May 16, 2009 (Part II) - A Mesoscale and Radar Perspective of the Tornadic Supercells

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WFO BGM
Mesoscale
Boundary Assistance

• A pre-frontal trough formed across Western NY / PA early in the afternoon
Boundary Assistance (Continued)

- As this trough sharpened up, the low-level flow backed, with helicity and convergence enhanced over time
KBGM VAD Wind Profile

Low-level flow backing with time

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kbgm VAD Wind Profile (RMS kts) Sat 20:04Z 16-May-09
0 to 1 km Shear and Helicity
Storm-scale
Chemung / Tioga Supercell
KBGM 0.5 Reflectivity, Just before SVR was Issued (2033 UTC)
4-Panel Reflectivity at 2033 UTC
4-Panel SRM at 2033 UTC
4-Panel Velocity at 2033 UTC
KBGM 0.5 Reflectivity, Just before TOR was Issued (2050 UTC)
4-Panel SRM at 2050 UTC

* On the border of a Minimal and Moderate Mesocyclone; VR shear of 31 kt, at a range of 26 nm
* Stronger rotation at 3.4 degrees, but at an altitude of almost 10,000 feet AGL
4-Panel Reflectivity at 2050 UTC

Persistent Hook Echoes in the lowest 2 tilts
4-Panel Velocity at 2050 UTC

Strong inbounds; possible Rear-flank (RFD) development
KBGM 0.5 Reflectivity, Near time of Tornado touchdown (2059 UTC)
4-Panel Reflectivity at 2059 UTC
4-Panel SRM at 2059 UTC

* Still on the border of a Minimal and Moderate Mesocyclone; VR shear of 33 kt, at a range of 22 nm
Chemung/Tioga Damage Photos
KBGM 0.5 Reflectivity, Just before next SVR was issued (2124 UTC)

Complex had appeared to acquire linear characteristics by this time.
KBGM 0.5 Reflectivity, Near time of reported wind damage (2141 UTC)

Nice bowing segment; good Rear-inflow jet (RIJ) formation
4-Panel Velocity at 2141 UTC

Strong inbounds; near ground level
Cortland / Madison County Supercell
KBGM 0.5 Reflectivity, Just before a SVR was Issued (2004 UTC)
4-Panel Reflectivity at 2004 UTC

Developing strong inflow notch
4-Panel Velocity at 2004 UTC

- Developing rotational couplet;
- still inflow dominant
KBGM 0.5 Reflectivity, Just before TOR was Issued (2012 UTC)
4-Panel Reflectivity at 2012 UTC

Strong inflow notches remain in the lowest 2 tilts
4-Panel SRM at 2012 UTC

* Rotational velocity value of 34 kt observed at 0.5 degrees, with a diameter of 1.7 nm, and a range of 31 nm
* This value is on the border of a Minimal and Moderate Mesocyclone

* This was before a brief EF0 touchdown, near the border of Cortland and Madison counties
KBGM Reflectivity, Near the time of an EF2 touchdown in Georgetown, NY (2033 UTC)

Strong inflow notch, and an appendage to the southwest
4-Panel SRM at 2033 UTC

* Rotational velocity of 43 kt observed at 0.5 degrees, at a diameter of 2.5 nm, with a range of 37 nm
* This was on the border of a Moderate and Strong Mesocyclone
EF2 Damage Photos
A Closer Inspection of the Storm-Relative Motion Data
KBGM 0.5 SRM at 2004 UTC

Northern couplet; possibly associated with Forward-flank downdraft (FFD)

Southern couplet; possibly associated with Rear-flank downdraft (RFD)
KBGM 0.5 SRM at 2016 UTC

RFD couplet; brief EF0 spin-up likely associated with this feature
KBGM 0.5 SRM at 2025 UTC

Leading edge of RFD; beginning to wrap towards center of vortex
KBGM 0.5 SRM at 2029 UTC

Leading edge of RFD continues to rotate cyclonically.
As RFD wraps into the middle of the mesocyclone, it intensifies, and an EF2 tornado forms near this time.
By this time, vortex had weakened, as the RFD airstream effectively “choked off” the system.
Zoomed-In KBGM SRM Loop
EF2 Damage Path

Main EF2 damage swath

Narrow valley may have enhanced SSE storm inflow
Summary

- Two long-lived, tornadic supercells developed on this day
  - One near the NY/PA border, and one across northern Cortland/southern Madison counties
- Chemung/Tioga
  - Proximity of pre-frontal trough likely helped focus convergence and also increased low-level shear
- Cortland/Madison cell
  - Storm scale occlusion processes (RFD wrapping into the main vortex) may have helped spawn EF2 tornado
Summary (continued)

• Lesson learned: switching to VCP212 sooner probably would have mitigated range folding issues with the Chemung/Tioga storm