The 20 July 2019 High-CAPE-Low-Shear Severe Weather Event in Eastern New York

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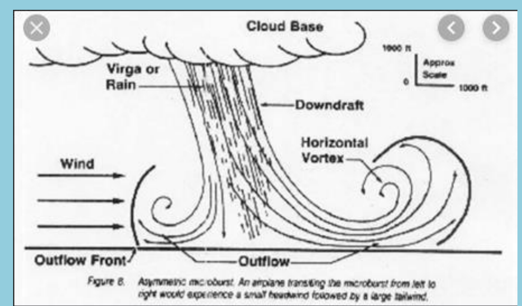
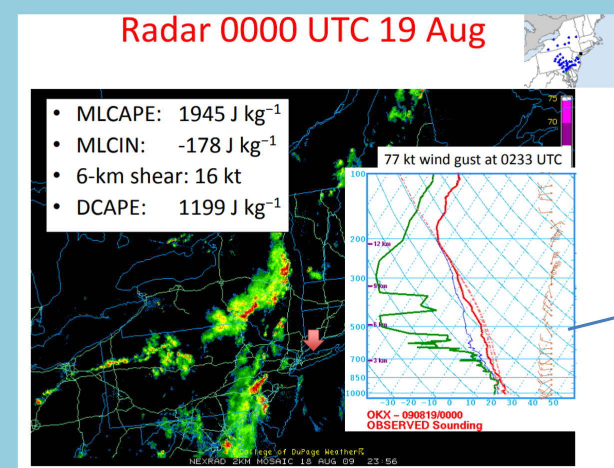
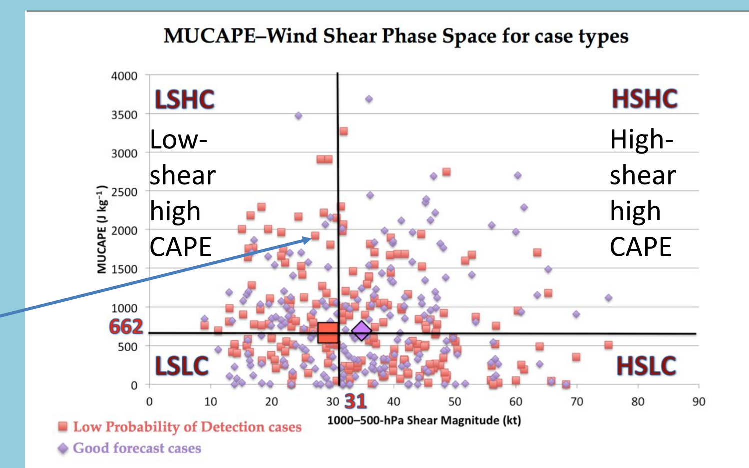
Background and previous research on High-CAPE-Low-Shear Events



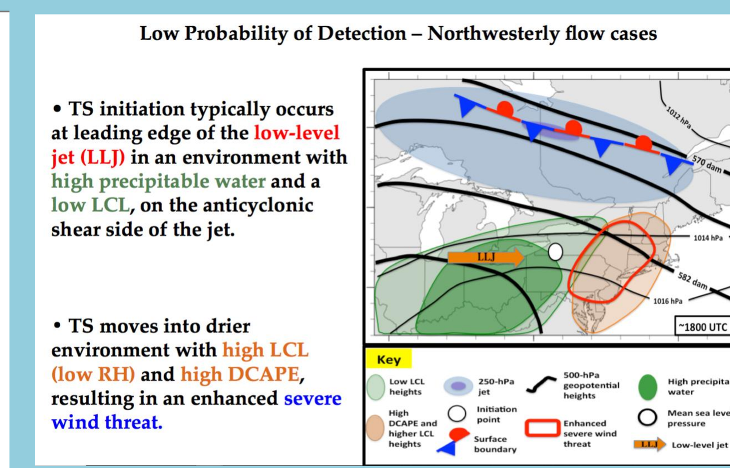
Wet Microbursts are associated with cold outflow descending from the core of the storm and often producing strongest winds very close to the ground. Radar can overshoot the strongest winds when they are near the ground.



