The July 8, 2014 Significant Severe Weather Event in Central New York and Northeast Pennsylvania

Part 2: Examination of Legacy and Dual Polarization Radar Data

Mike Evans
WFO Binghamton, NY

23rd Annual Great Lake Operational Meteorology Workshop
August 25-27, 2015

A Rare Severe Weather and Tornado Event in Central New York and Northeast Pennsylvania: July 8, 2014

- 6 Tornadoes and numerous severe reports.
- First tornado fatalities in our county warning area since 1998.
- A mix of tornadic and non-tornadic supercells.
- Fatalities occurred with a relatively subtle Bookend Vortex Signature.

Damage near Smithfield, NY

Forecasting and warning factors

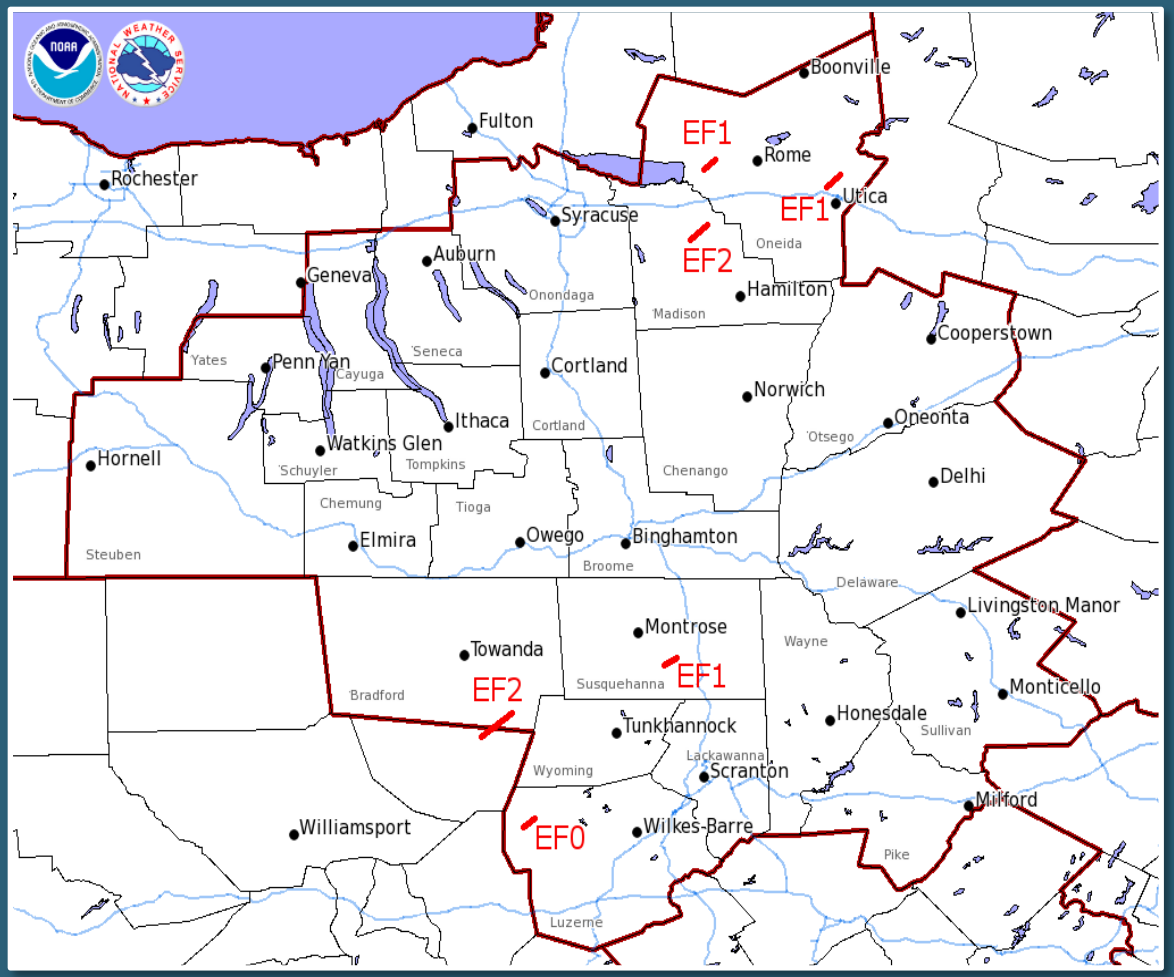
- New tools helped forecasters to anticipate the evolution and magnitude of the event.

- Dual polarization data may have been helpful to discriminate between tornadic vs. non-tornadic storms.

