

The Multi-Hazard Severe Event of 21 August 2019 across eastern New York and western New England



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Motivation

- Tornadoes in the Albany Forecast Area are rare (~85% are EF0/EF1) with about 3 per year.
- CSTAR V VI Goals (2010 Present)
- (1) To examine severe weather cases with application of the new (April 2012 to 2019) dual polarization radar data (differential reflectivity, correlation coefficient, and specific differential phase)
- (2) Expand ALY Tornado V_r-R Shear Climatology from 1998-2000 in

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- Tornado Climatology
- Storm-scale Analysis with new V-R
- Utilization of K_{DP} descending columns for forecast wind damage

Area of focus is the Mohawk River Valley, Capital Region into the Lake

August 21, 2019 Tornadoes



EF1 damage in Windham, Windham Co., VT

Picture: Raymond O'Keefe

EF0 tornado with peak winds of 70 to EF1 tornado with max estimated winds of 105 80 mph that touched down at 1824 mph that touched down at 1935 UTC. Damage UTC in Johnstown, Fulton County near a home east of Saratoga Springs, NY. **Picture: RT 67E between Johnstow** Trees were snapped and uprooted. and Tribes Hill by Shelley Brienza Picture: Mike S. Evans

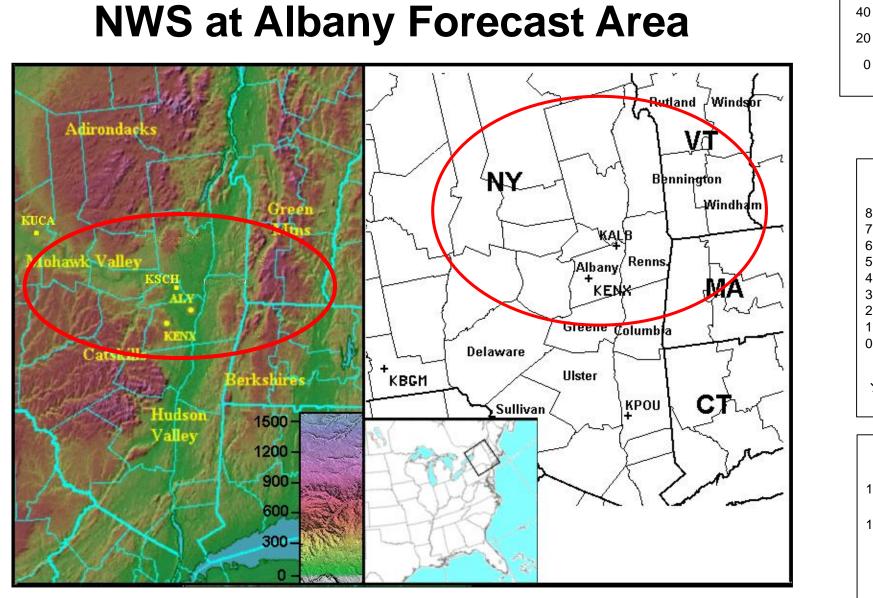


Tree damage in Johnstown, Fulton Co. icture: Marcia Oddy

COMET partners project

Outline

- Brief Synoptic Overview
- Mesoscale Analysis: SPC Rapid Refresh & NYS Mesonet
- Shear Nomogram
- Brief Flash Flood Threat review



George and southern Vermont corridor

Storm Reports

Tornado Climatology

1980 - "AUG" 2019

of Tornadoes per Year for NYS

N = 375 tornadoes

of Tornadoes per Month in NYS

of Tornadoes By Intensity in NYS

VT Tornadoes (n = 21)

