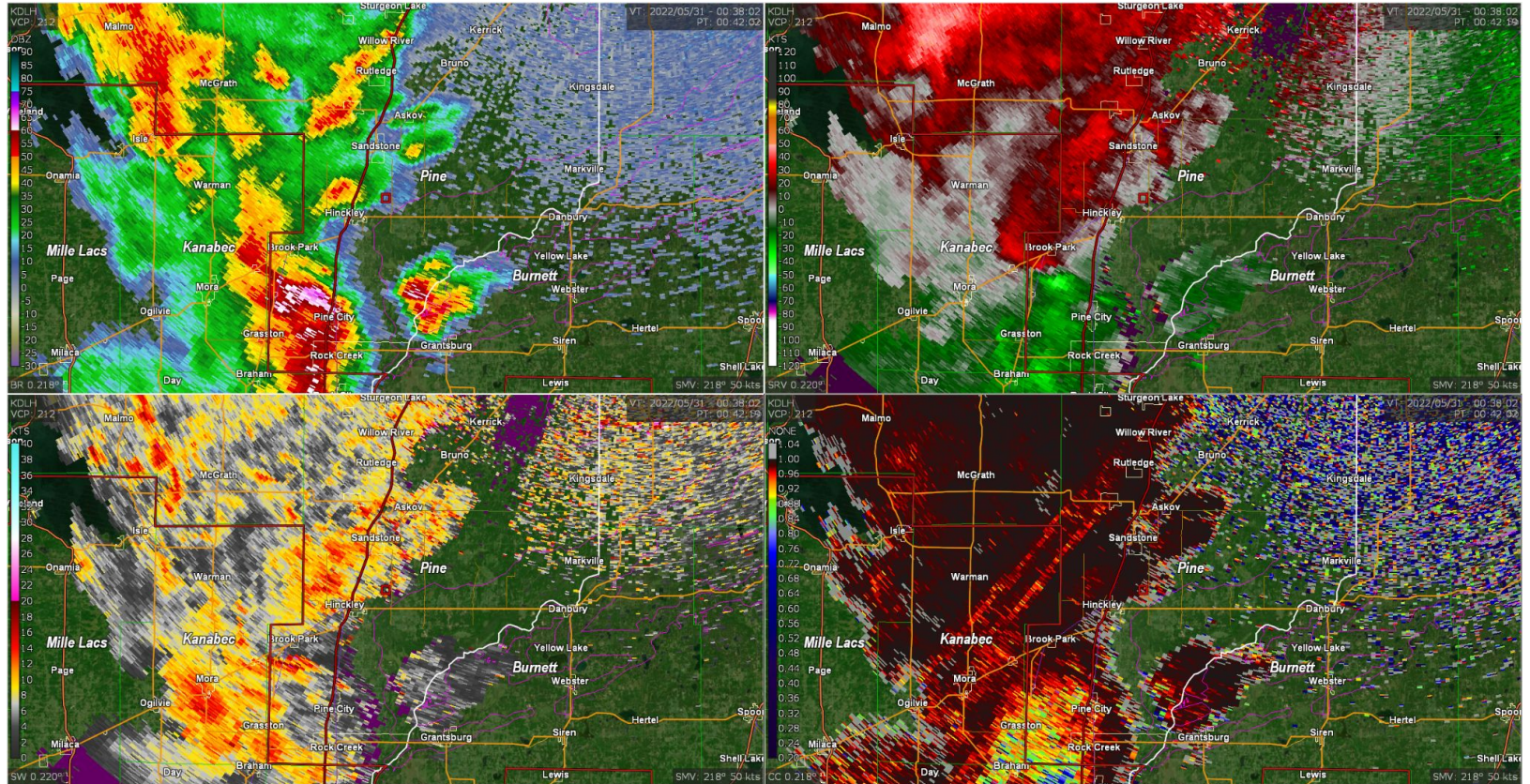
Tornado #4 - Hinckley - 0038z



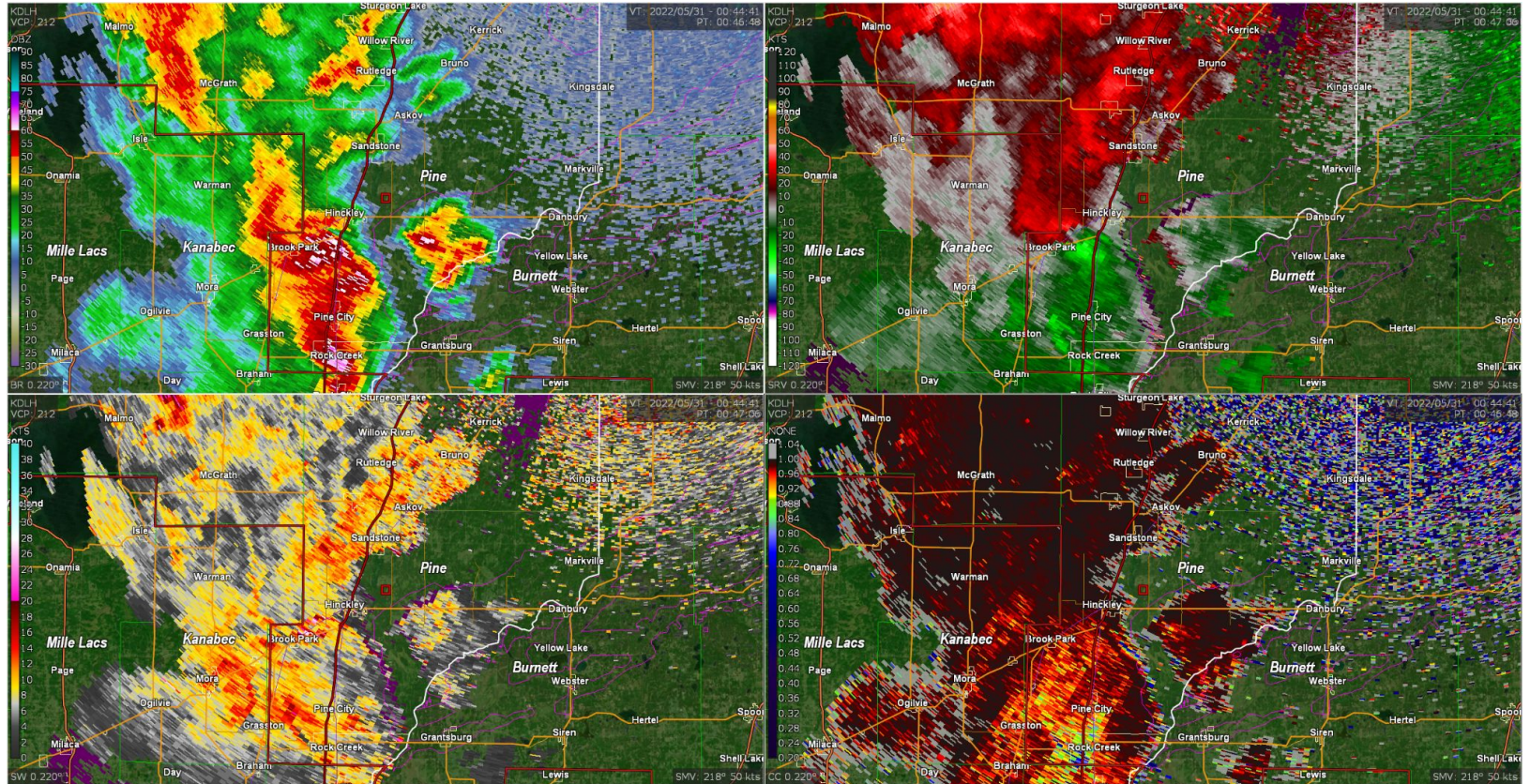
Tornado #4 - Hinckley - 0040z



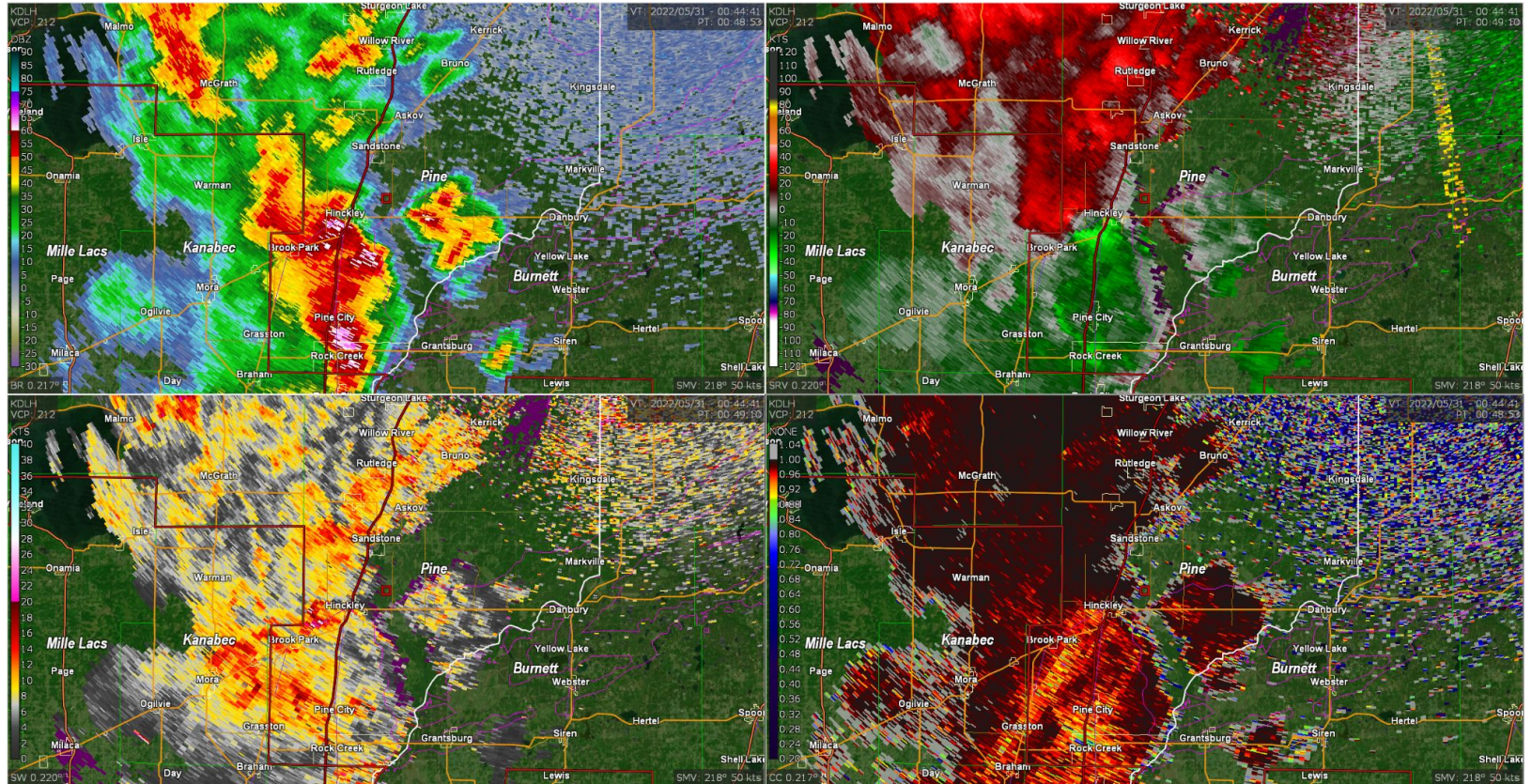