Damage near Smithfield, NY

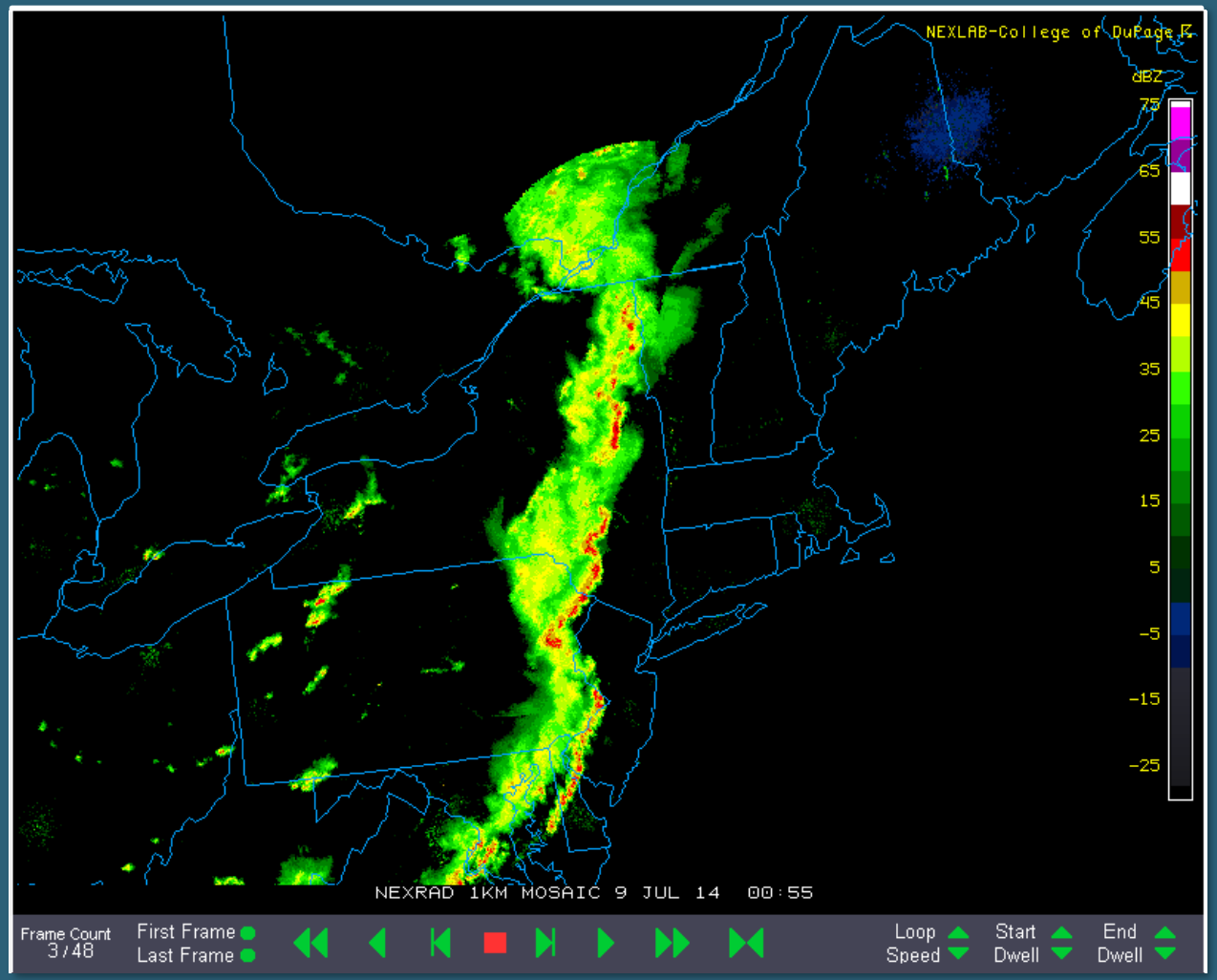
Tornado Tracks

- Six Tornadoes occurred in BGM CWA.
- Two tornadoes were rated EF2.
- The tornado with 5 fatalities occurred in Madison county.