of Tornadoes Per Month in VT

of Tornadoes By Intensity in VT

First tornado in VT since 2012 and the first one in

of Tornadoes Per Year in CWA ALY

N = 103 tornadoes

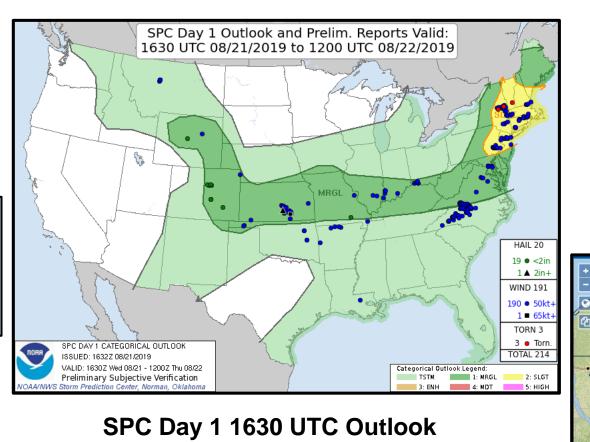
of Tornadoes Per Month in CWA ALY

of Tornadoes By Intensity in CWA ALY

of Tornadoes Per Hour in CWA ALY

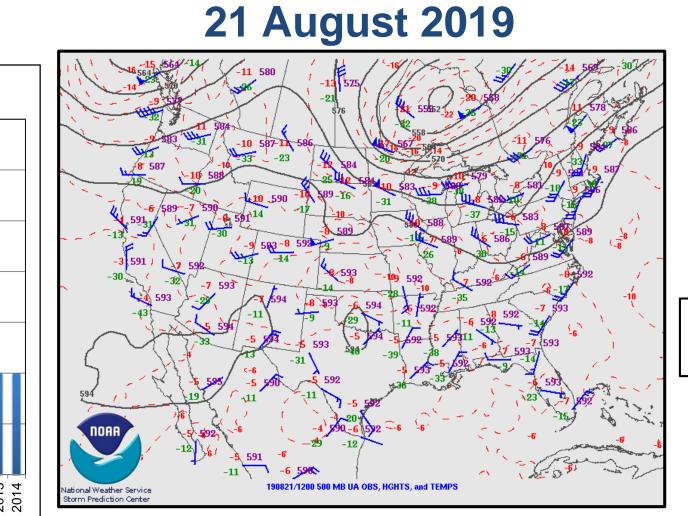
Number of Tornadoes by time in EST

Note: Most occur between 12:00-20:00 EST

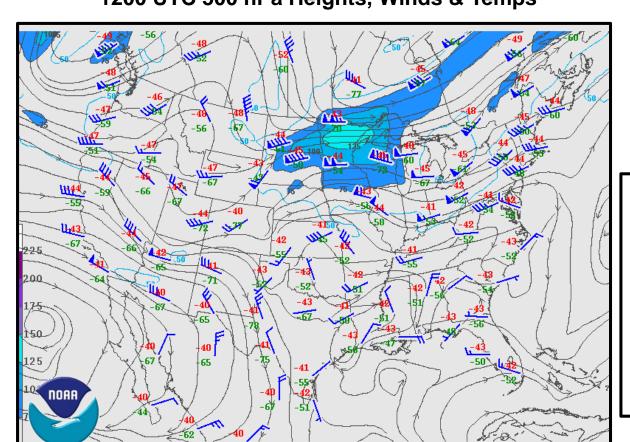


SPC Experimental Storm Reports Viewer for 21 August 2019

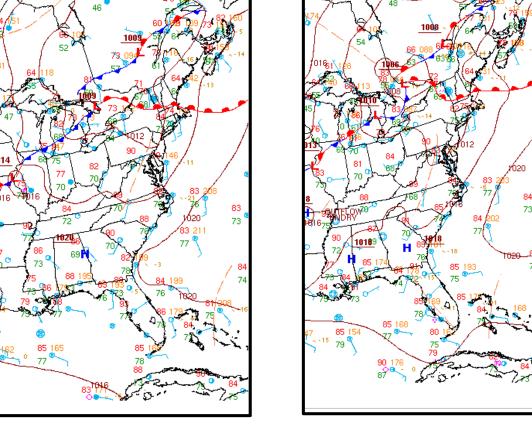
Synoptic Overview



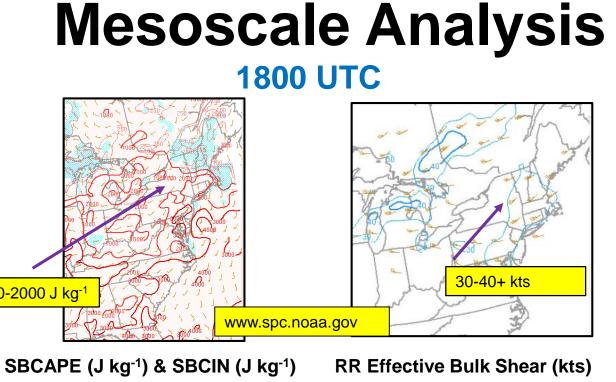
1200 UTC 500 hPa Heights, Winds & Temps



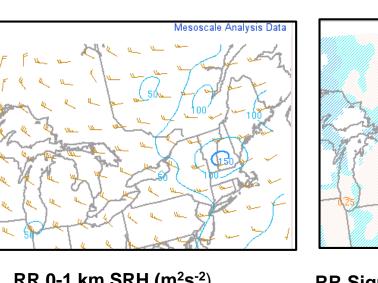
1200 UTC 250 hPa Heights, Isotachs & Temps

