Severe Weather Event Across Southern Vermont on May 18th, 2004

On May 18th a broken line of strong to severe thunderstorms impacted parts of Rutland County in southern Vermont with large hail and damaging winds. The greatest damage occurred in western and north-central Rutland County near the towns of Florence and Pittsford. A National Weather Service survey team determined the cause of the damage was from thunderstorm straight-line winds. It was concluded from the survey that the winds were in excess of 80 to 90 mph in the greatest damage area along Markowski Road in the town of Pittsford. The damage survey reveled numerous maple, pine and hemlock trees were snapped or uprooted with some as large as four feet in diameter. The damage field was determined to be approximately one half mile long and 200 yards wide at its greatest impact. In addition to wind damage, the western part of Rutland County near Castleton received one-inch diameter hail from the storm.

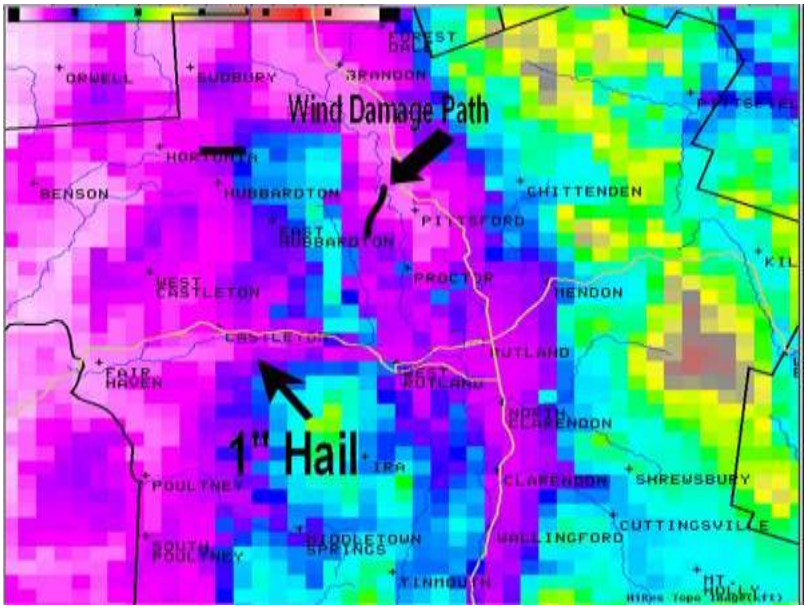

Figure 1: This shows the location where damage occurred in Rutland County

On May 18th a strong surface cold front was approaching the Saint Lawrence Valley by 18z. Meanwhile, south to southwest winds were advecting plenty of low-level moisture into the southern Champlain Valley, along with increasing amounts of surface instability. In addition, visible satellite pictures showed clouds breaking up across southern Vermont, which helped warm surface temperatures into the mid/upper 70s. These temperatures and dewpoints near 60f, created surface based CAPE values in exceed of 1200 j/kg, with minimal CIN.