Soundings associated with wet microbursts are often characterized by large CAPE, steep low-level lapse rates and weak deep-layer shear

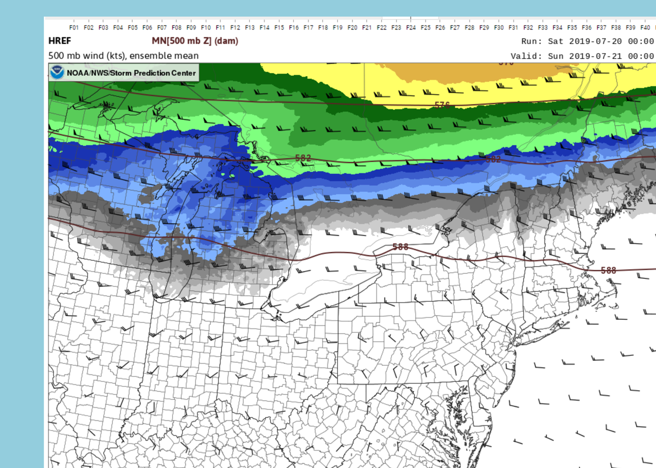


Research from the Collaborative Science, Technology, and Research (CSTAR) Program has shown that high CAPE / low shear environments can produce poorly-detected severe weather events.

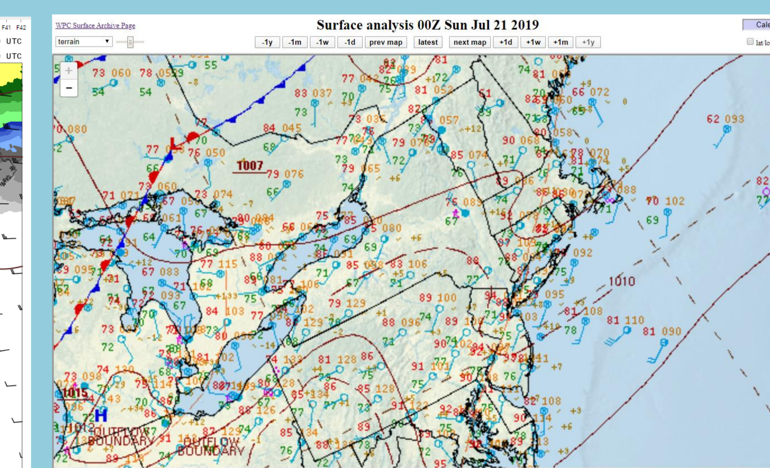


Environments favorable for poorly-detected events include northwesterly mid-level flow, and large DCAPE. Synoptic scale forcing is often well to the north or west.

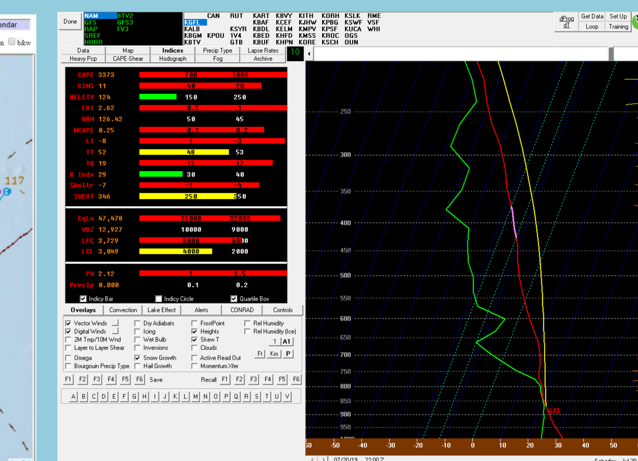
Large-scale pattern and sounding- July 20, 2019



500 mb heights (dm), and wind at 00z on 21 July. The flow was northwesterly across upstate NY, however strongest winds were to north in Quebec.