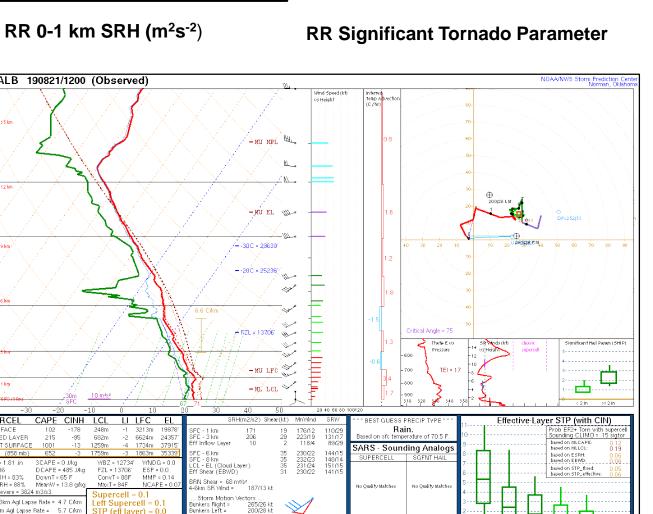


1800 UTC & 2100 UTC WPC SFC Analysis



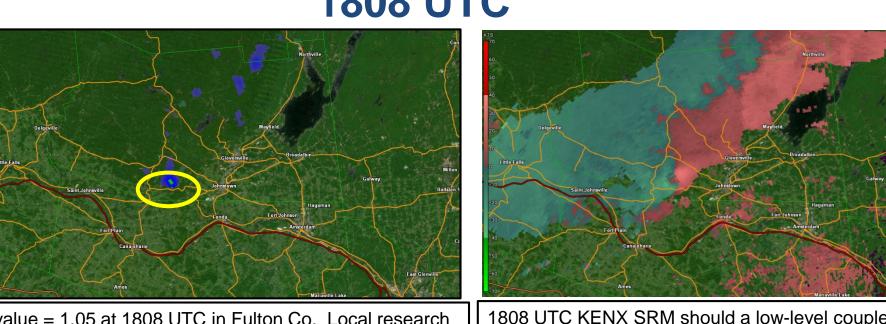
RR SBCAPE (J kg⁻¹) & SBCIN (J kg⁻¹) 1900 UTC

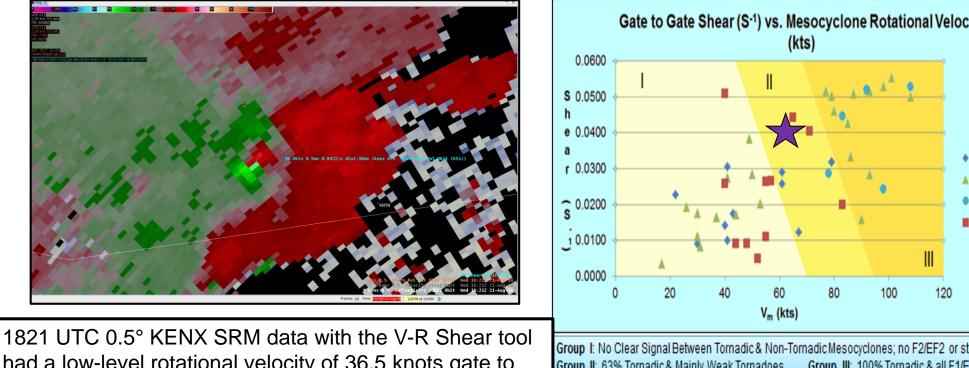




1808 UTC

Storm-Scale Analysis

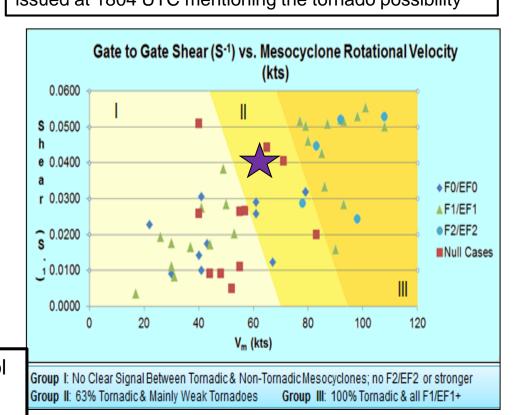




had a low-level rotational velocity of 36.5 knots gate to gate with a shear value of 0.0422 s⁻¹ over a 0.5 nm radius at distance of 30 nm from the RDA. A tornado warning was issued within a few minutes. An initial severe thunderstorm warning issued at 1803 UTC had a tornado possible tag, and an SVS statement was issue at 1818 UTC with winds increased to 70 mph, and the tornado possible tag continued.