Tornado #4 - Hinckley - 0042Z



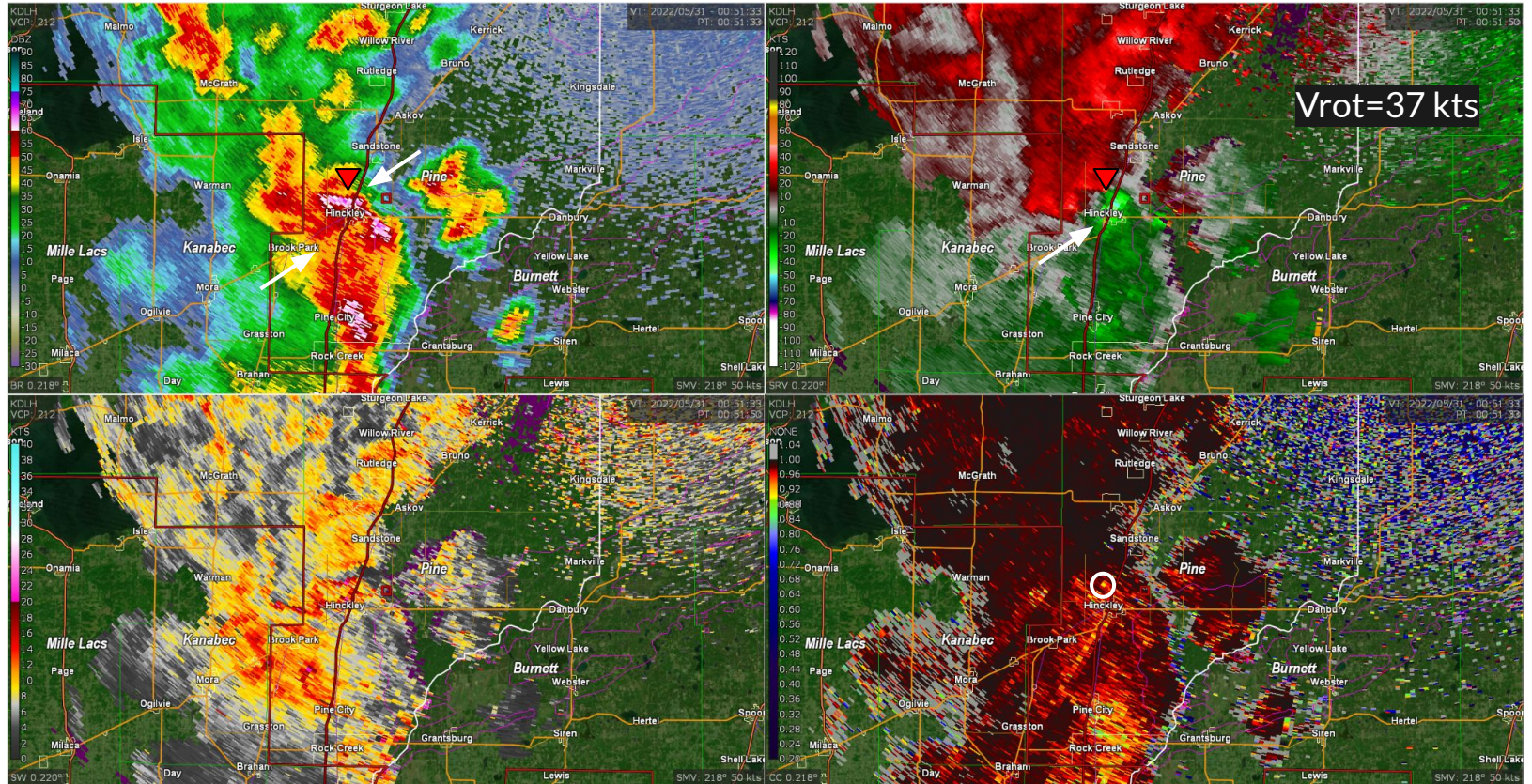
Tornado #4 - Hinckley - 0047z



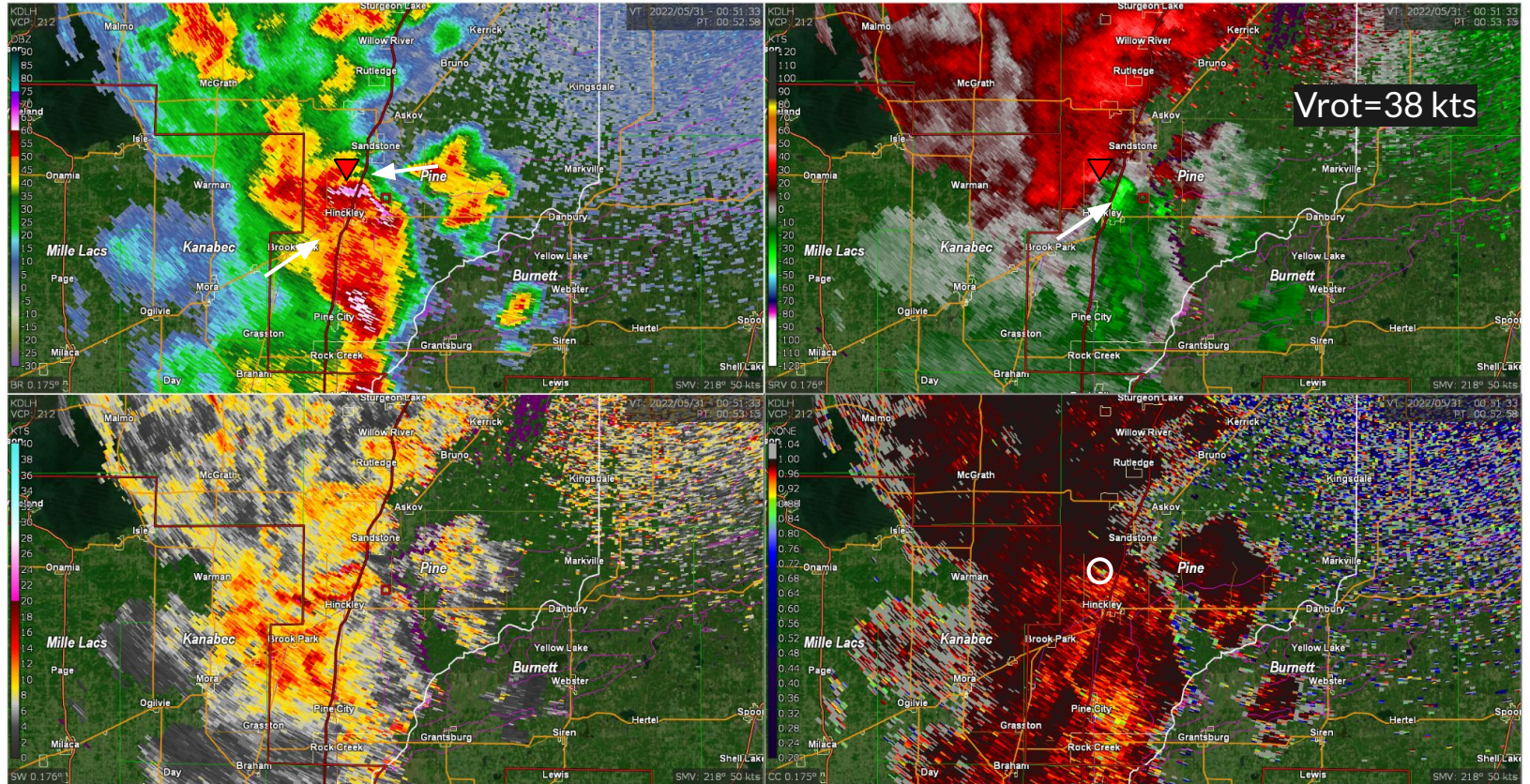
Tornado #4 - Hinckley - 0049z



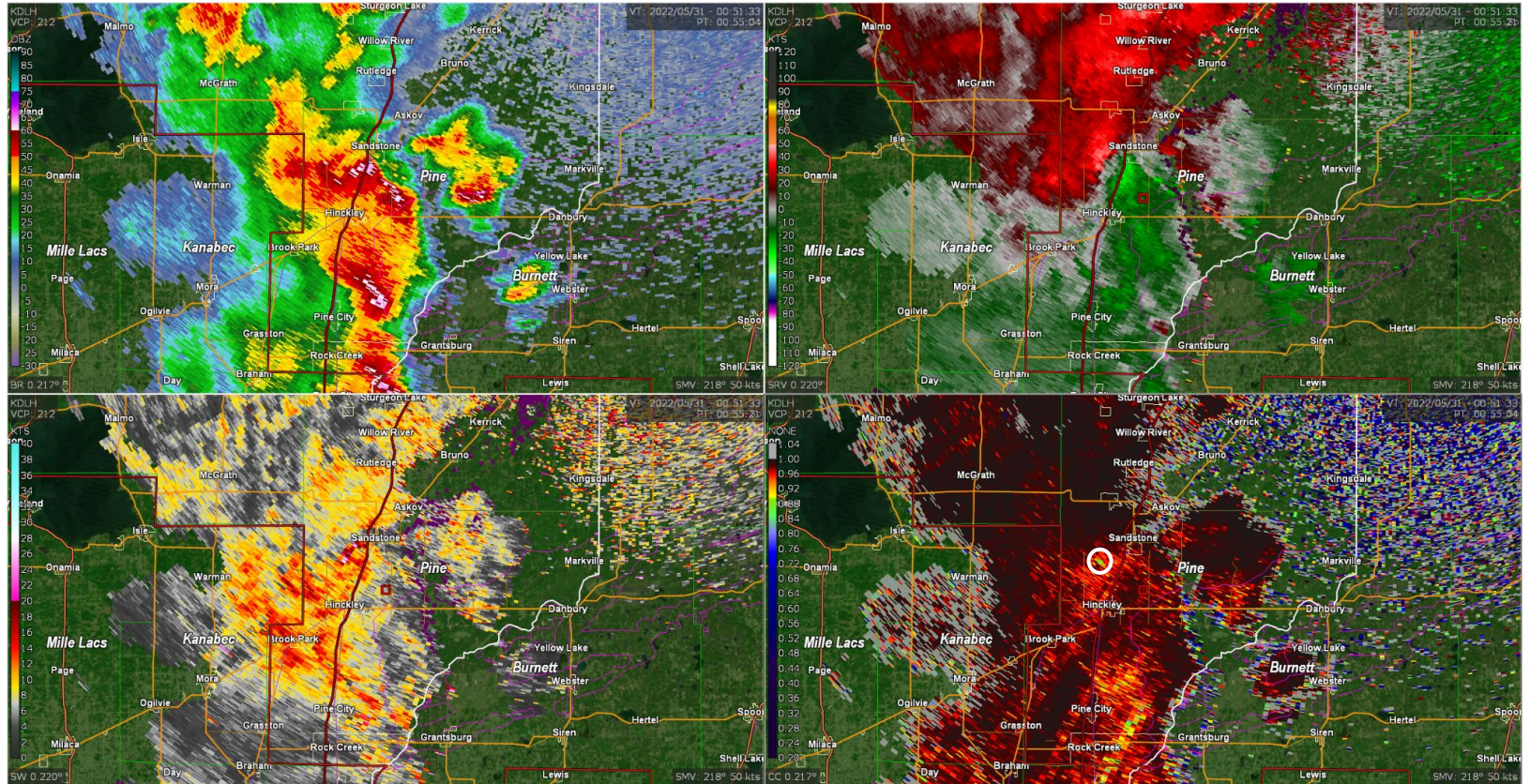