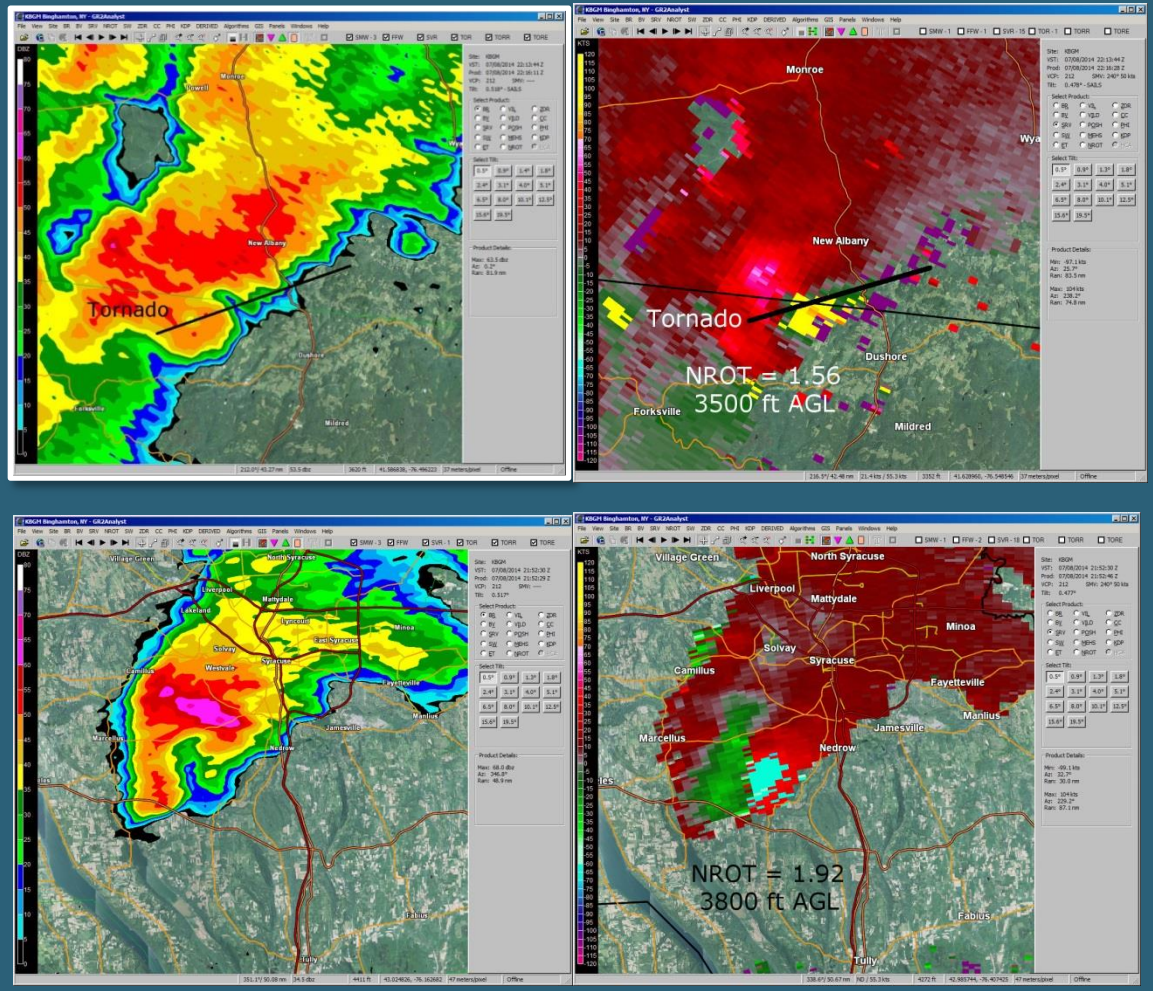
Tornado tracks and EF ratings from July 8, 2014

Radar mosaic



Tornadic vs. non-tornadic supercells

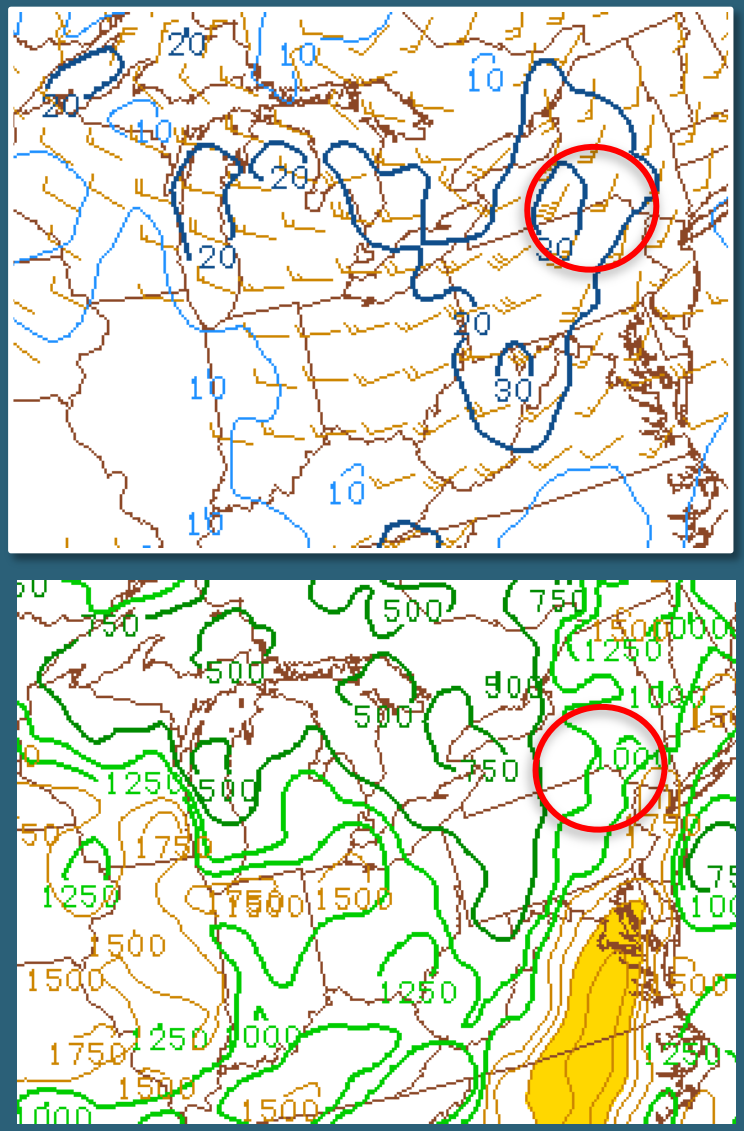
- A small supercell produced an EF2 tornado in northeast Pennsylvania. (top)
- Another impressive supercell near Syracuse produced no tornadoes. (bottom)