1910 UTC 1917 UTC

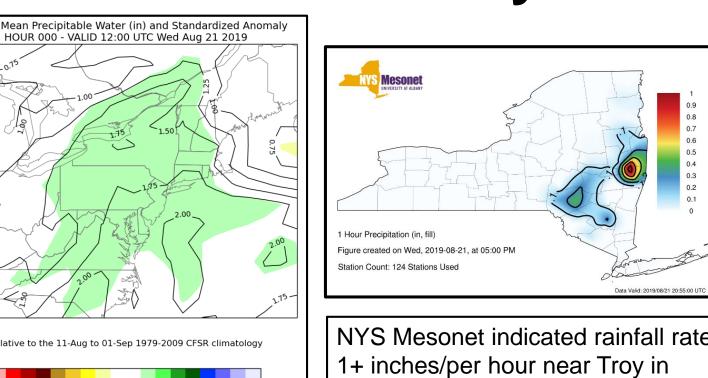
south central Fulton Co. A severe thunderstorm was



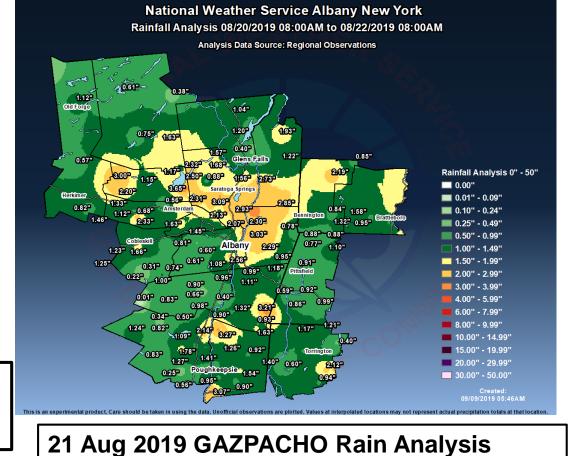
V-R Shear Nomogram (CSTAR IV-V Frugis & Wasula Research)

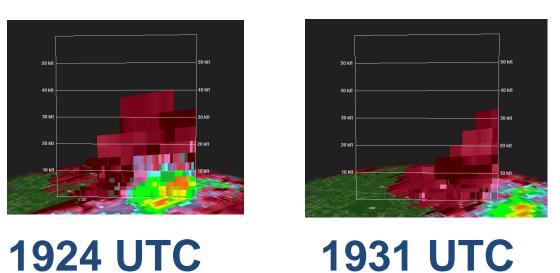
Nomogram: Gate to Gate Shear vs. Mesocyclone Rotational Velocity for 41 ALY Cases (2003-13) $V_m = 65$ kts and S = 0.422 S⁻¹ Johnstown, Fulton County EF0

Flash Flood Analysis



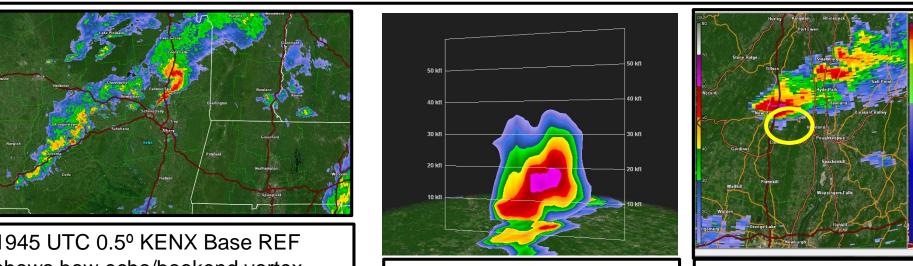
1+ inches/per hour near Troy in northern Rensselaer Co. This area to the north was hit with 1-2+ inches 12Z KALY sounding had PWAT 1.81". 12Z NAEFS had anomalies of rain earlier in the day +1 to +2 STDEVs above normal





1931 UTC

A microburst occurred near Saratoga Springs with a descending KDP column that collapsed with values of 3-5 deg/km rose above the freezing level (~13.5 kft AGL), and descended with widespread wind damage at 1925-1935 UTC. The tornado occurred at the end of the life cycle.