Tornado #4 - Hinckley - 0051Z



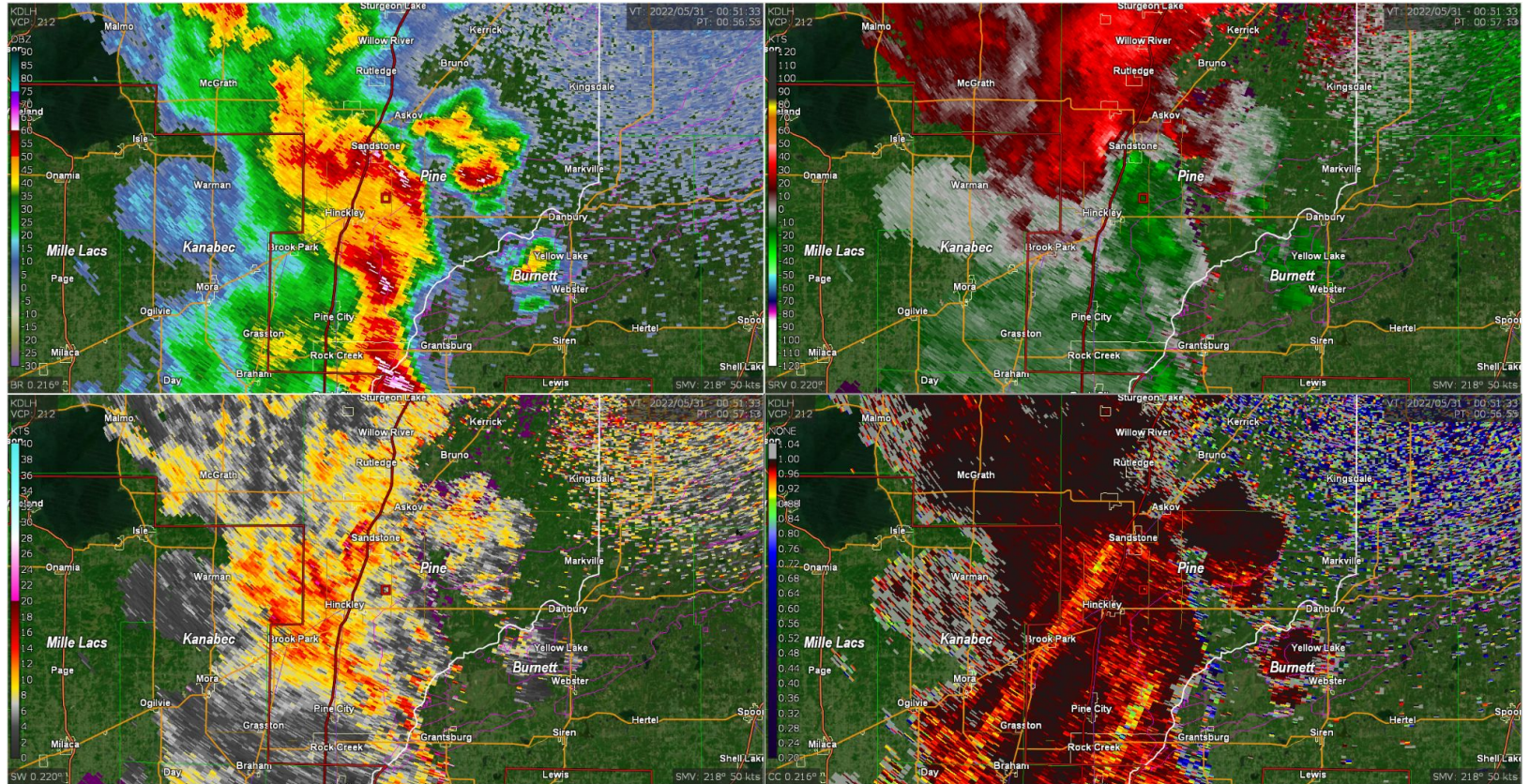
Tornado #4 - Hinckley - 0053z



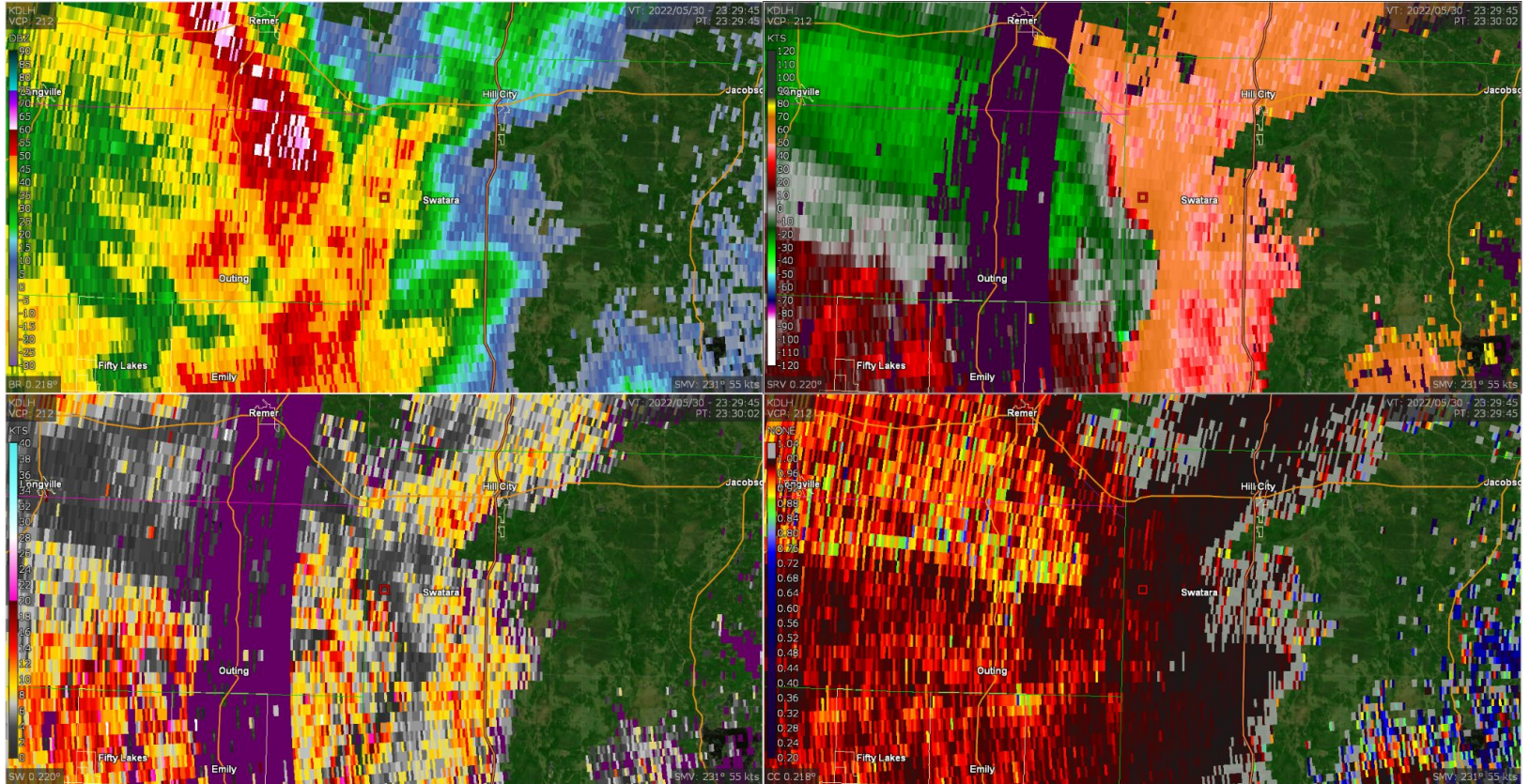
Tornado #4 - Hinckley - 0055Z