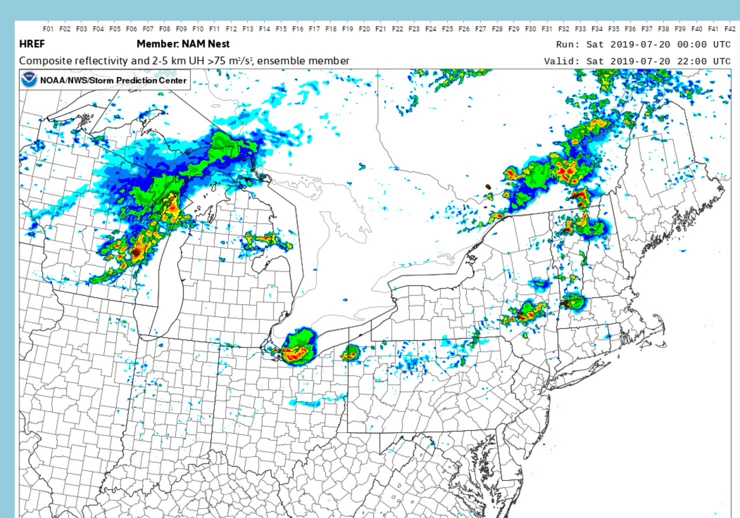


Synoptic-scale frontal zones were well to the north and west of upstate NY, however some subtle surface troughs were analyzed in the area.

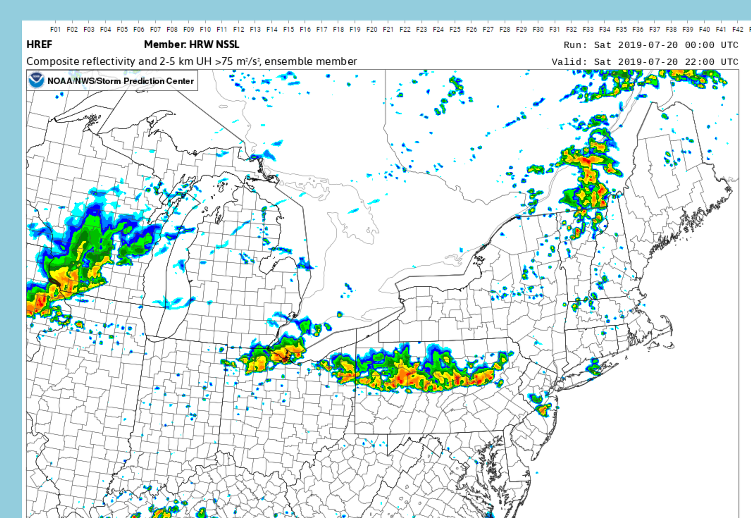


NAM forecast sounding at Albany valid 22z 20 July. Unseasonably hot, humid conditions were associated with very large CAPE values, in excess of 3000 J/kg, along with weak deep layer shear.

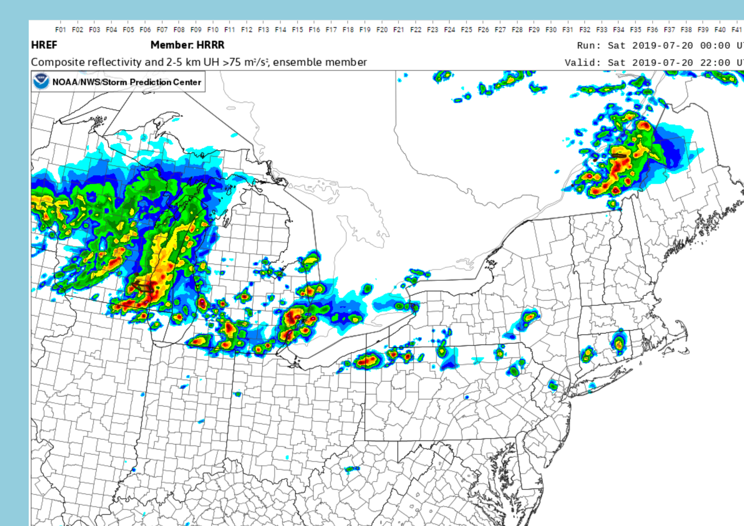
High resolution model forecasts valid 22z July 20 struggled to produce strong signals for organized convection in eastern NY