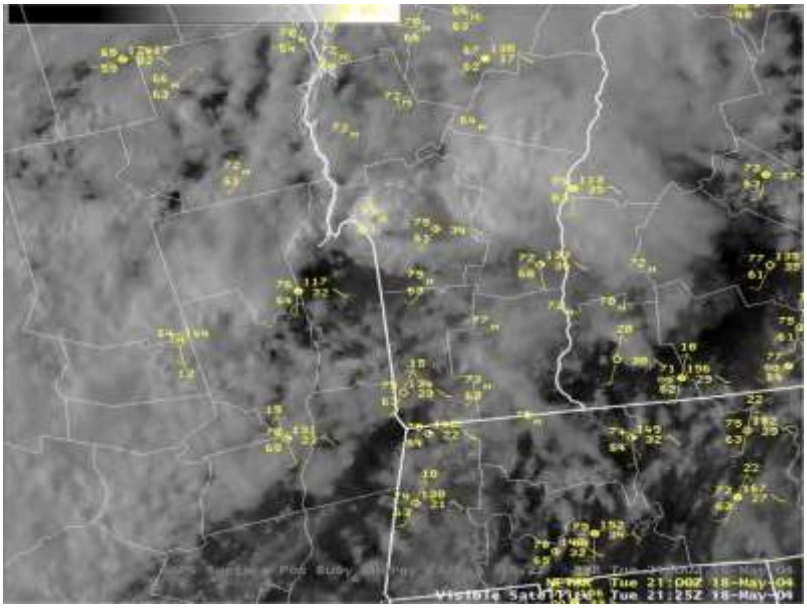

Figure 2: Shows Visible Satellite and Surface Obs

The synoptic features that were present on May 18th included a strong surface low pressure and associated cold front. The surface low pressure tracked from the central Great Lakes into southern Canada, while the cold front was near the Saint Lawrence valley by 18z and through most of Vermont and New York by 00z on May 19th. The combination of strong low-level convergence with the front and favorable dual 250mb jet structure helped to enhance mid level lift and upper level divergence across our county warning area. Figure 3 below shows our forecast area under the right rear quadrant of a departing 250mb jet maximum over southern Canada with another jet couplet approaching our western zones from the northern Great Lakes

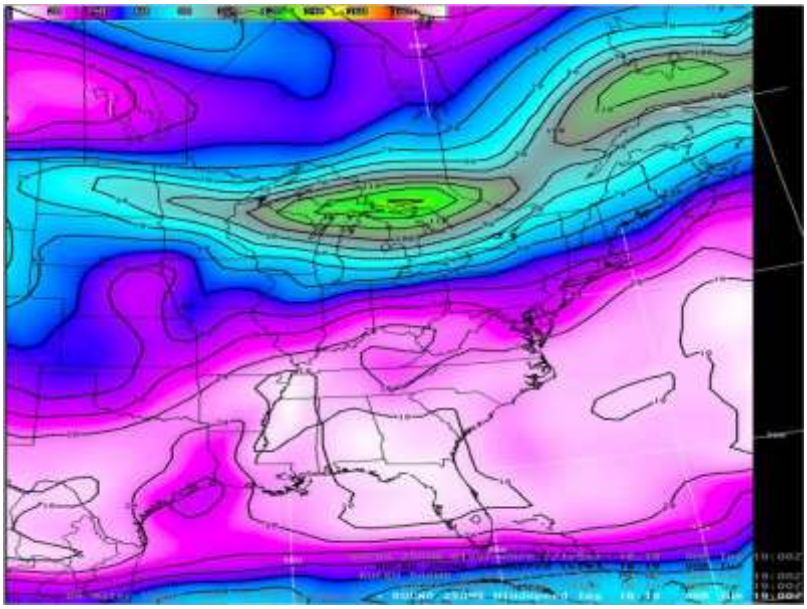

Figure 3: Shows the RUC analysis of the 250mb dual jet structure

At 500mb a fast west to east zonal flow was present with numerous embedded vorticity maximums. These features also helped to enhance lift across our forecast during the afternoon of May 18th. Figure 4 shows the RUC 500mb height analysis and position/ strengthen of vorticity maximum over the Eastern United States

