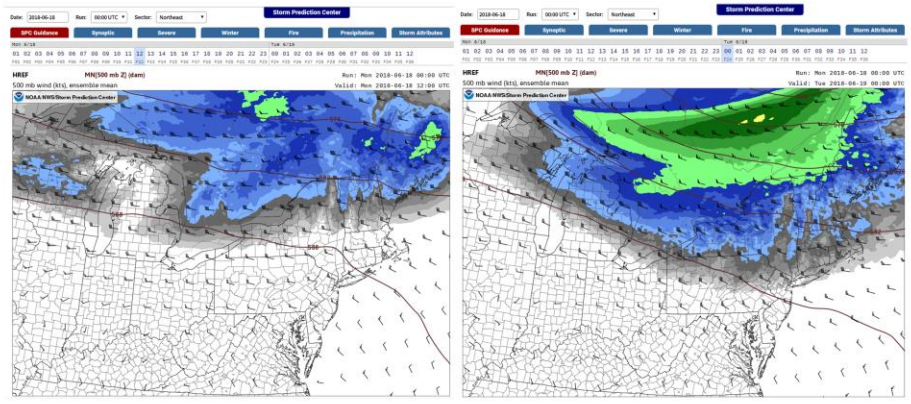
The June 18, 2018 Severe Weather Event

Mike Evans

Outline

- Large scale
- Meso-scale
- High resolution models
- Radar and reports
- Summary and conclusions

500 mb heights and wind



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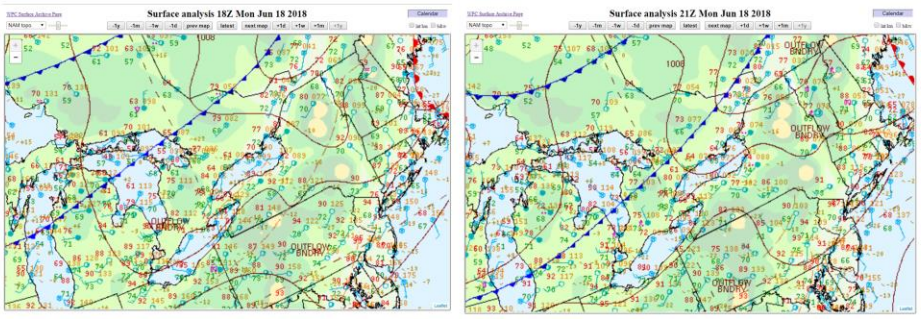
500 mb heights and wind from the 12-24 hour HREF forecast indicated a northwesterly mid-level flow across upstate NY and New England with speeds around 40 kts. A short-wave trough was forecast to track across Quebec producing modest height falls across upstate NY and northern New England.

Surface plots



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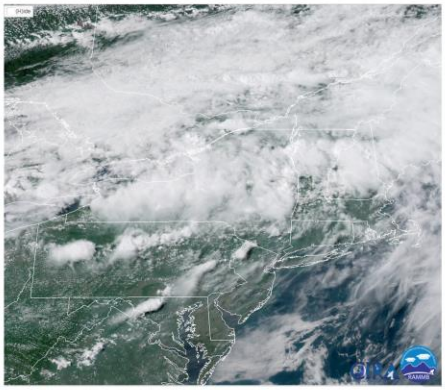
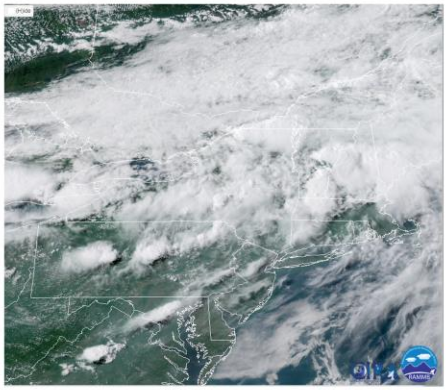
At the surface, a cold front was forecast to drop south across southern Quebec while a pre-frontal trough was forecast to develop over central and eastern NY.

Satellite imagery



20z June 18, 2018



21z June 18, 2018

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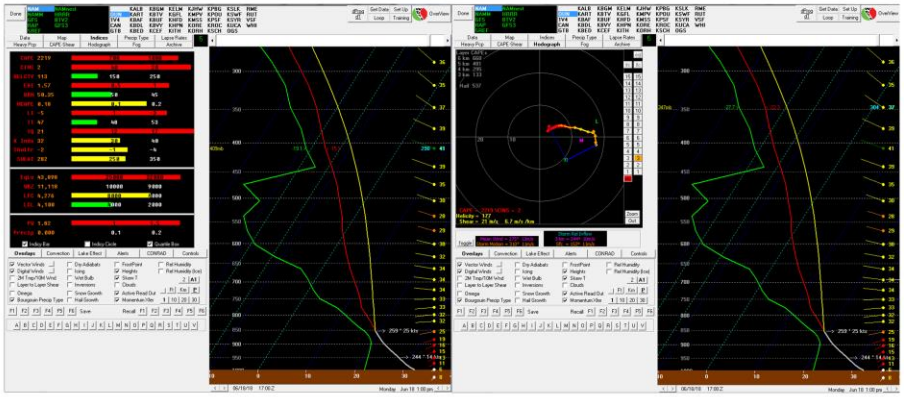
Satellite imagery showed plenty of cloud cover over upstate NY on the 18th, however enough breaks in the overcast would develop to allow for convection.