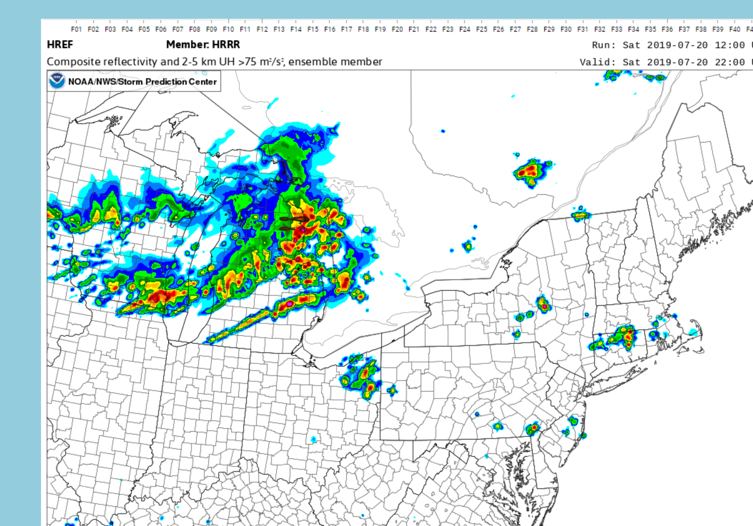
00z 20 July NAM nest reflectivity forecast valid 22z on 20 July. Scattered storms were forecast over eastern New York



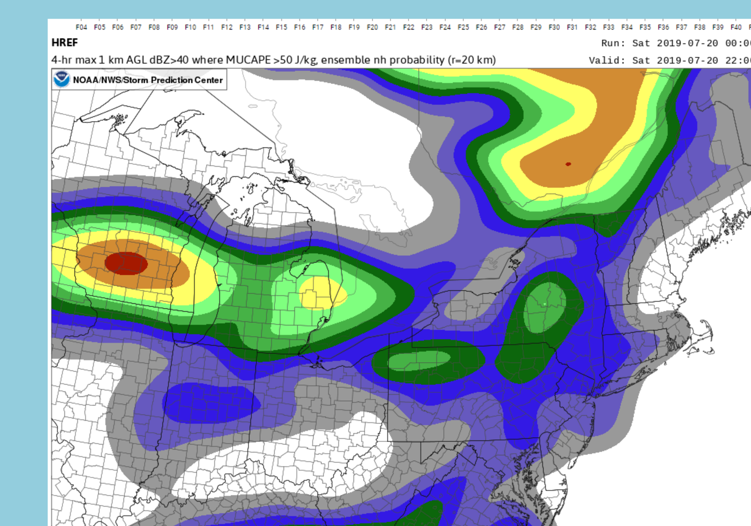
00z 20 July NSSL WRF reflectivity valid 22z 20 July. Little to no thunderstorm activity forecast over eastern NY, organized convection forecast in Pennsylvania.



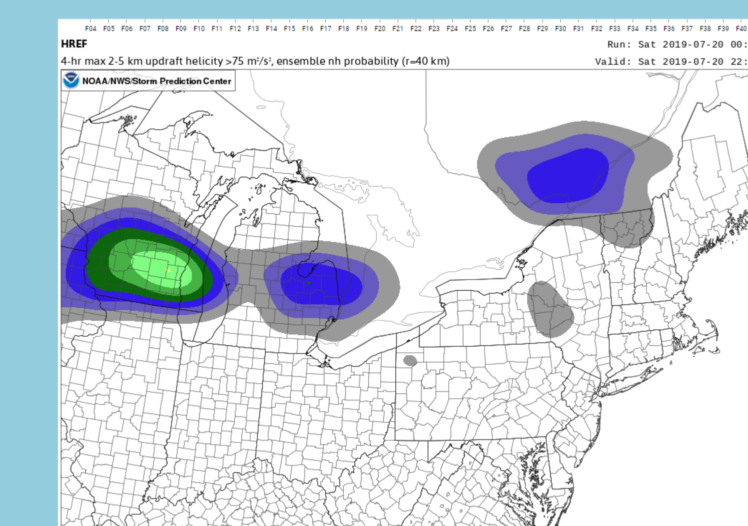
00z 20 July HRRR reflectivity valid at 22z. Isolated pulse storms forecast from northern Pennsylvania to southern New England.



12z HRRR reflectivity valid at 22z 20 July. Isolated storms forecast across eastern New York and southern New England.