shows bow echo/bookend vortex

NYS Mesonet

L (pressure, fill) and Radar (> 20 DBZ) Figure created on Wed, 2019-08-21, at 01:01 PM

Figure created on Wed, 2019-08-21, at 02:00 PM

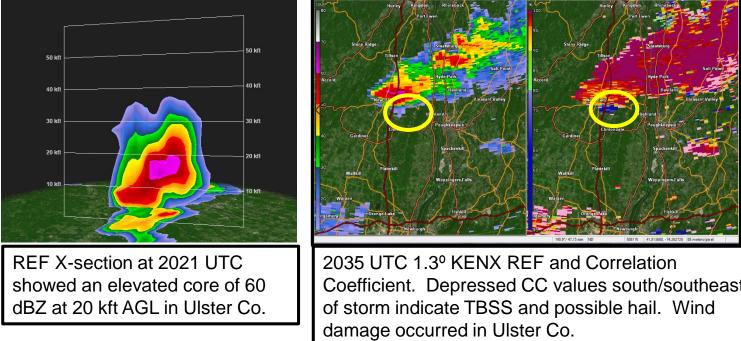
Station Count: 126 Stations Used

Mesonet UNIVERSITY AT ALBANY

1700 UTC

1800 UTC

1900 UTC



2103 UTC KENX Base Velocity

Storm Total Accumulation (STA) showed heaviest rain heaviest rain north of Troy product underestimated the rain with several rounds of rain amounts in northern Rensselae this day

1 AUG 2019 KENX Dual Pol

21 AUG 2019 photo in downtown Trov with

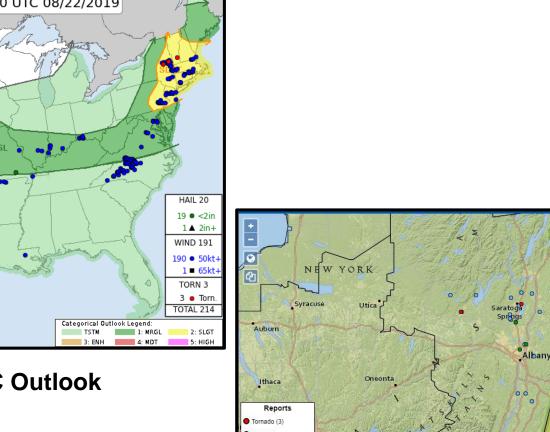
21 AUG 2019 MRMS data

flooding at 6th and Federal Street. A total of 1 3" of rain fell during the day and the sewers backed up and the drainage system had major issues with man hole caps popping. Photo: Amy Zawistociski

Summary

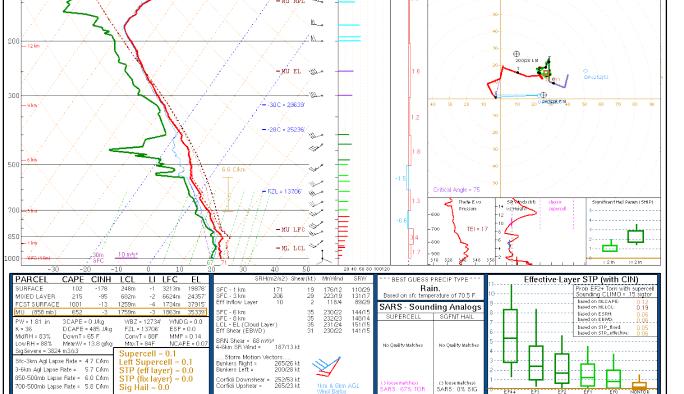
- 3 tornadoes in the ALY forecast area (last time was 29 May 2013)
- Moderate CAPE Moderate Shear pre-convective environment for mini discrete supercells & bows. 0-1 km SRH increased to 100-200 m²/s⁻²
- Along low-level theta-e and CAPE gradient, severe convection migrated along in the Mohawk River Valley, Capital Region into the Saratoga Region and southern VT
- A bow echo and a well defined northern bookend vortex to a line produced widespread wind damage with descending K_{DP} column(s) present. EF1 spin-up tornado occurred with bow echo
- Applied collaborative research from CSTAR for tornado warning decision (V_r R Shear Study) showed fairly high confidence for a weak EF0/EF1 tornado in Fulton County
- Windham, VT tornado difficult to detect due to beam height close to 7 kft AGL, and obstruction of mountains
- Flash flood(s) were isolated, but anomalous PWATs, intense rain rates, and repeated rounds of rainfall due to "training" echoes were plausible reasons











1200 UTC 21 August 2019 ALY Sounding