12z NAM sounding at ALB valid 17z



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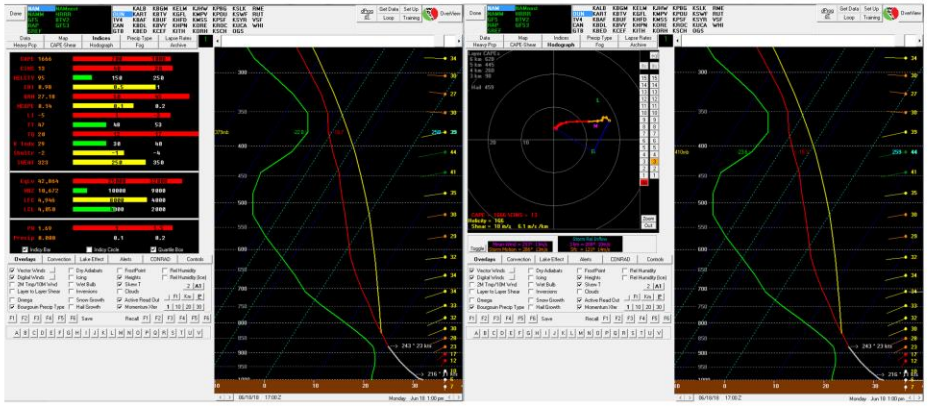
NAM forecast soundings valid during the afternoon on the 18th indicated MLCAPE values in excess of 2000 J/kg and a veering wind profile with winds from 30 to 40 kts above 850 mb. The shear vector would be oriented from the west-northwest.

16z RAP sounding at ALB valid 17z



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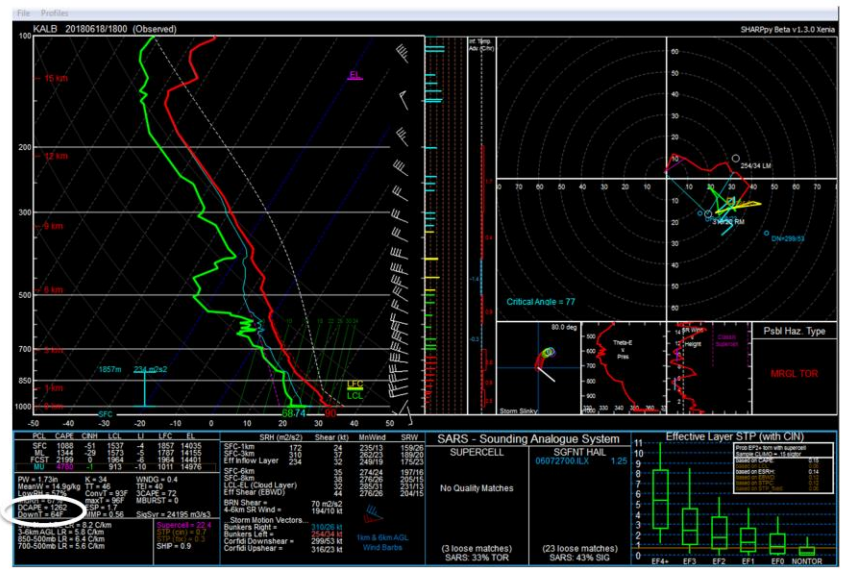
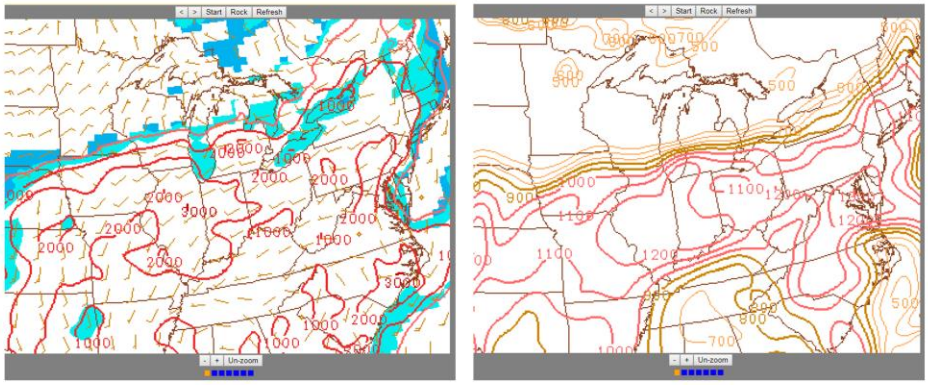
Short-range RAP forecast soundings were similar to the NAM, except that MLCAPE values were somewhat less; generally between 1500 and 2000 J/kg.

Observed ALB sounding at 18z



The observed MLCAPE from the 18z sounding at ALB was 1344 J/kg. Winds were from the west at 30 to 40 kts above 850 mb, resulting in deep layer shear values of 30 to 40 kts. Of interest is the DCAPE value of 1262 J/kg, despite the afore-mentioned cloud cover.

SPC CAPE and DCAPE at 18z



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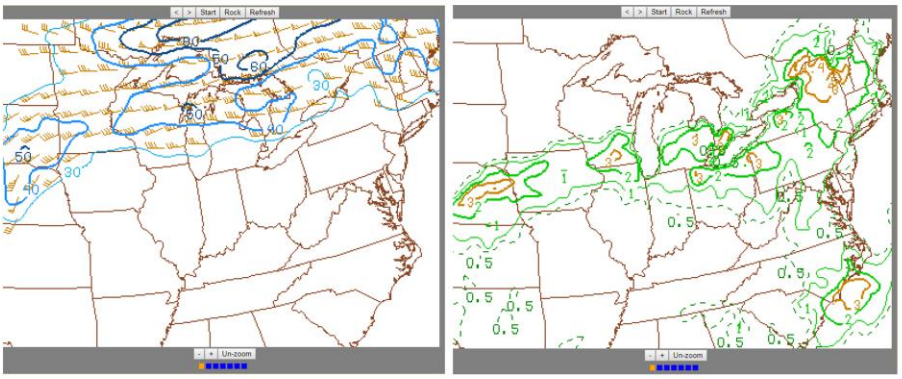
SPC meso-analysis showed MLCAPEs approaching 2000 J/kg over the lower-Hudson valley at 18z. DCAPE values in that area were around 1000 J/kg.