0.5 degree reflectivity (left) and SRM (right) for a tornadic storm in Pennsylvania (top) and non-tornadic storm in New York (bottom). The tornado path is annotated by the black line in upper figures.

SPC Mesoanalysis

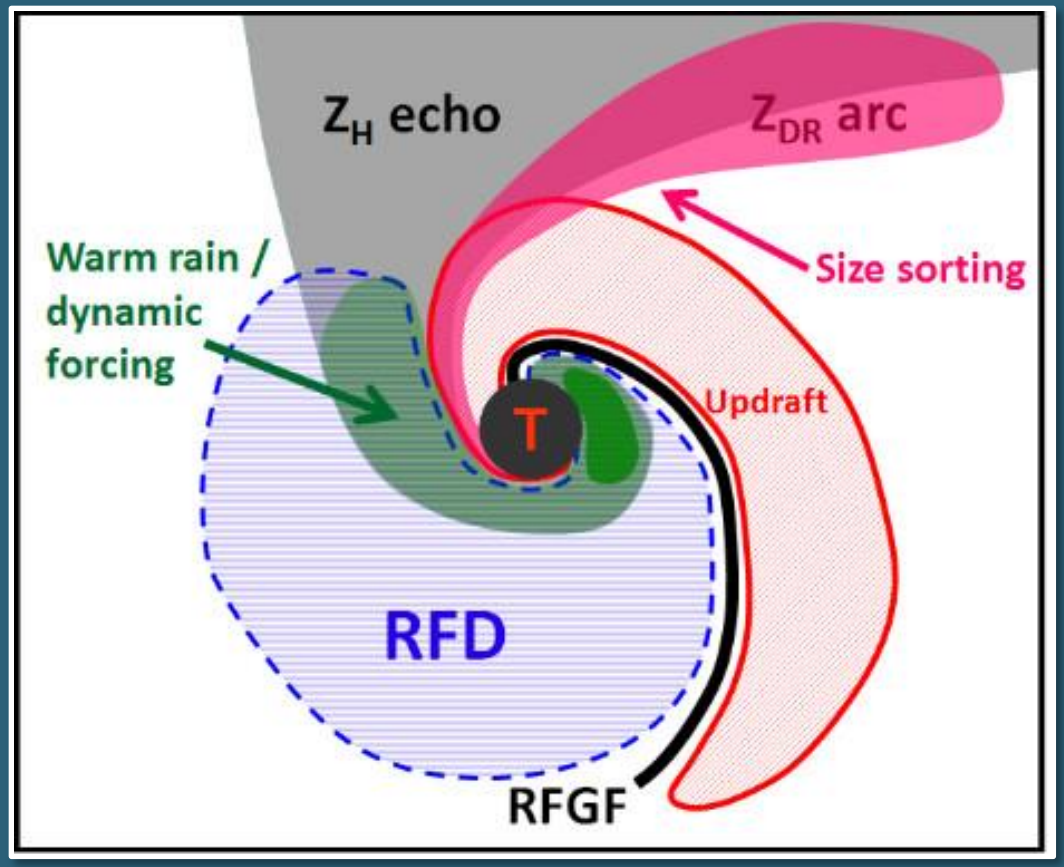
- SPC Mesoanalysis showed a favorable environment for tornadoes across CWA.
- Strong low-level shear and low LCL heights.
- Can dual pol data be used to provide an improved assessment of tornado potential?