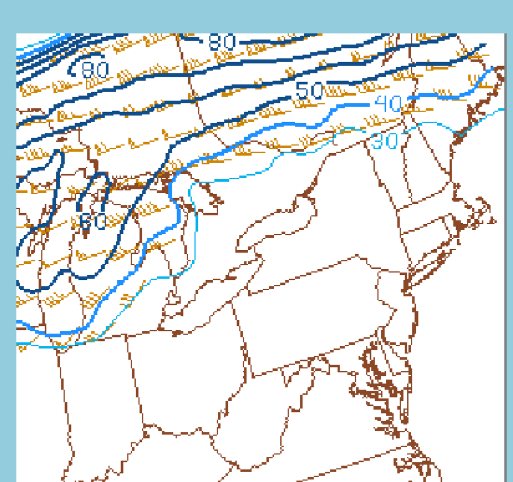


00z 20 July HREF Probability of reflectivity > 40 dbz valid at 22z. A weak signal for convection can be see over eastern NY, with a much stronger signal from Wisconsin to Michigan.

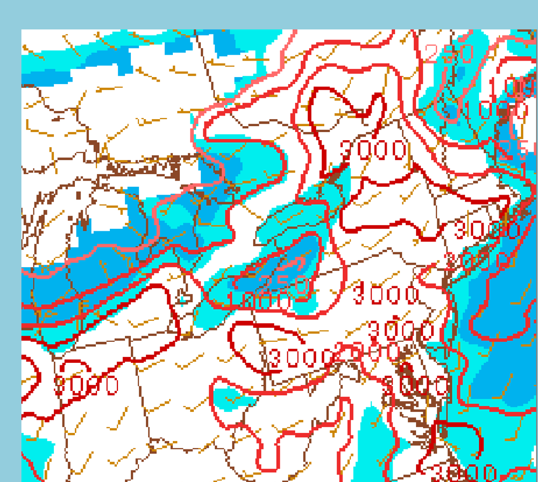


00z 20 July HREF probability of updraft helicity > 75 m^2/s^2 valid at 22z 20 July. Little to no signal for rotating convection over eastern NY.

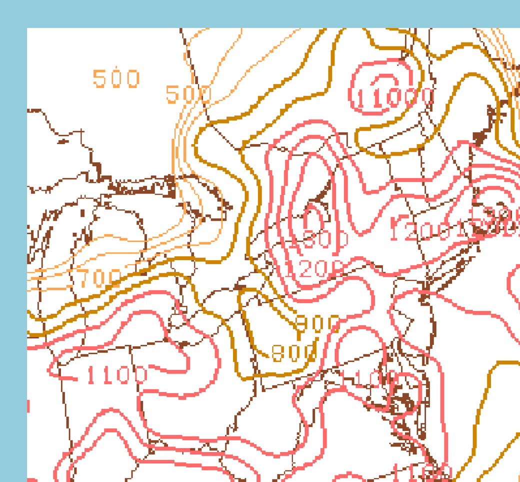
Meso-analysis from SPC at 22z July 20 and SPC severe weather outlook



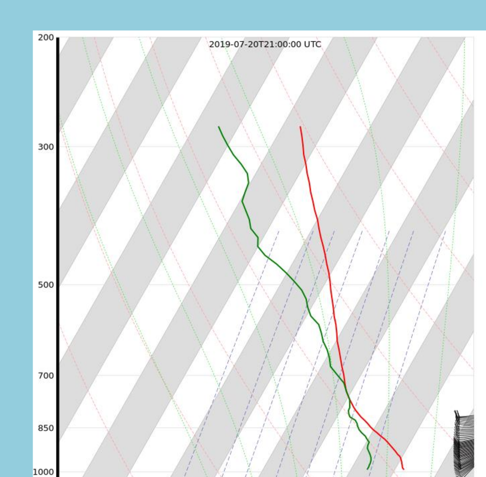
SPC meso-analysis 0-6 km shear (kt) at 22z 20 July