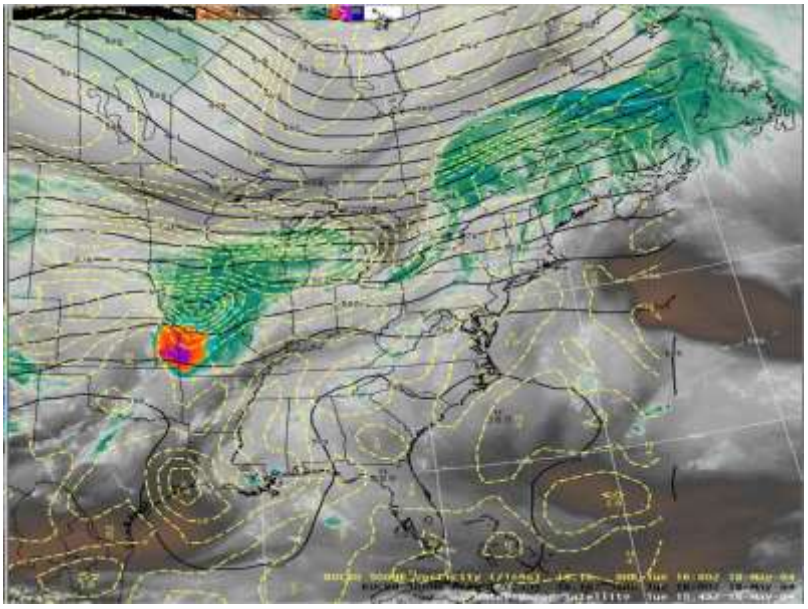

Figure 4: Shows water vapor display, along with RUC 500mb height/vort analysis

Given the amount of cloud cover and limited surface heating with temperatures only in the 70s, the low level instability was marginal for severe thunderstorm development. Helping with the instability was very high dewpoints across the region, mainly in the lower to mid 60s, along with some breaks across the Champlain Valley. These breaks were associated with low-level down-sloping flow across the Adirondack Mountains over northern New York. The four panels below show the 18z Meso-Eta analysis of Cape, CIN, Lifted Index, and Showalter Index. Models showed an axis of greater instability across the southern Champlain valley with Cape values near 1200 J/KG and LI's near -4.

Figure 5: Shows Stability parameters

The low-level shear parameters were enhanced across the region because of southerly winds at 10 to 20 knots funneling up the Champlain Valley. Meanwhile, winds at 850mb were from the Southwest at 20 to 30 knots. These parameters helped to provide the system with favorable low-level winds for organized convection to develop. The four panel below shows: 0-3km helicity values, VGP, Bulk Richardson Number, and BRN Shear values. Helicity values were greater than 200(m^2/S^2), along with a VPG axis of 0.20. These numbers, along with BRH Shear values around 80 supported the development of isolated super-cells across the region.

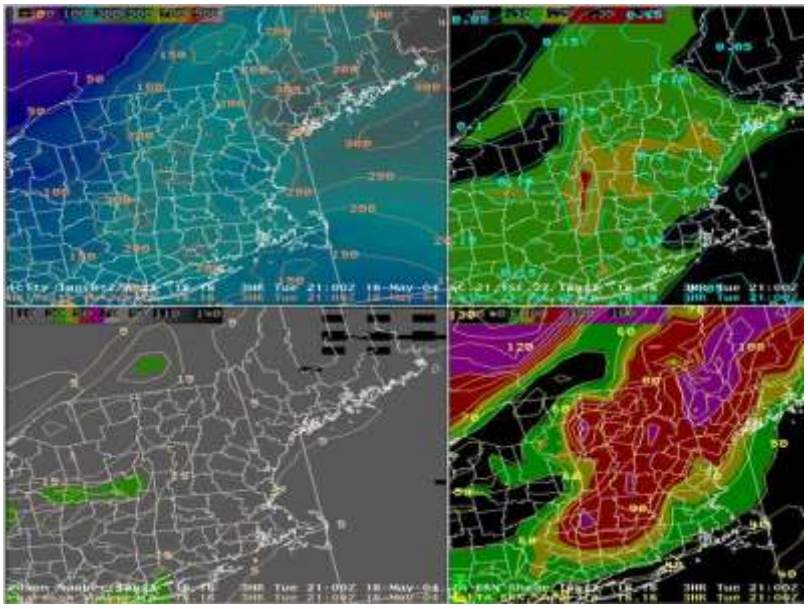

Figure 6: Shows Meso-Eta analysis of shear parameters

The radar display at 2056z on May 18th showed a bow like structure to the echoes across north-central Rutland County. This was very close to the time wind damage was reported in the area. Also, note the comma head structure to the echoes near the town of Chittenden. Finally, large hail was reported with the strong cells from Fair Haven to Castleton, which had 65 DBZ returns in the lowest two elevation angles, extending up to approximately 10000 ft above ground.