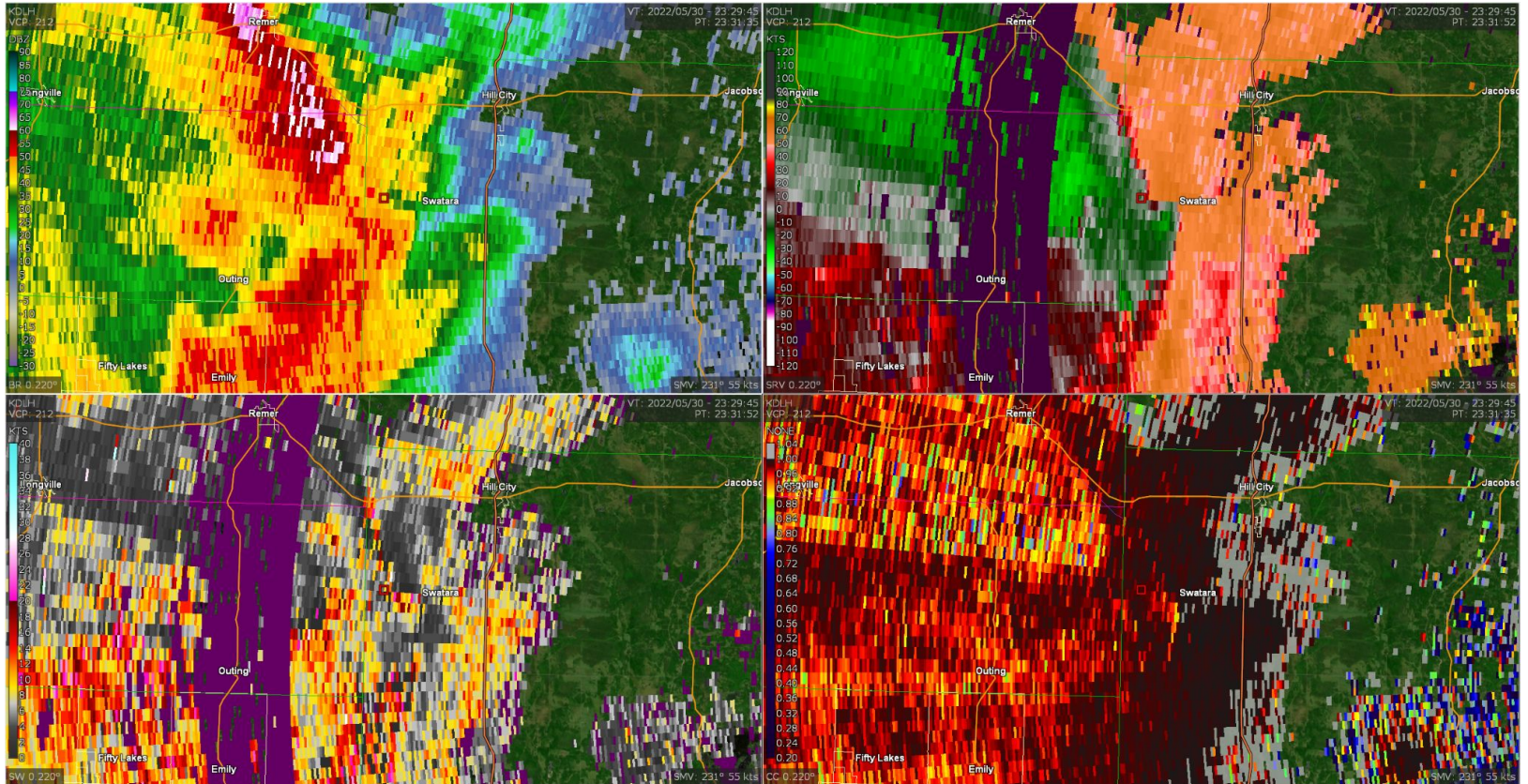
Tornado #4 - Hinckley - 0057z



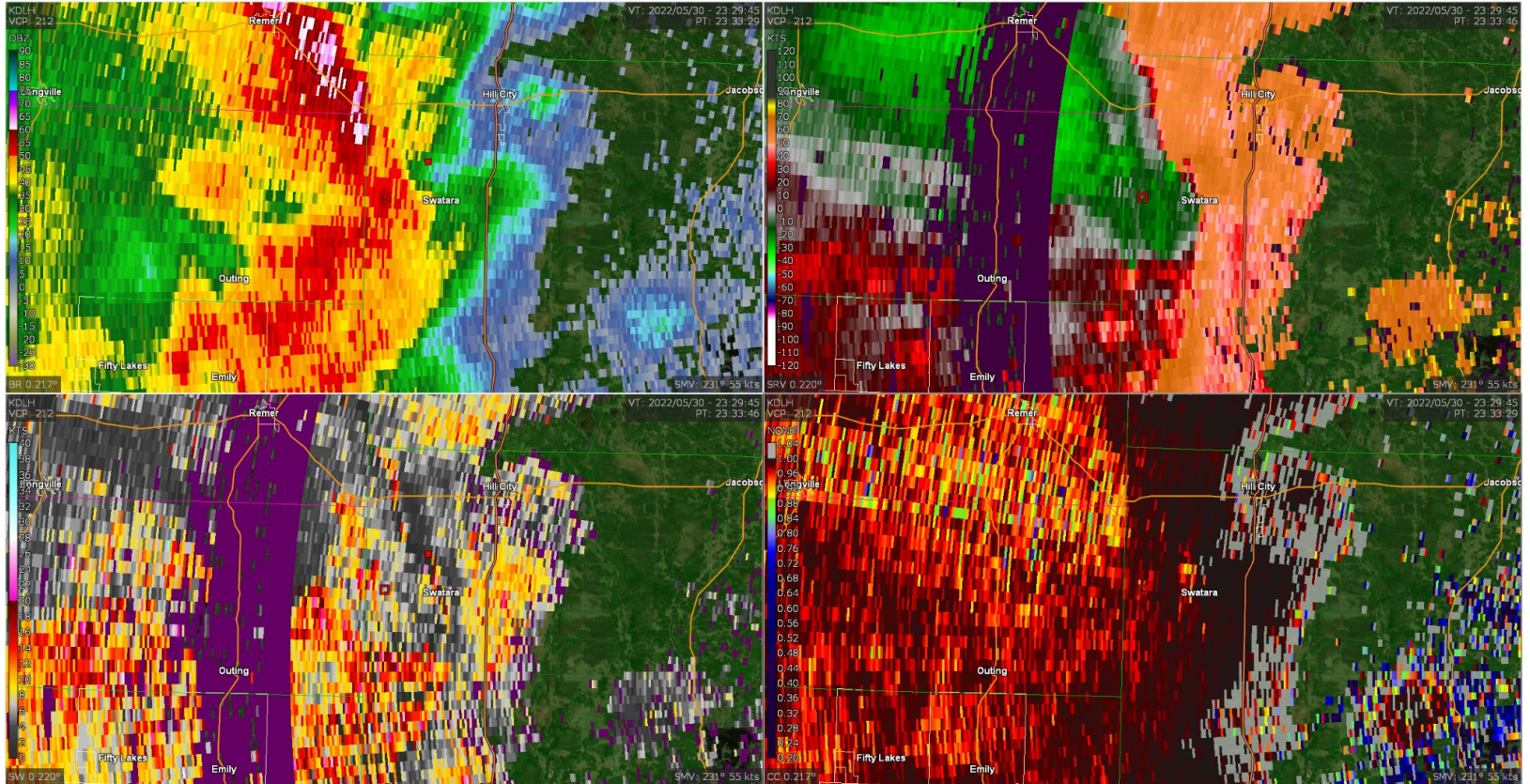
Null Tornado - Swatara - 2330z



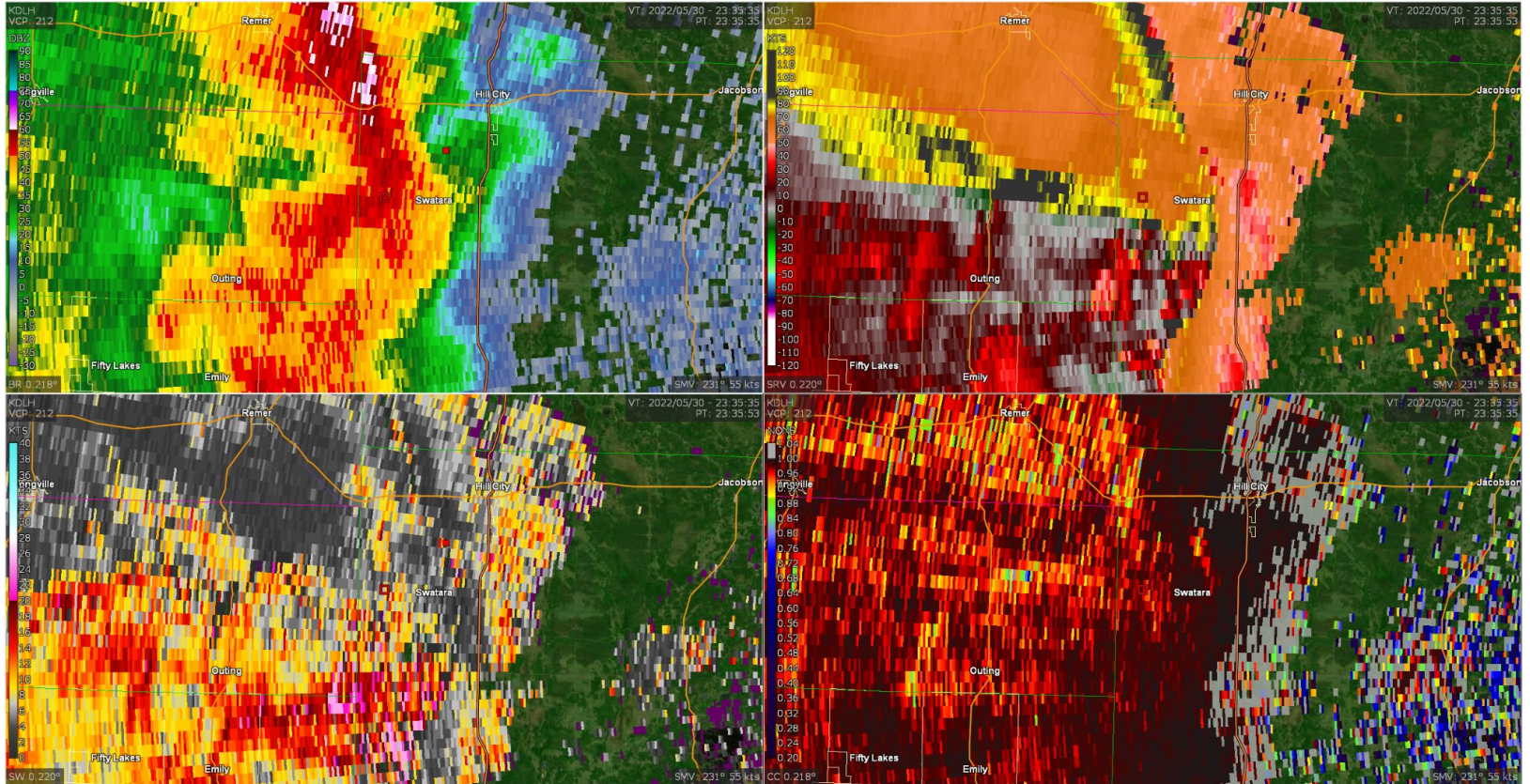
Null Tornado - Swatara - 2331Z