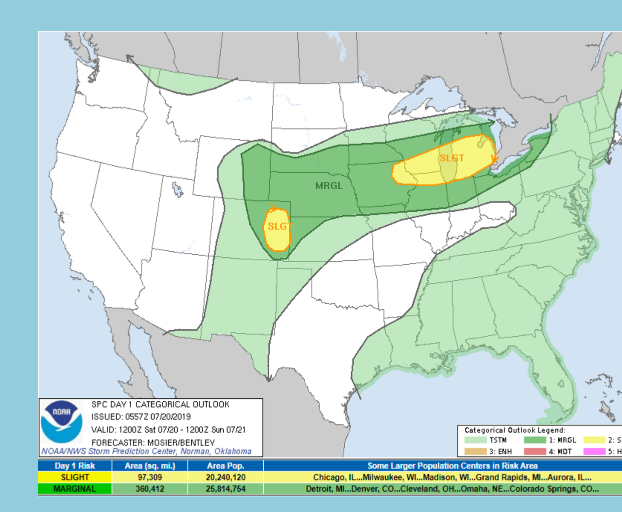
SPC meso-analysis MLCAPE (J/kg) at 22z 20 July



SPC meso-analysis DCAPE (J/kg) at 22z 20 July

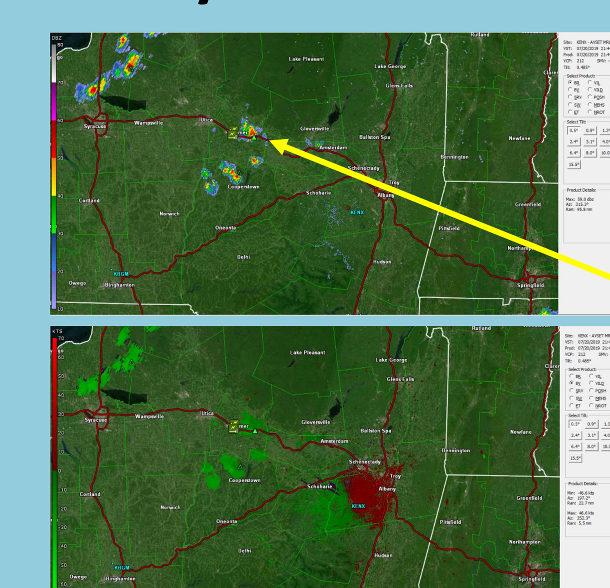


A sounding from the New York State meso-net at Jordan in central NY at 22z

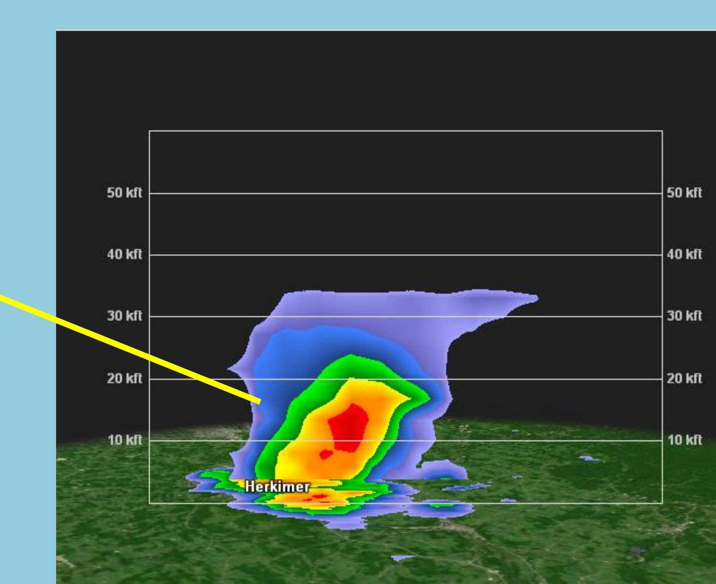


SPC day 1 convective outlook for 20 July (issued at 06z)