SPC Mesoanalysis of 0-1 km shear (top) and LCL height (bottom) valid at 21z

Recent Studies - Conceptual Model

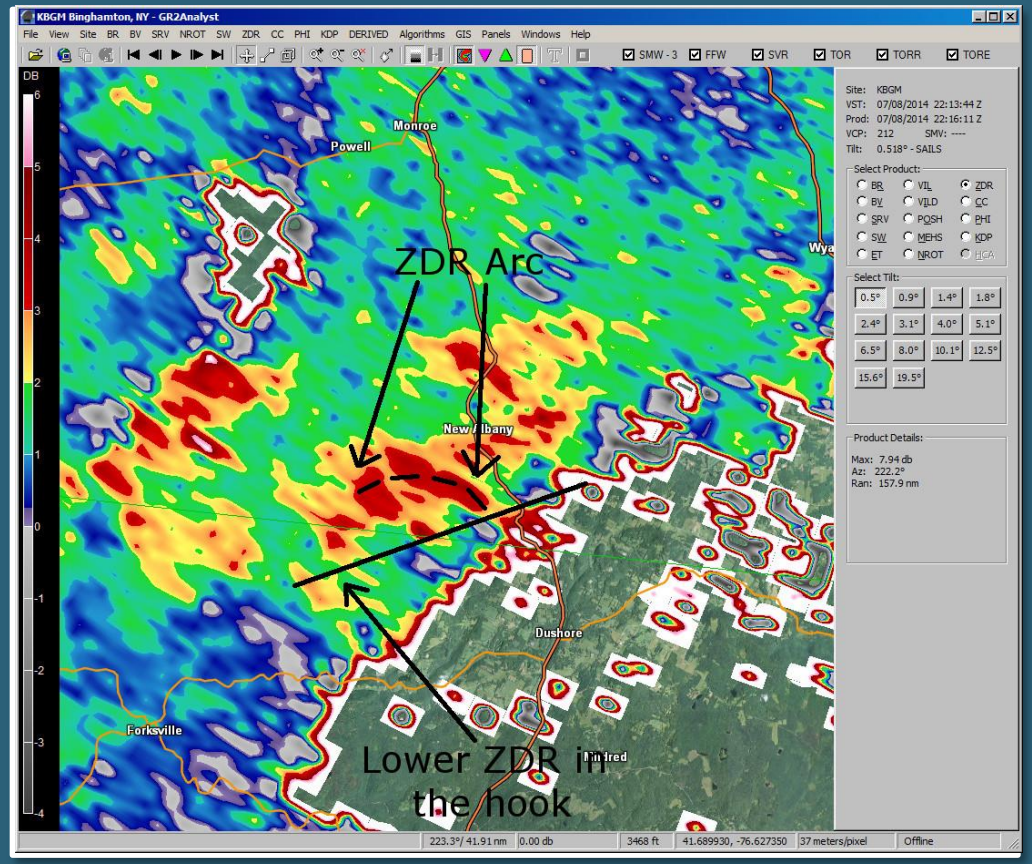
- ZDR arc around the edge of the inflow
- Small drops / low ZDR in the hook echo region of the storm.



Conceptual model of ZDR patterns in a tornadic supercell. (from Kumjian et. al. 2011).

Tornadic Storm

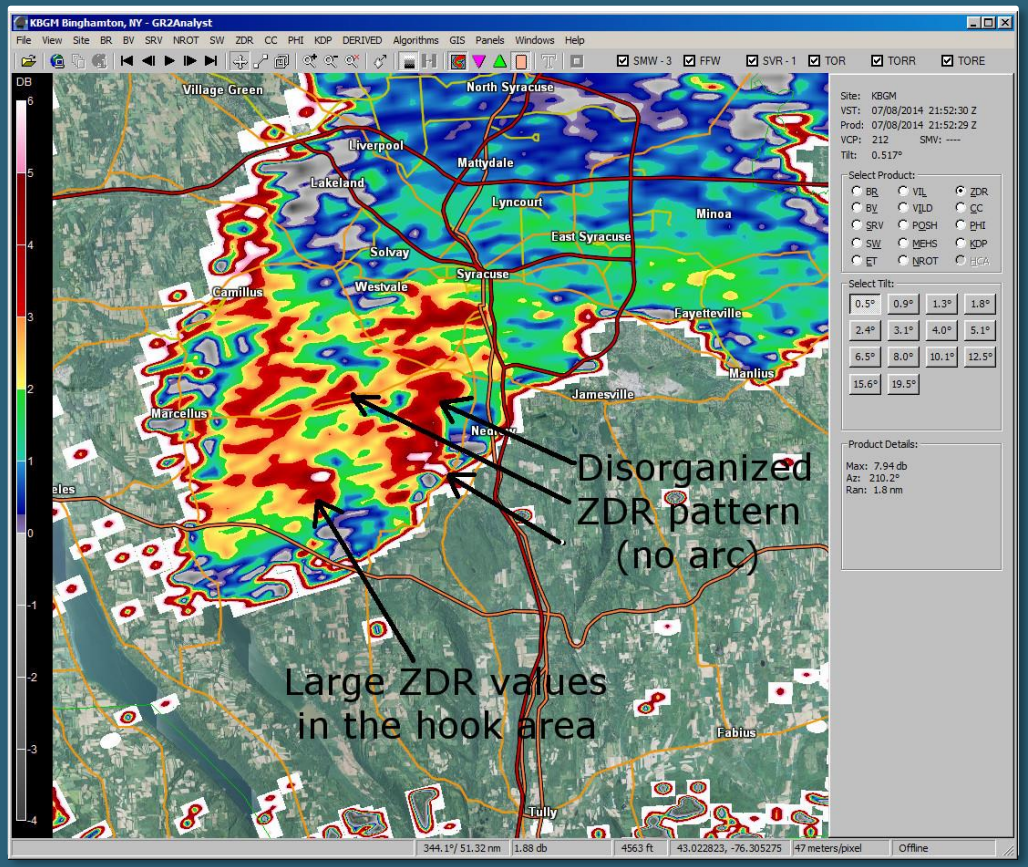
- ZDR arc developed north of the tornado.
- Low ZDR in the tornadic hook echo.