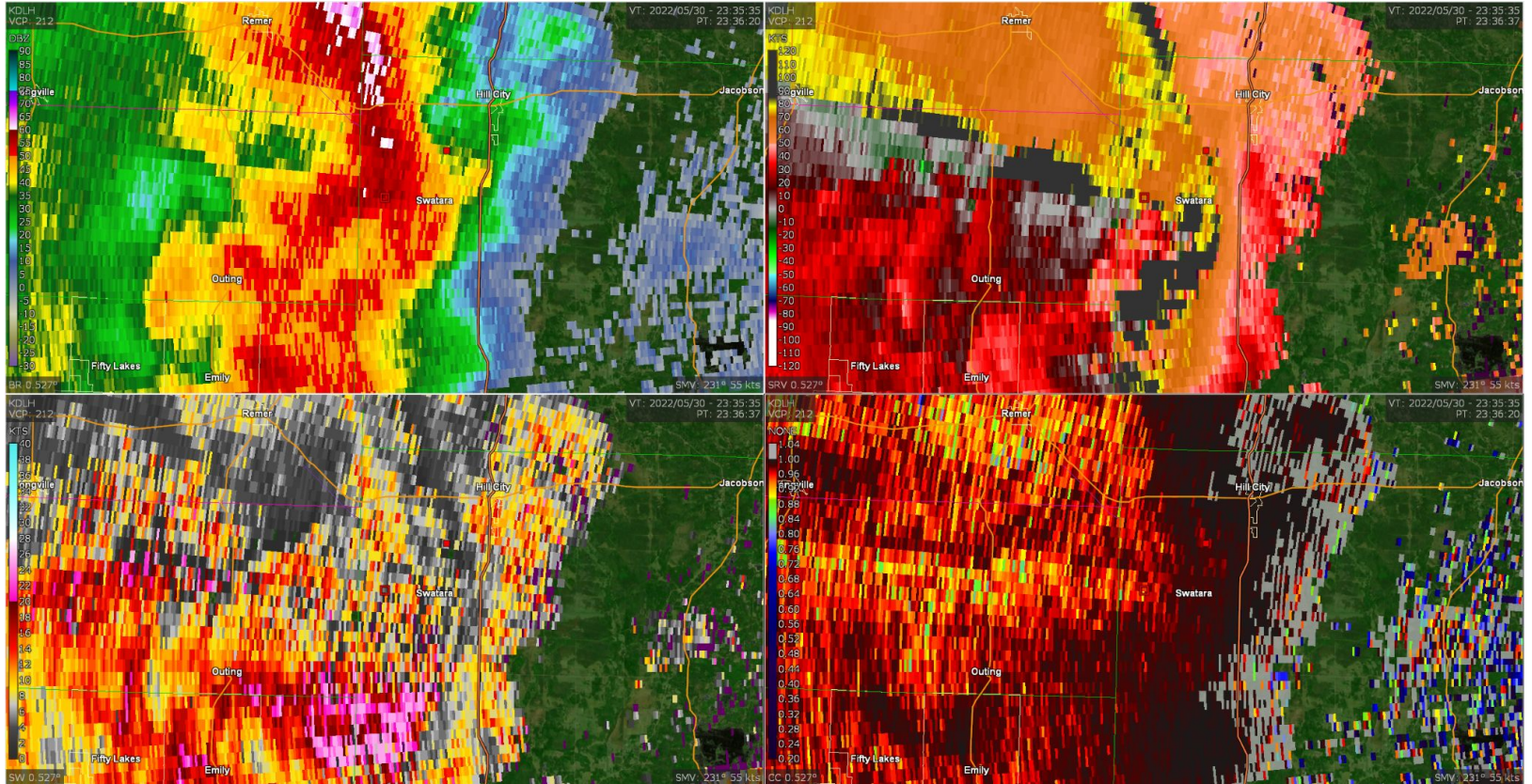
Null Tornado - Swatara - 2333Z



Null Tornado - Swatara - 2335Z



Null Tornado - Swatara - 2335Z - 0.5°

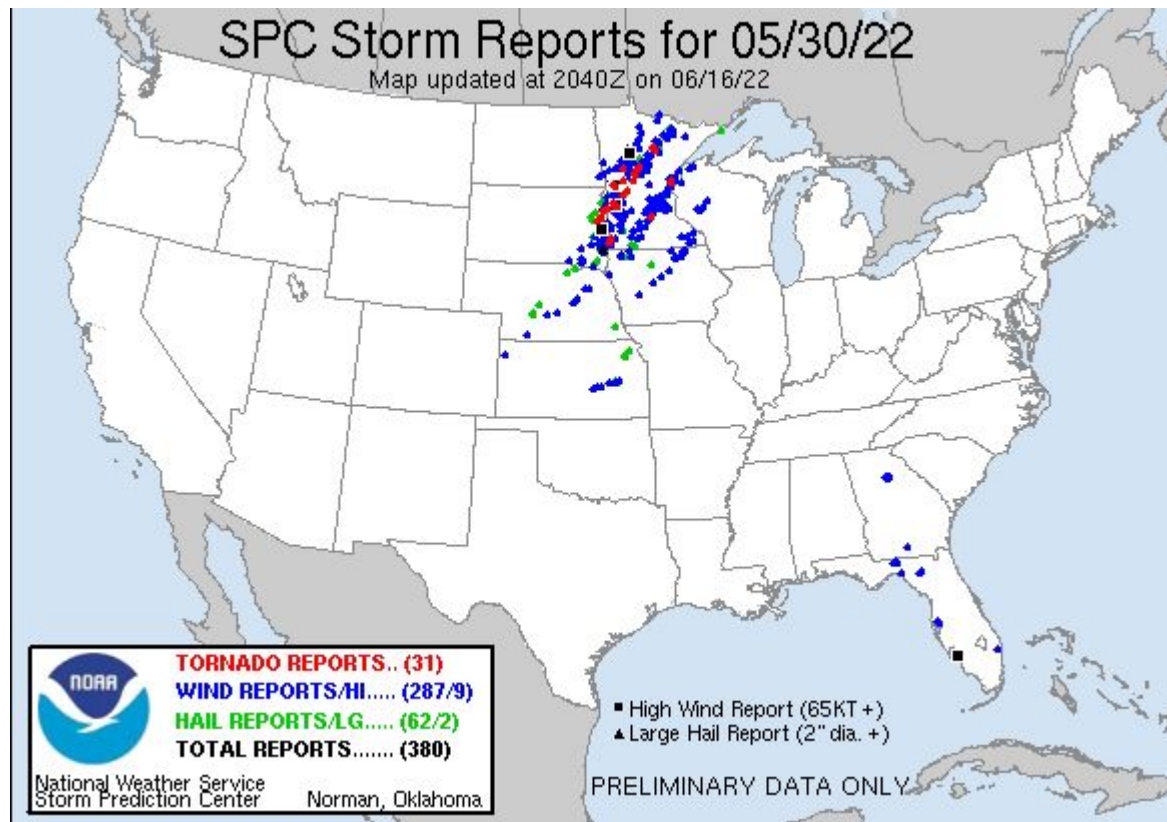