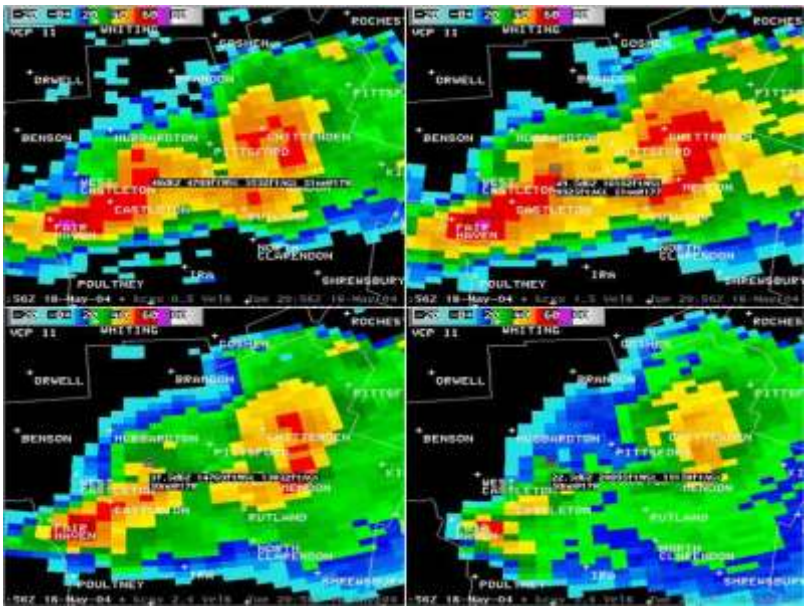

Figure 7: Shows 8-bit reflectivity in the lowest four elevations scans

The velocity display at 2056z on May 18th showed strong rear inflow jet of greater than 50 knots across northern Rutland County associated with the bow-echo. This was depicted on the lowest elevation scan about 4000 ft above ground, however the environment was favorable for the winds aloft to mix down to the surface. Also, helping to enhance wind flow near Pittsford was the orientation of a mountain valley. The storm survey revealed, this helped to funnel the low-level winds and increase the speeds, which created significant tree damage.

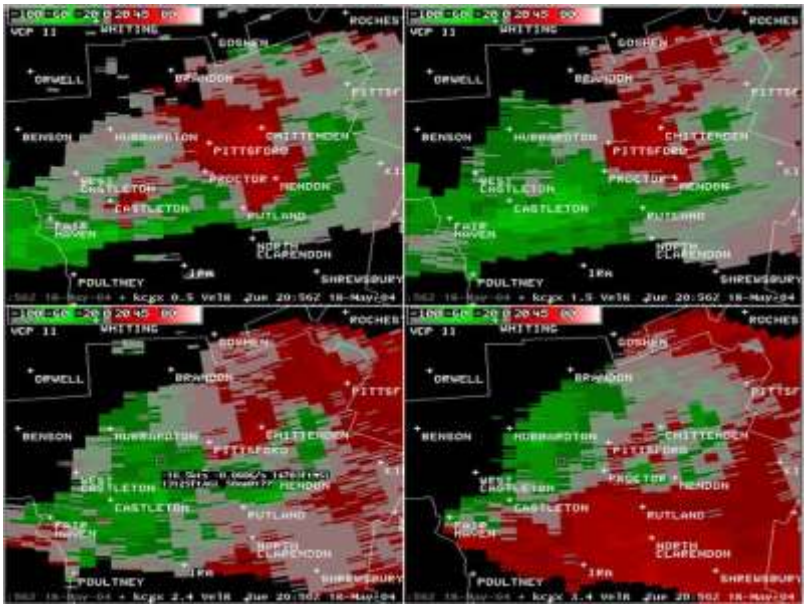

Figure 8: Shows 4-panel of 8-bit velocity display

Jason Neilson and Scott Whittier took the following pictures, during their storm survey to the region on May 19th. Most of the damage occurred in north-central Rutland County, along Markowski Road in the town of Pittsford. From the survey winds were estimated to be between 80 and 90 mph, which blew down or uprooted numerous trees in the area. The damage path was approximately one half mile long and near 200 yards wide at its greatest point.