SPC 0-6 km shear and 0-3 km EHI at 18z



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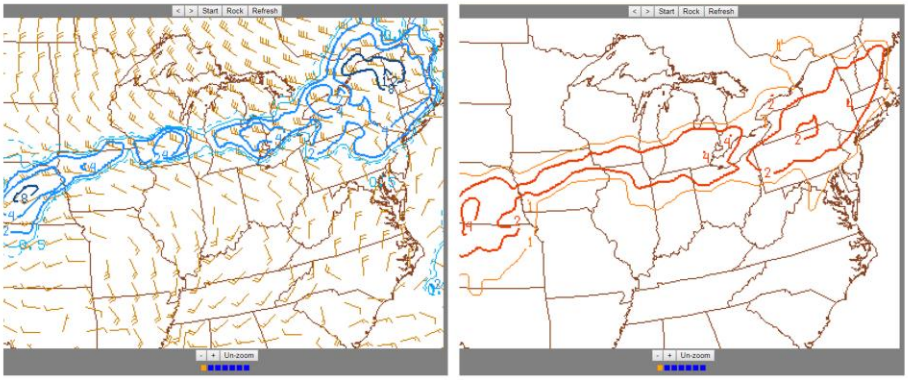
Exceptionally large deep-layer shear was confined to the Capital District and points north. The 0-3 km energy helicity index, which is combination of CAPE and helicity, was maximized north of the Capital District, but was still rather large to the south.

SPC supercell and derecho composite parameters at 18z



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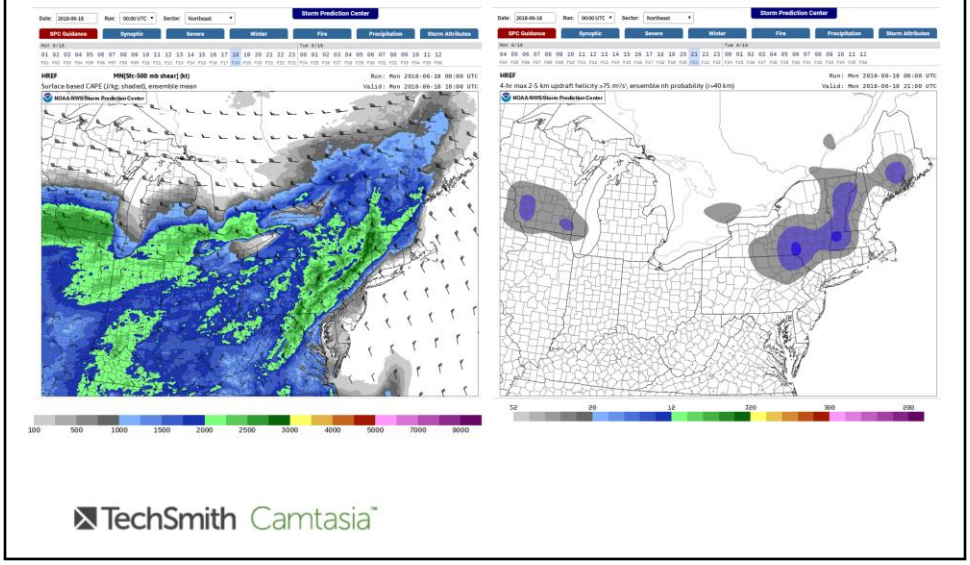
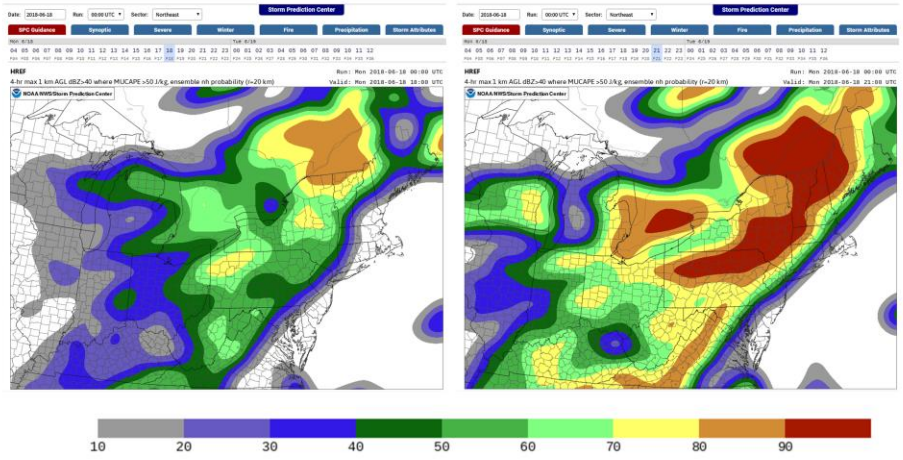
Both the supercell composite and derecho composite parameters appeared to be favorable for severe weather for eastern NY and northern Pa.