Overview



- Environment
- Radar Analysis
- **Damage Assessment**

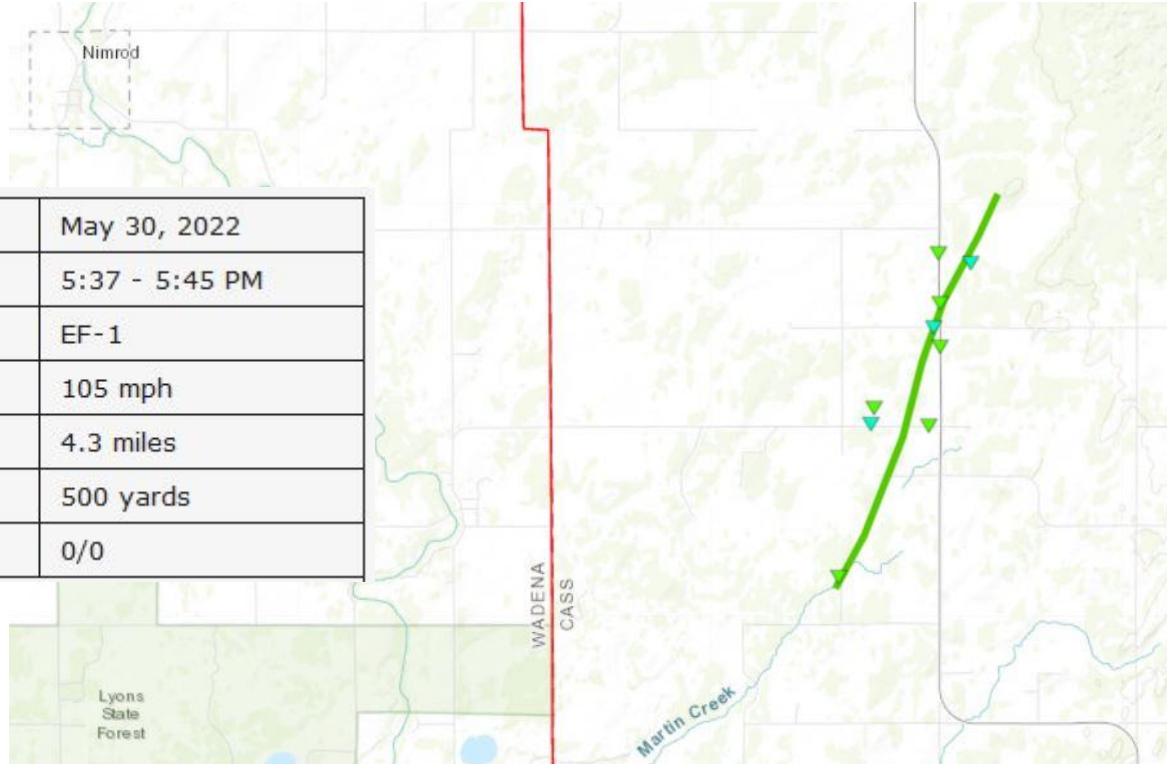
5/30 Storm Reports



Tornado #1 - Poplar Township



| | |
|------------------------|----------------|
| Date | May 30, 2022 |
| Time (Local) | 5:37 - 5:45 PM |
| EF Rating | EF-1 |
| Est. Peak Winds | 105 mph |
| Path Length | 4.3 miles |
| Max Width | 500 yards |
| Injuries/Deaths | 0/0 |