Reflectivity and ZDR for a tornadic supercell over northeast Pennsylvania at 2213z. Tornado path is annotated.

Non-Tornadic Storm

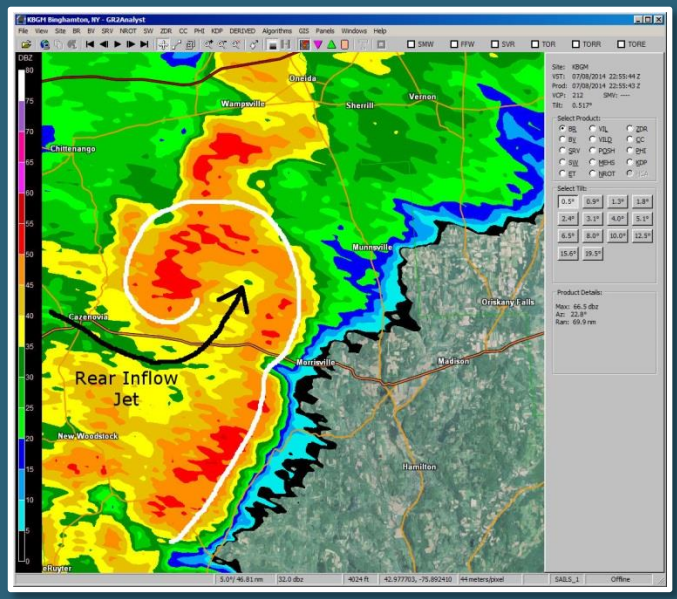
- ZDR pattern was more disorganized.
- No clearly defined ZDR arc.
- Areas of large ZDR values also found in the hook near the location of the potential tornado.

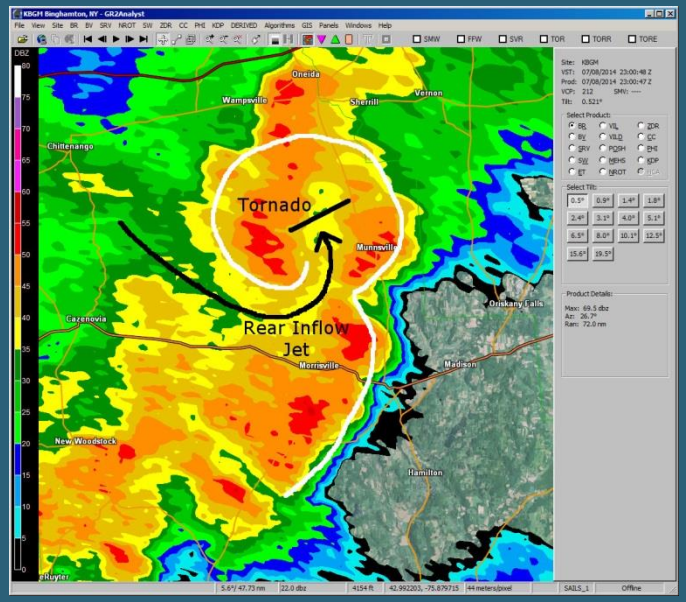


Reflectivity and ZDR in a non-tornadic supercell over central New York at 2152z

EF-2 with 5 fatalities

- A subtle radar signature associated with a bookend vortex.
- The storm was associated with a strong, highly curved rear inflow jet.
- Forecasters more focused on supercells.