00z HREF MLCAPE and 4 hr max 2-5 km updraft helicity > 75 m/s^2



HREF forecasts run at 00z June 18 indicated that MLCAPE values would reach 2000 J/kg over the Hudson valley during the afternoon on the 18th. A stripe of enhanced updraft helicity probabilities was also indicated with storms that would develop over the Catskills, mid-Hudson valley and western New England late in the afternoon.

00z run HREF prob dBZ>40 with CAPE > 50 J/kg



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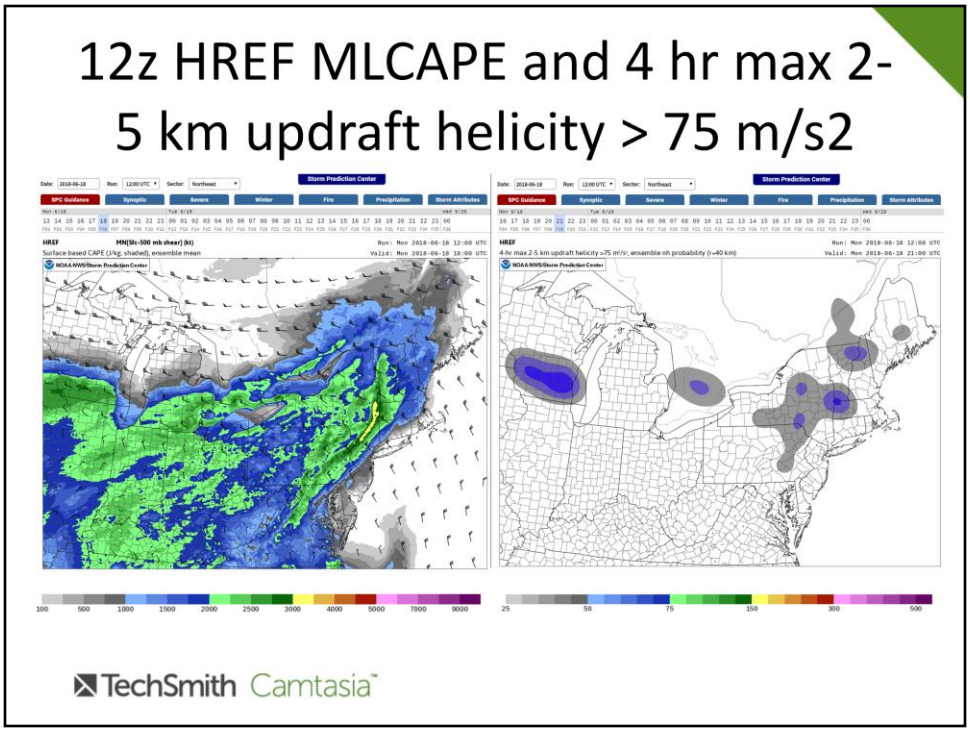
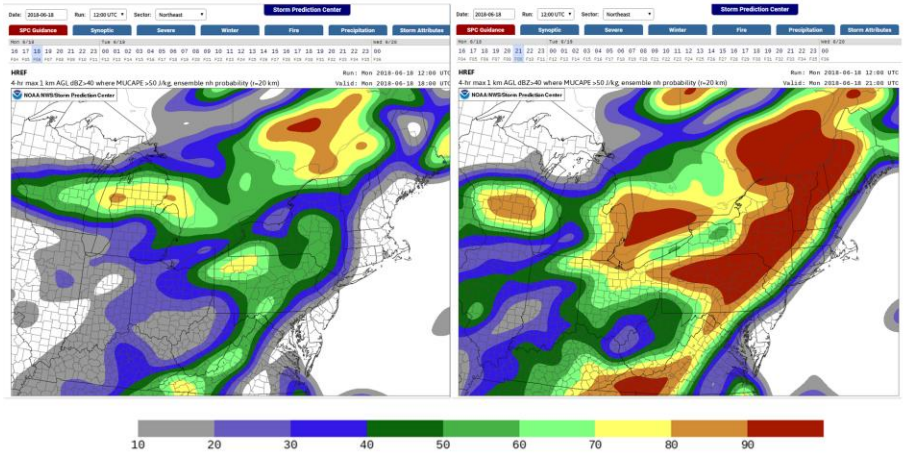
HREF 40 dbz probability values increased to over 80 percent by 21z in a stripe from northern Pa to western New England.



The 12z run of the HREF indicated that MLCAPE values would reach 3000 J/kg across a small area in the lower to mid-Hudson valley during the afternoon on the 18th.