Initially "weak" storms developed in the Mohawk Valley

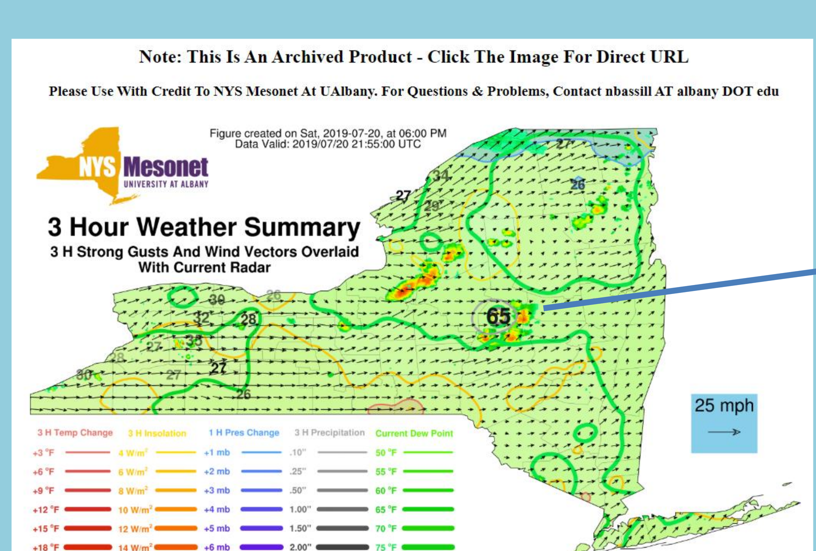


Reflectivity and base velocity from the KENX (Albany) at 2144z 20 July.

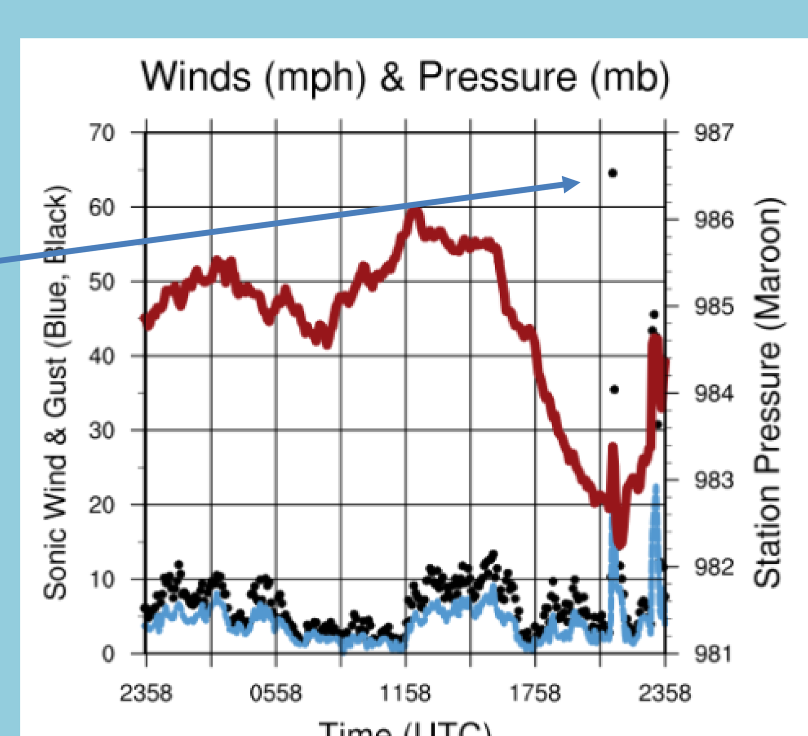


A reflectivity cross-section taken across the small thunderstorm over the Mohawk valley at 2130z. High reflectivity cores below 20000 feet.