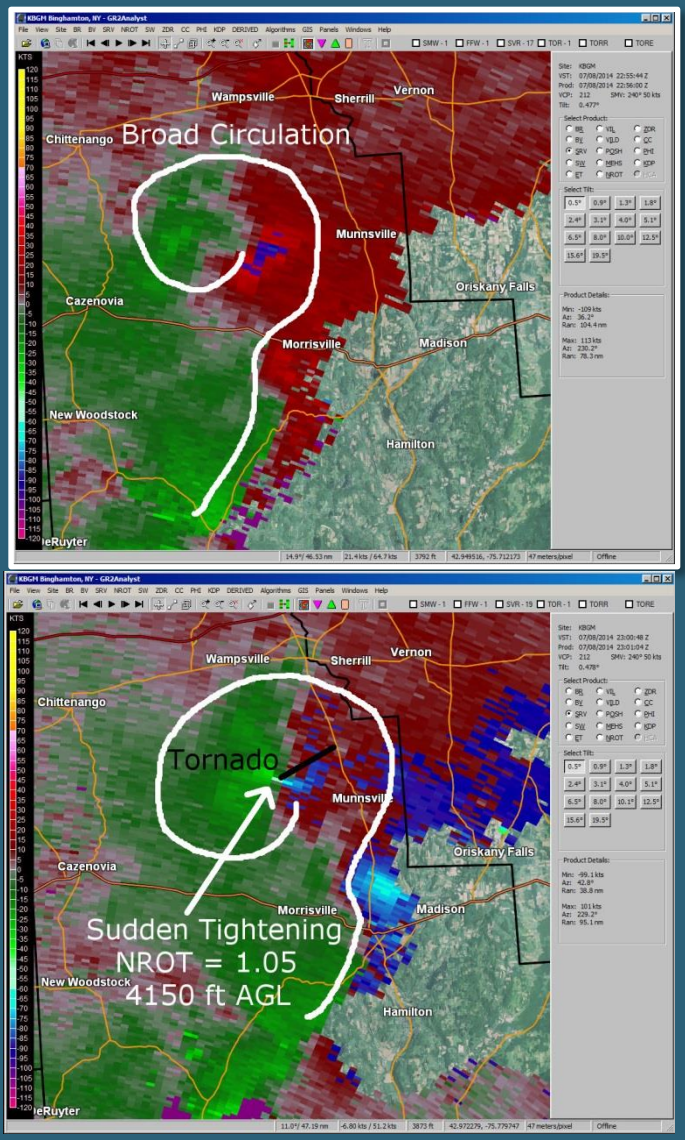




0.5 degree Reflectivity (top) and SRM (bottom) for a tornadic storm at 23z. Tornado path is annotated.

EF-2 with 5 fatalities

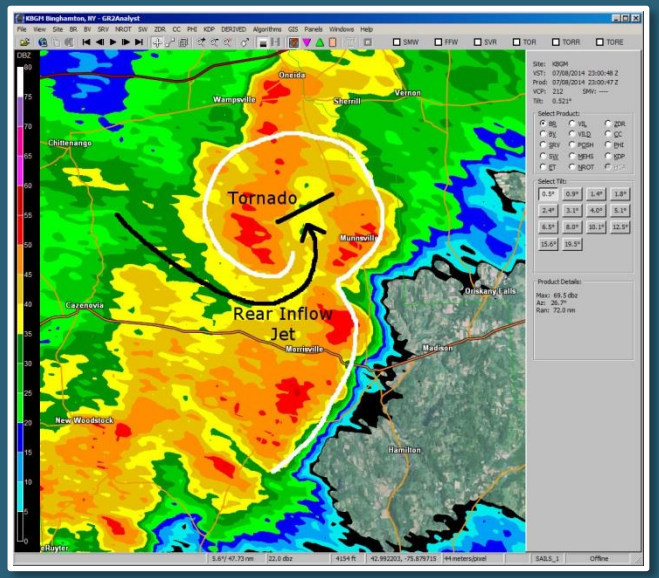
- The velocity signature developed very suddenly.
- A severe thunderstorm warning was in effect for Madison county (no tornado warning).