12z run HREF prob dBZ>40 and MLCAPE > 50 J/kg



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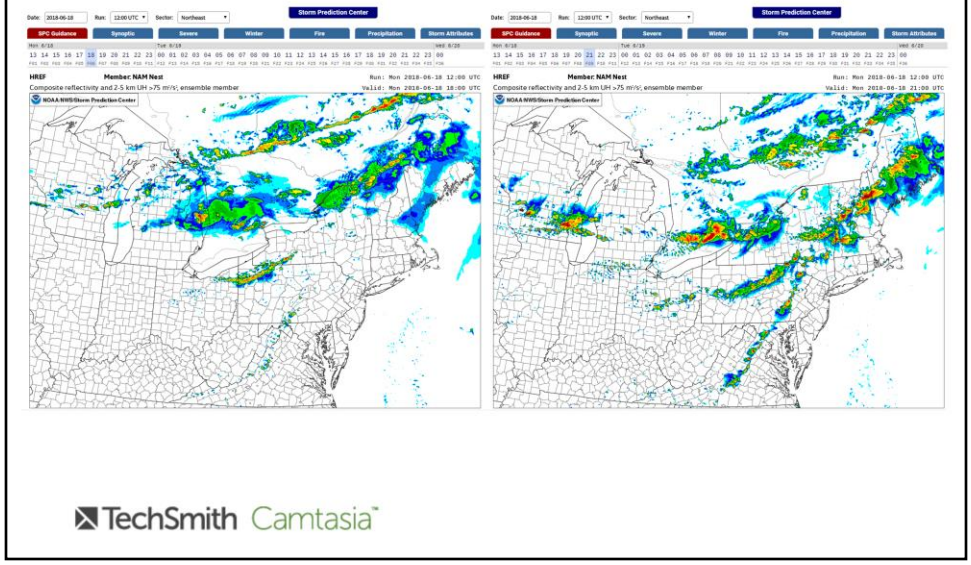
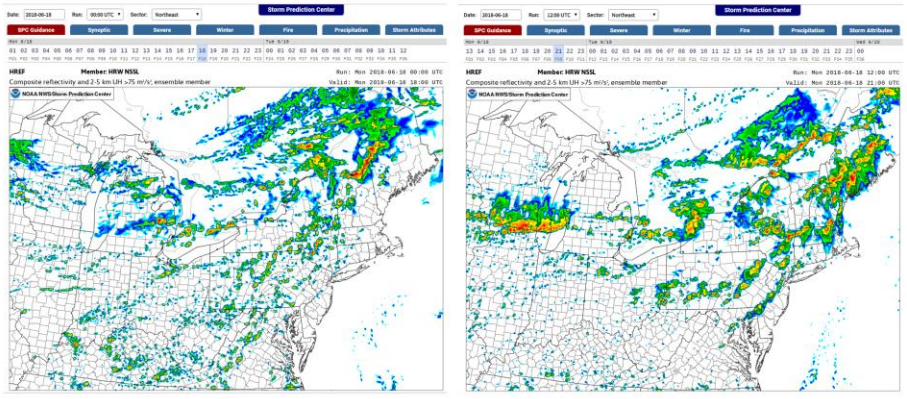
Similar to the 00z run, high probabilities for convective precipitation were forecast for northern Pa to western New England by late afternoon.

12z NAM Nest reflectivity – valid 18z and 21z



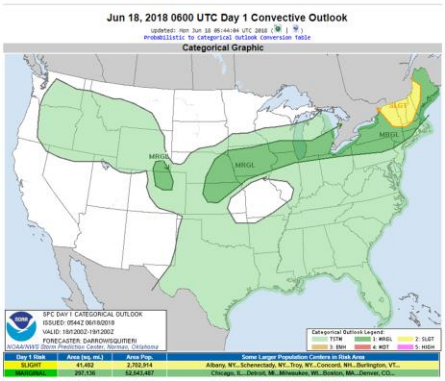
The NAM nest, which is one member of the HREF, showed a broken line of convection developing from Pa to northwestern New England between 18z and 21z.

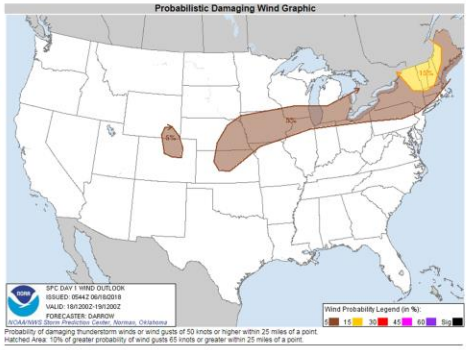
12z NSSL WRF reflectivity – valid 18z and 21z



The NSSL WRF was similar, showing broken lines of storms developing from Pa to New England by 21z.

SPC severe and damaging wind outlooks





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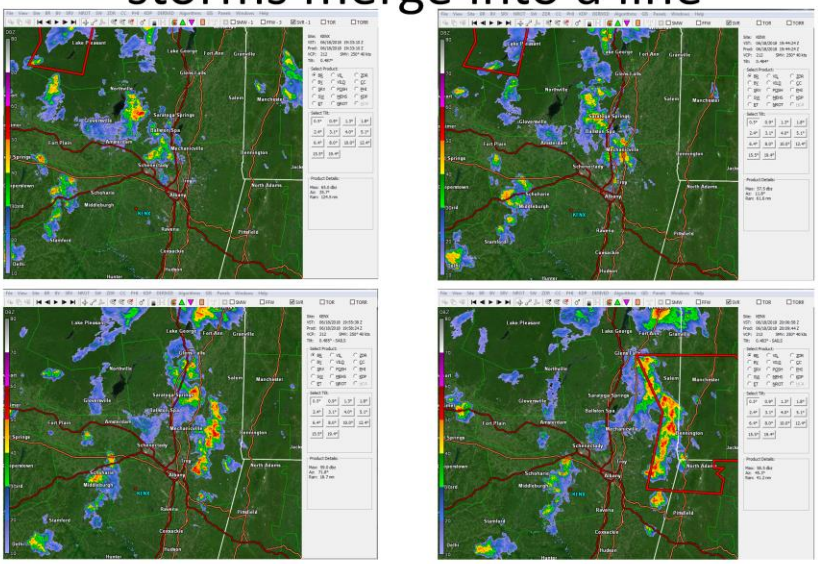
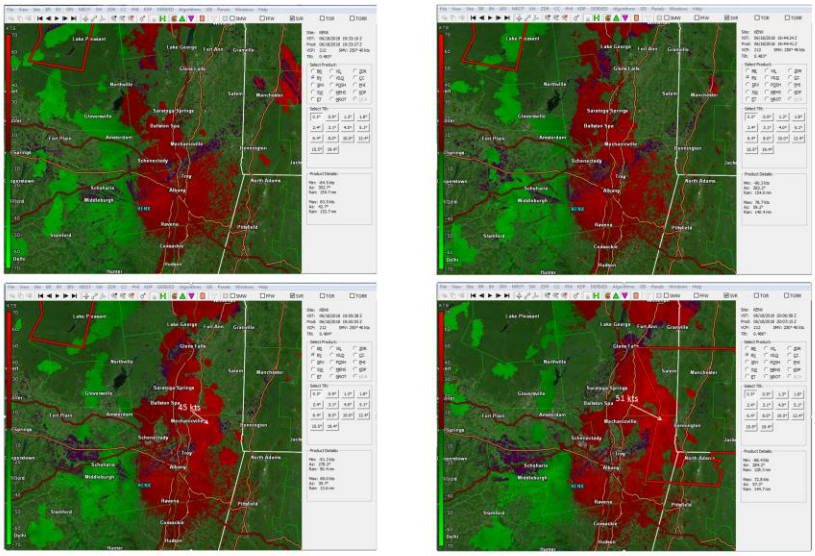
SPC indicated a slight risk of severe storms over the northern half of our area, extending from northeast New York across northwestern New England. The main threat would be damaging winds.