Tornado #1 - Poplar Township



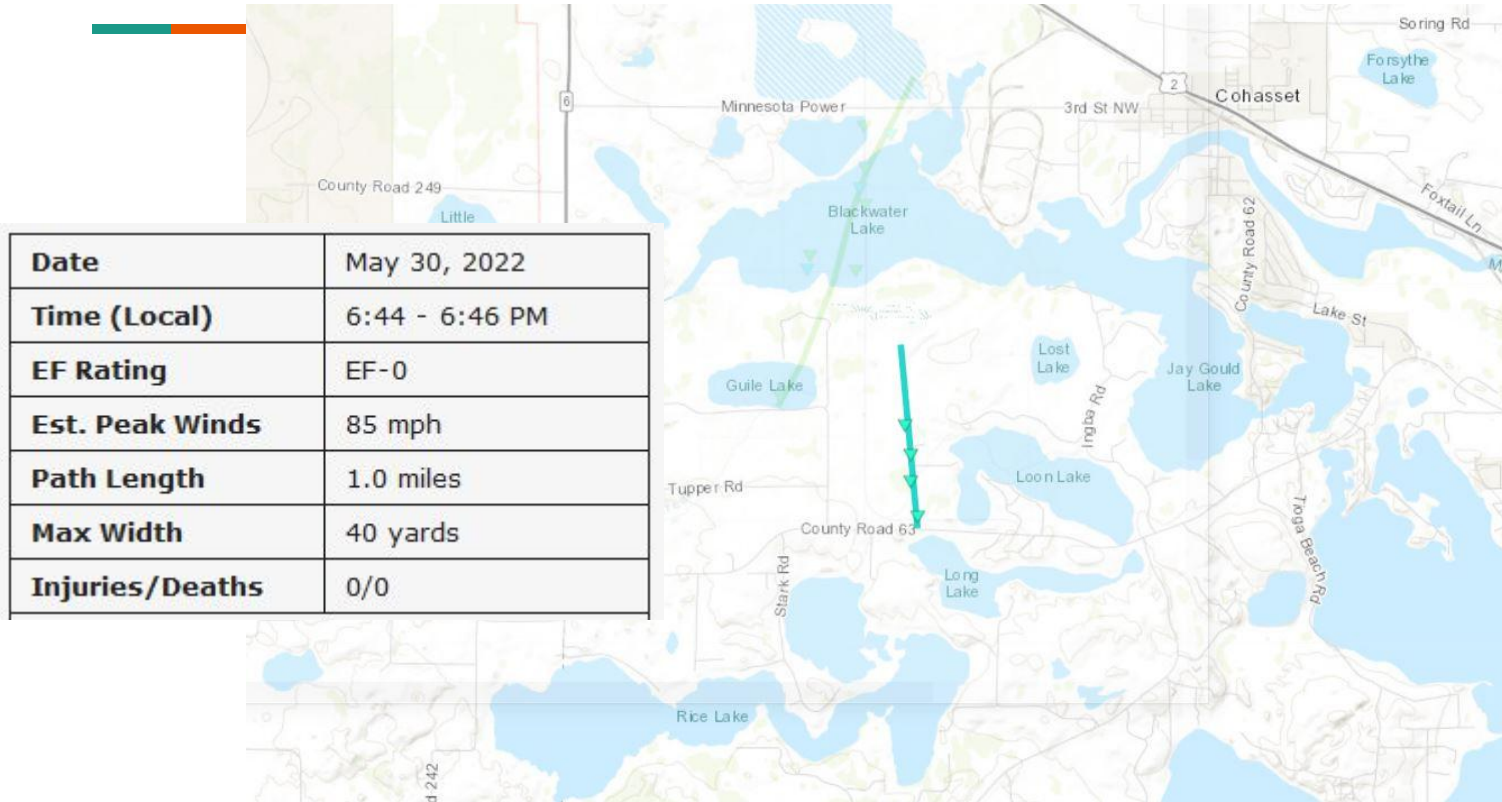
Tornado #1 - Poplar Township



Tornado #1 - Poplar Township

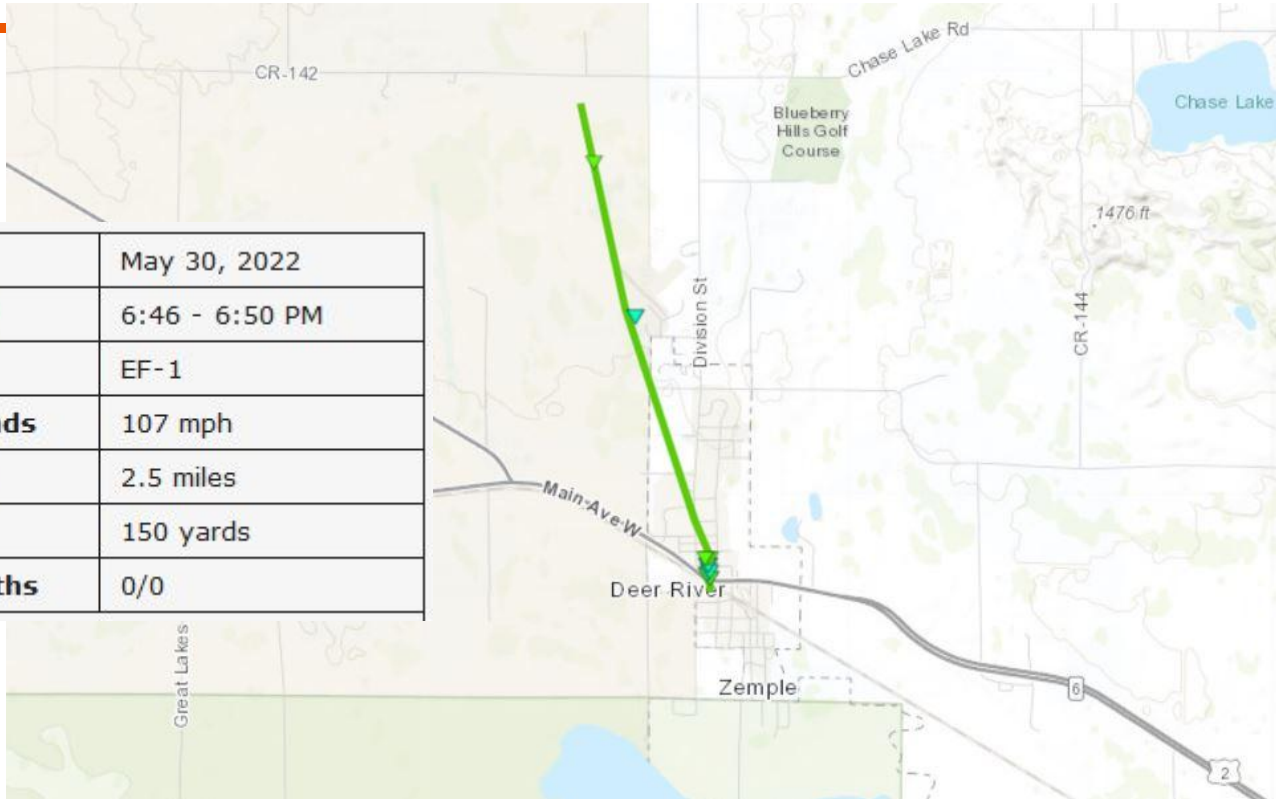


Tornado #2 - Cohasset



Tornado #3 - Deer River

| | |
|------------------------|----------------|
| Date | May 30, 2022 |
| Time (Local) | 6:46 - 6:50 PM |
| EF Rating | EF-1 |
| Est. Peak Winds | 107 mph |
| Path Length | 2.5 miles |
| Max Width | 150 yards |
| Injuries/Deaths | 0/0 |



Tornado #3 - Deer River



Tornado #3 - Deer River



Tornado #3 - Deer River



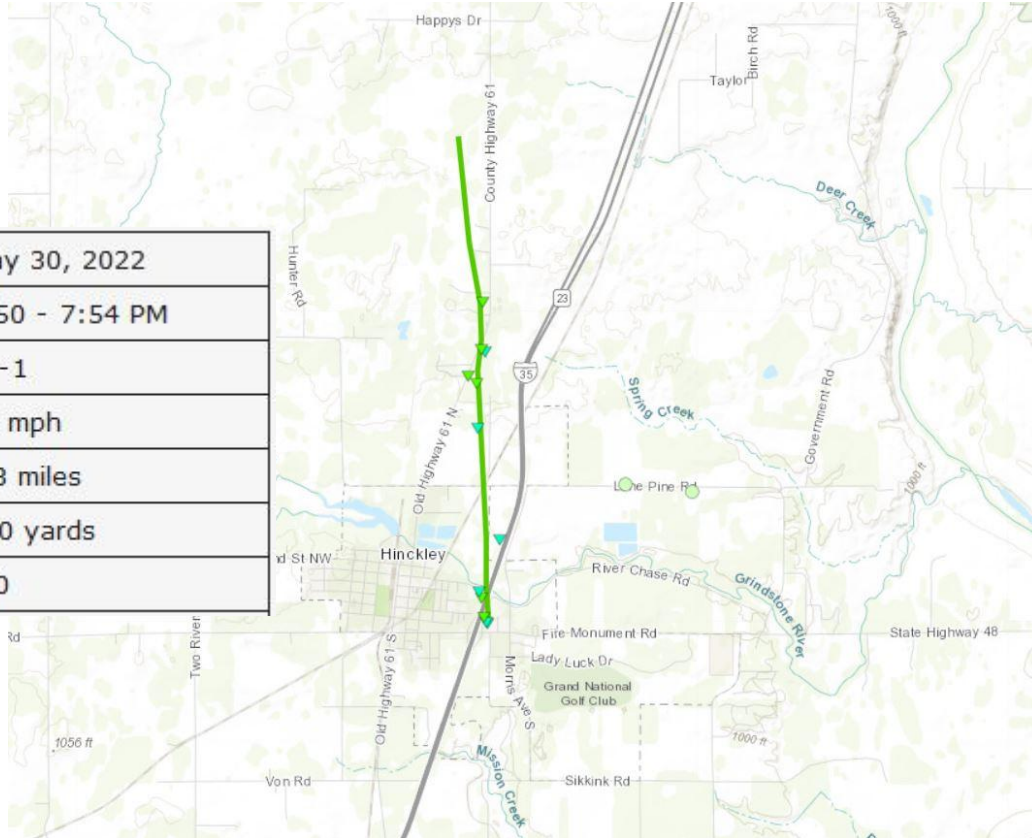
Tornado #3 - Deer River



Tornado #3 - Deer River



Tornado #4 - Hinckley



| | |
|------------------------|----------------|
| Date | May 30, 2022 |
| Time (Local) | 7:50 - 7:54 PM |
| EF Rating | EF-1 |
| Est. Peak Winds | 95 mph |
| Path Length | 3.3 miles |
| Max Width | 300 yards |
| Injuries/Deaths | 0/0 |

Tornado #4 - Hinckley



Tornado #4 - Hinckley



Tornado #4 - Hinckley



Tornado #4 - Hinckley



Tornado #4 - Hinckley



Thank You!

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- Patrick Ayd, SOO NWS DLH
- Joe Moore, WCM NWS DLH
- Denise Baran, Pine County EM