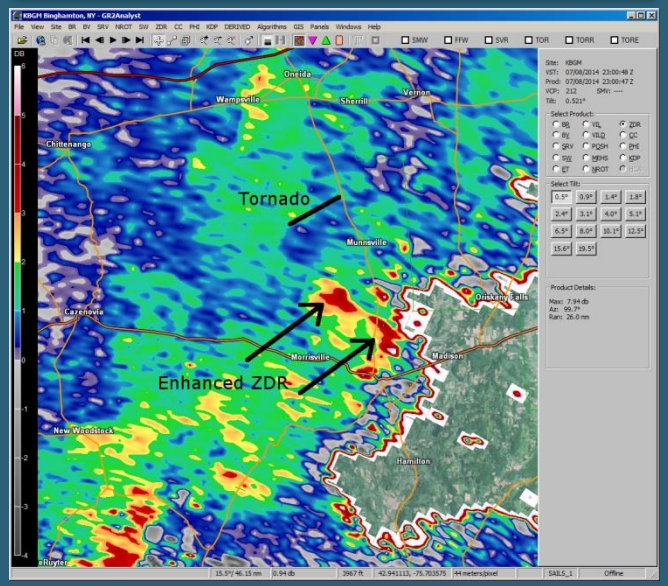


0.5 degree Reflectivity (top) and SRM (bottom) for a tornadic storm at 23z. Tornado path is annotated.

EF-2 with 5 fatalities

- ZDR enhanced on the leading edge of the convective system.
- Lower ZDR in the tornadic area of the storm.

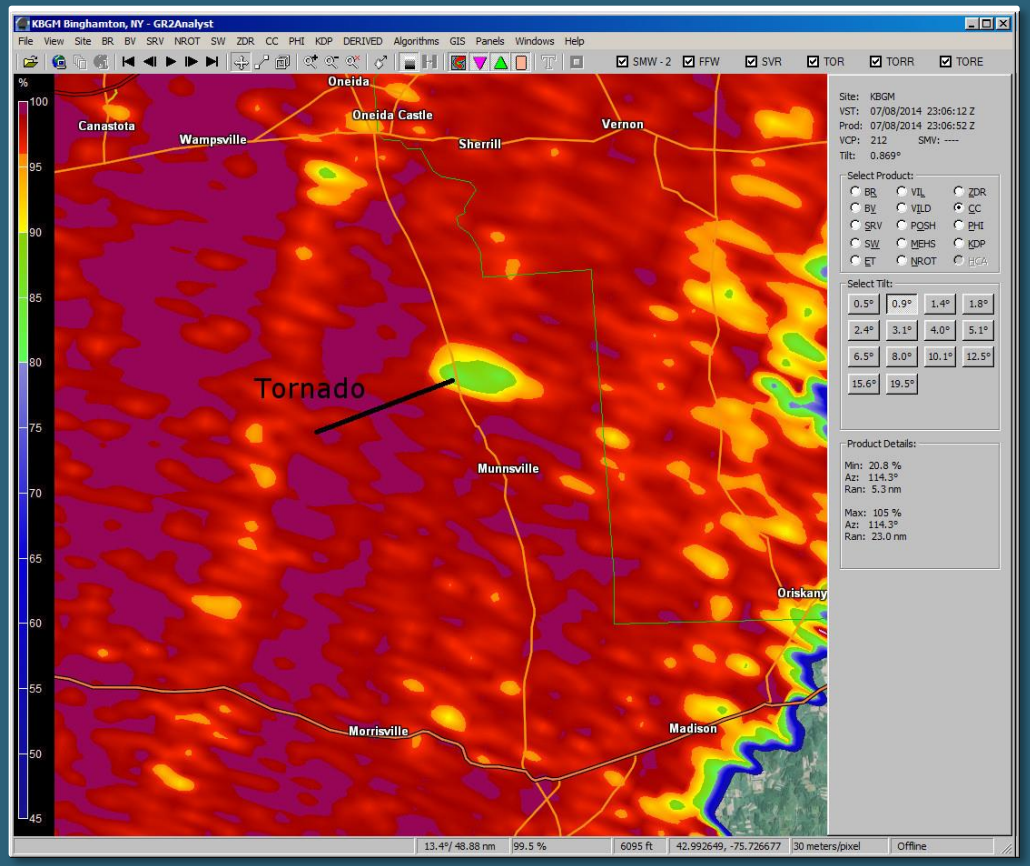




0.5° Reflectivity (top) and ZDR (bottom) for the tornadic storm in New York at 23Z.

EF-2 with 5 fatalities

- TDS developed between 23z and 2306z – just after tornado touchdown.
- TDS extended up through 0.9 degrees (~ 7000 feet).



Correlation coefficient for a tornadic storm from 2300 – 2306Z. Tornado path annotated.

Summary

- A rare severe weather and tornado event in central New York and northeast Pennsylvania occurred on July 8, 2014.
- New tools showed promise helping forecasters to anticipate the occurrence and magnitude of the event.
- Dual polarization radar products have potential to help discriminate between tornadic and non-tornadic storms.

A rare severe weather and tornado event in central New York and northeast Pennsylvania: July 8, 2014

Contact: Mike Evans
michael.evans@noaa.gov