Reflectivity – 1938z – 2006z – storms merge into a line



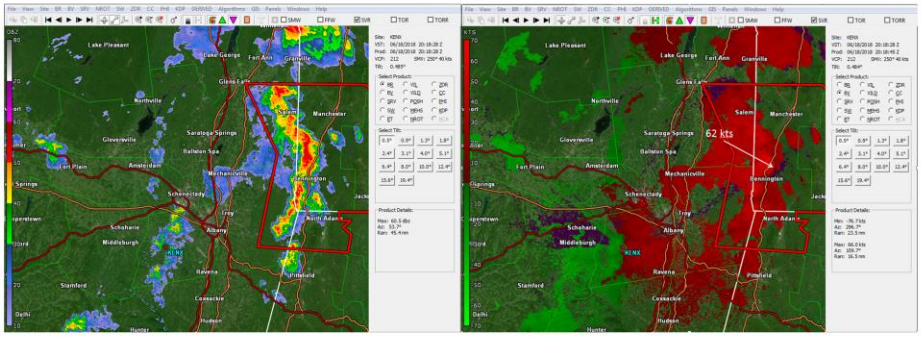
One round of severe weather occurred over Saratoga county east into Vermont between 1930z and 2030z. Scattered storms developed over the southern Adirondacks down to Saratoga county between 1930z and 20z. The storms organized into a bow echo as they tracked east across the Hudson river after 20z. Scattered wind damage occurred across Saratoga county, with wind damage continuing farther east trough Washington and Rensalear counties and into Vermont. A warning was not issued until the storms were approaching the New York / Vermont state line.

Velocity – 1933z – 2006z



KENX-detected velocity values did not exceed 40 kts outbound until the storms got east of the Hudson River, around the time that the warning was issued. Outbound velocities eventually exceeded 50 kts as the storms tracked east into southern Vermont.

Reflectivity and velocity – 2018z



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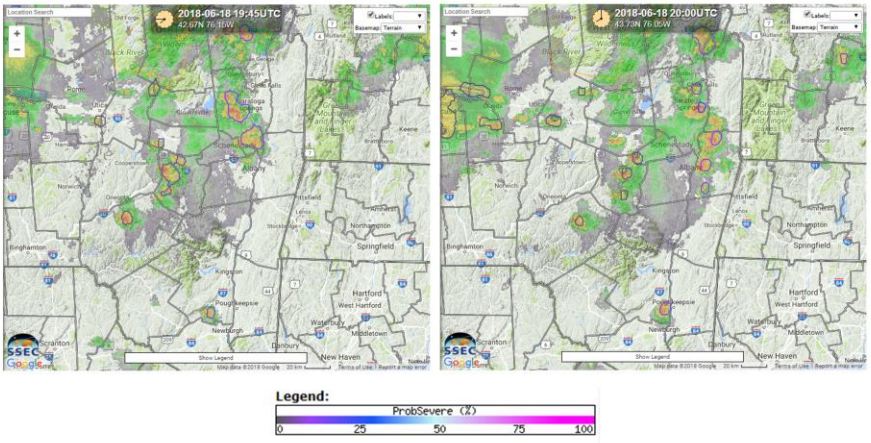
By 2018z the storms had developed into a well organized squall line with outbound velocities detected on the KENX radar greater than 60 kts.

Prob severe 1945z – 2000z



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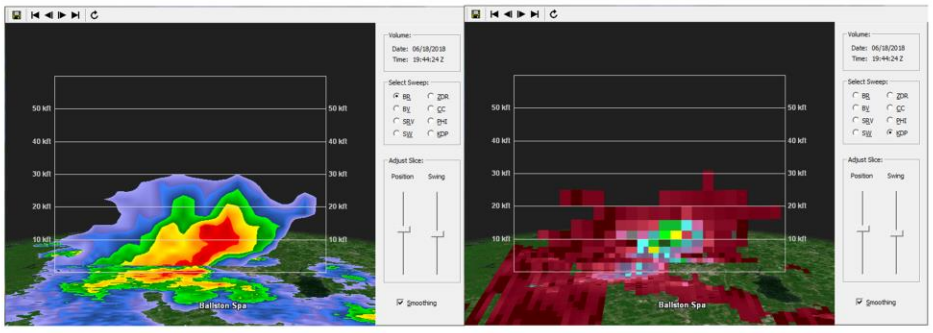
Prob severe values were mainly near or lower than 50 percent for the storms that initially developed north of Albany.