New York Mesonet gave indications of severe wind at Herkimer

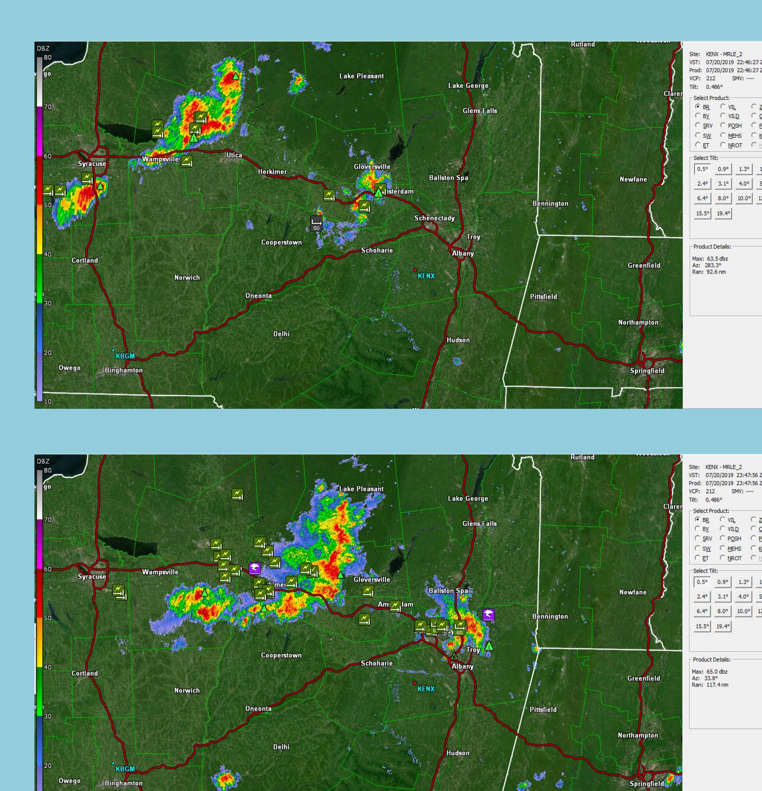


3-hour maximum wind gusts from the New York meso-net at 22z 20 July. "Weak" storms over the central Mohawk Valley were associated with a wind gust of 65 kt at the site in Herkimer. This observation allowed warning meteorologist to realize that strong winds were occurring beneath the radar beam, near the ground. Warnings were issued downstream from this location, based partially on this observation.

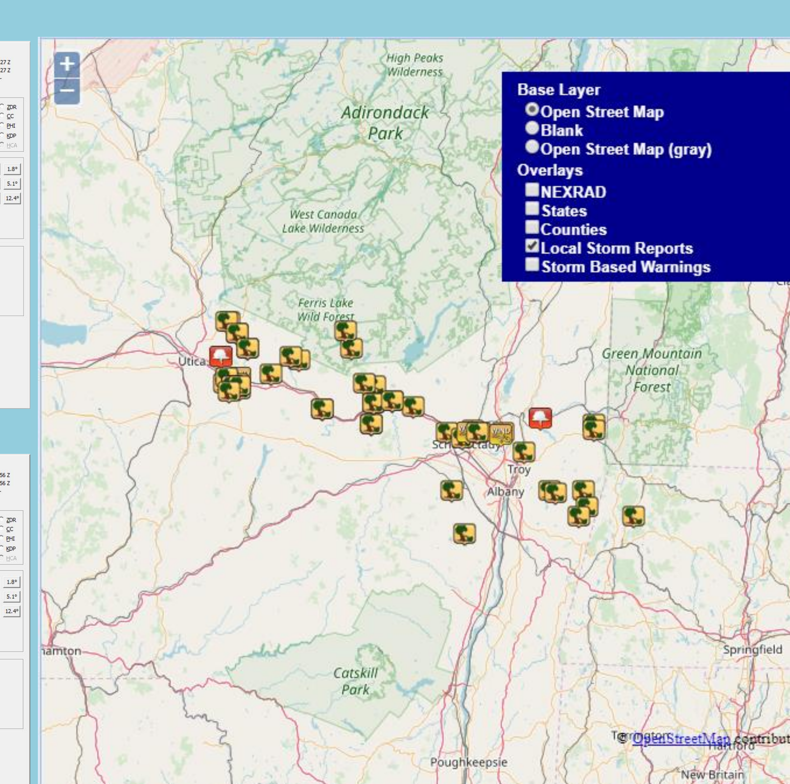


Meteogram of wind and pressure at Herkimer (New York State mesonet)

Storms became weakly organized into a line, produced lots of damage



Reflectivity from the ENX WSR-88D at 2246z and 2347z on 20 July.



Severe wind and hail reports from the evening on 20 July.

Summary

- **Convective storms developed over the Mohawk Valley late on 20 July in an environment characterized by large MLCAPE, weak shear, steep low-level lapse rates and weak large-scale forcing for lift.**
- **High-resolution models were variable with their reflectivity forecasts, and were mostly unable to show strong signals for a significant severe convective event.**
- **Radar overshot the strongest low-level winds associated with these storms.**
- **Storms were initially discrete but ultimately managed to evolve into a weakly organized line as they moved down the valley, producing widespread wind damage.**