Reflectivity and KDP – 1944z



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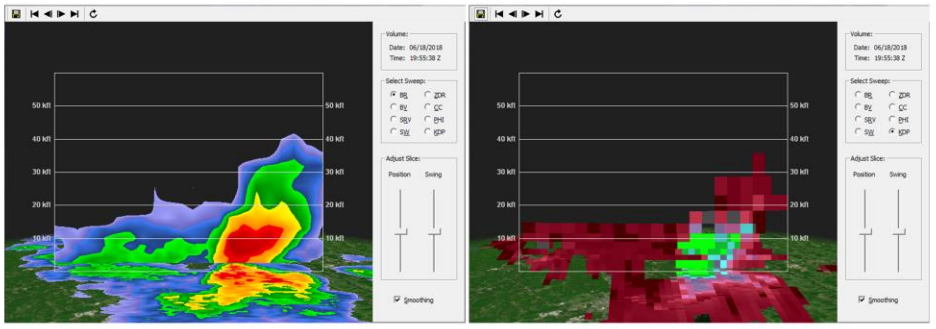
Cross-sections of these storms while they were over Saratoga county indicated 50 dbz reflectivity cores at or below 20000 feet AGL. The -20 degree C from the ALB sounding was about 26000 feet AGL, so these cores were rather low for severe weather-producing storms. However, some larger values of KDP (greater than 5 degrees / km) could be seen around 10000 feet AGL. These large values were located near the top of the mixed layer, indicating the potential for an elevated core of high KDP to mix to the surface, producing damaging winds.

Reflectivity and KDP – 1955z



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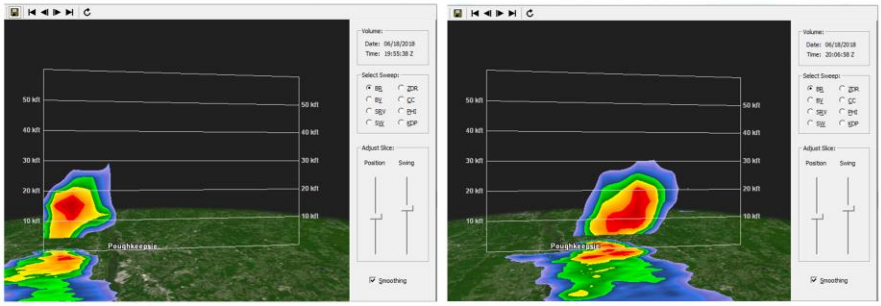
At 1955z, the core from the storm shown on the last slide can be seen to lower, and the kdp core can also be seen to lower and decrease in value. Some local research has found that intense, lowering kdp cores can be associated with damaging wind gusts.

Reflectivity 1955z – 2006z



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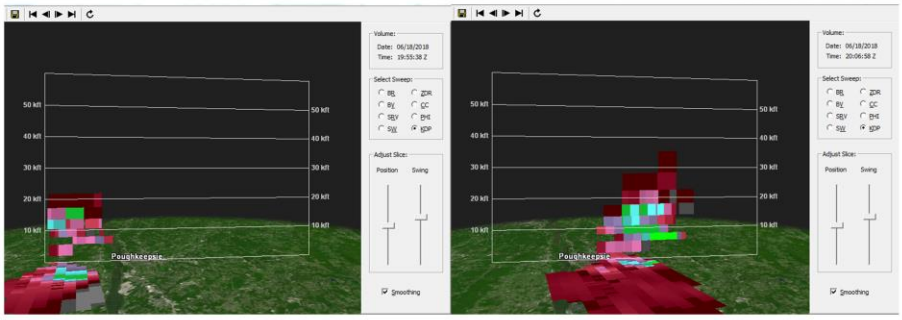
A small storm developed near POU around 2000 UTC. Once again, the core was mainly at and below 20000 AGL.

KDP 1955z – 2006z



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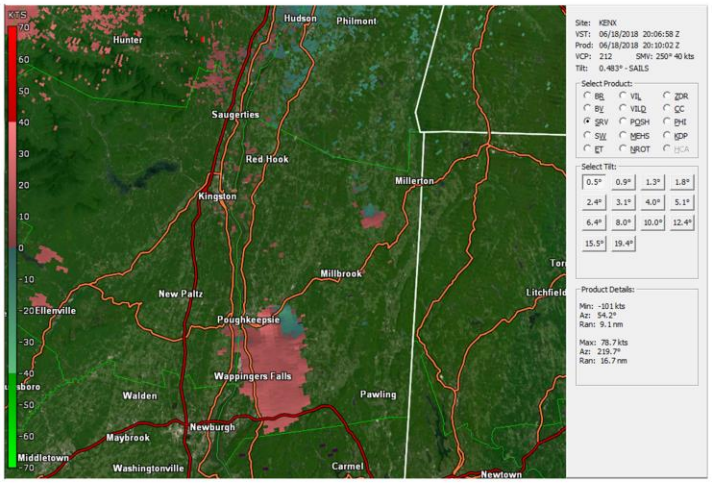
In this case, the KDP values were not very high.

Storm relative velocity – 2006z



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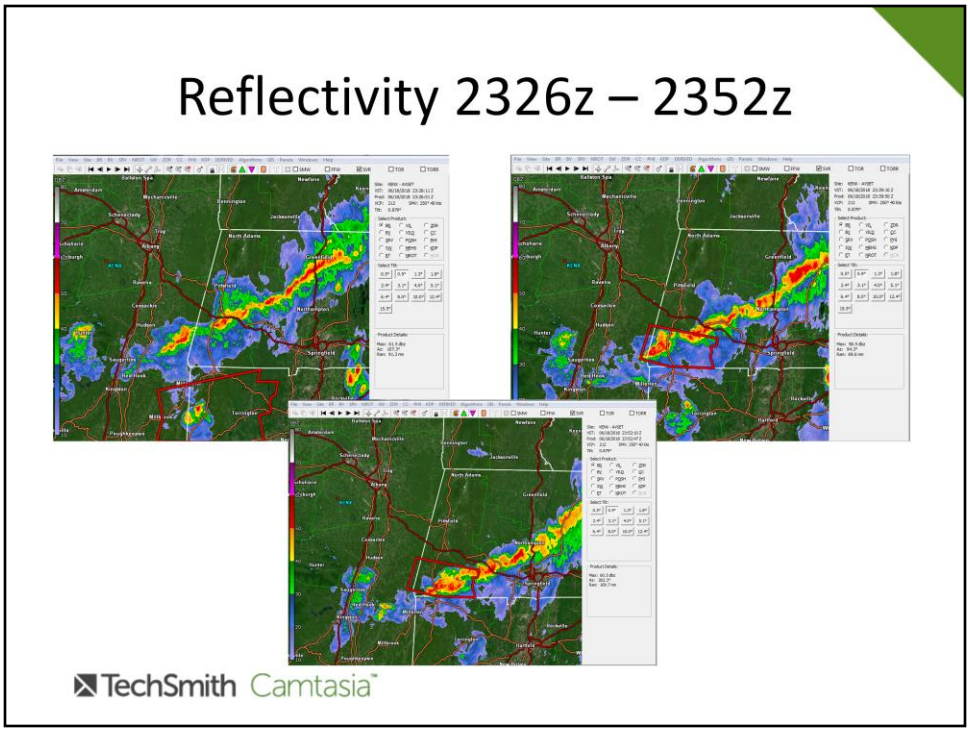
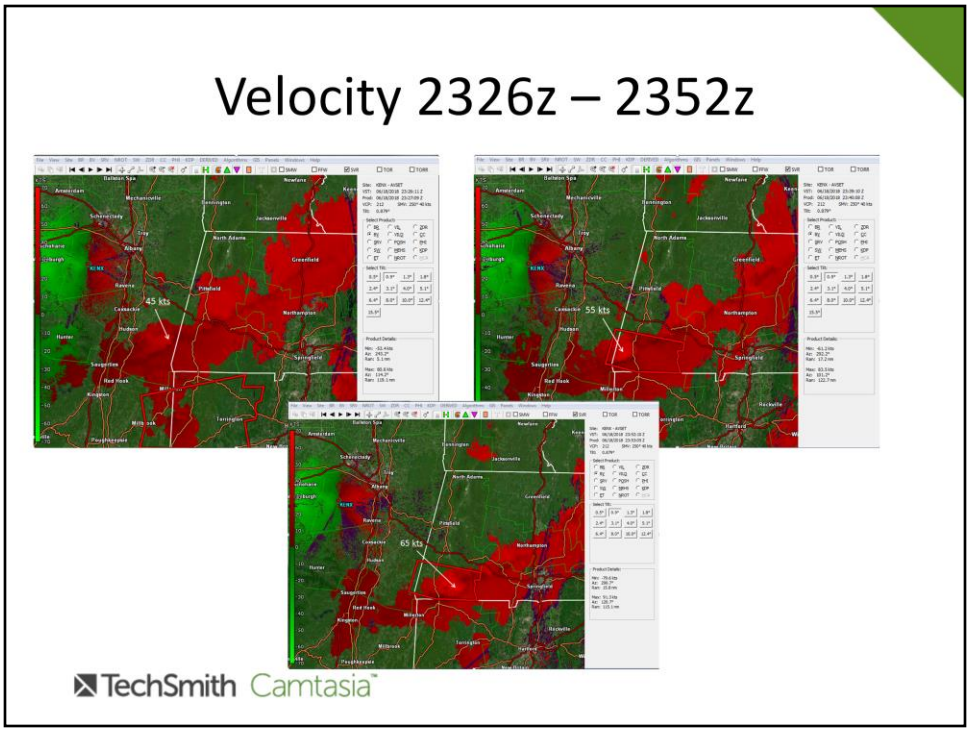
The storm did exhibit significant mid-level rotation as shown on this slide. Damaging wind gusts were reported near POU, including one gust that collapsed a building, resulting in injuries.



The last phase of this event in the ALY county warning area was damaging winds associated with a line of storms moving southeast across southwestern Massachusetts. Wind damage occurred with storms on the southwestern end of the line.



The velocity with these storms appeared to be well-sampled by the WSR-88D at KENX. Outbound velocities as high as 65 kts can be seen on this slide over southwest Massachusetts, co-located with reports of downed trees.

Summary conclusions

- A northwesterly flow severe weather event affected our area on June 18, 2018.
- Severe weather was mainly wind damage.
- Damaging wind initially occurred with discrete, low-topped convection and some subtle radar signatures.
- Two significant squall lines also developed, associated with distinct radar-indicated velocity maxima.