A Synoptic Overview of the Severe Weather Event across Northern New York and Vermont on July 1st, 2004

The significant severe weather outbreak on July 1st included numerous reports of hail across the North Country, along with some wind damage. Reports included hail up to 1.5 inches in diameter 5.2 miles northeast of Underhill, which covered the ground up to 2 inches deep in spots. In addition, several reports of nickel to quarter sized hail were reported near the City of Burlington and at The National Weather Service Office in South Burlington. Meanwhile, downed trees knock out power near Rouses Point on Route 11 and some wind damage was reported in southern Addison County near Salisbury. Also, across northern New York hail up to 1.25 inches in diameter was reported near Mooers in Clinton County, along with numerous other reports of hail across Essex and Franklin Counties. The link below shows a preliminary summary of all the storm reports received at the National Weather Service Office in South Burlington.

Click here for the Local Storm Report Summary

The upper level pattern on July 1st featured a vigorous 500mb short wave rotating around a deep mid/upper level trough across southern Canada. In addition, to this energy a jet couplet located over the central Great Lakes moved into the region by 18z on the 1st, to help enhance the upper level divergence across northern New York and Vermont. The surface features included a cold front located over southern Canada, which approached the Saint Lawrence Valley by 00z on July 2nd. In addition, surface analysis placed a weak pre-frontal trough across extreme northeastern New York into western Vermont around 18z on July 1st. This low level convergence combined with ample daytime heating and surface dew-points near 60F helped in convective initiation across the forecast area around 17z. The generally storm motion was to the northeast at 5 to 10 mph with the cells tending to back build.

In this brief event summary write up, we will show water vapor displays to indicate the upper level pattern across the northeast part of the United States. Also, we will use some model data to show forecast movement of upper level features, along with middle level lift and moisture progged across the region, and movement of surface fronts. In addition, we will show some LAPS data to indicate the amount of low level instability present. Finally, some satellite data with surface observations and lightning plot with be used to show amount of daytime heating and position of boundaries. Also, some radar data will be displayed to look at the structure and make-up of the strongest cells. The final pictures will show the hail that fall with the storm in the Burlington area.

The following picture below is a water vapor display taken around 18z on July 1st. Notice the strong trough across southern Canada and the vigorous 500mb strong wave energy embedded within the trough. Also, noticed several lines of convection across western New York and Vermont at this time. The darker colors located over the Central Great Lakes was associated with the 250mb jet and an area of strong subsidence/dry air aloft. This helped to decrease the thunderstorm activity across western New York during the afternoon hours. This display shows RUC 400mb height analysis, along with 700-300mb vorticity and lightning data.

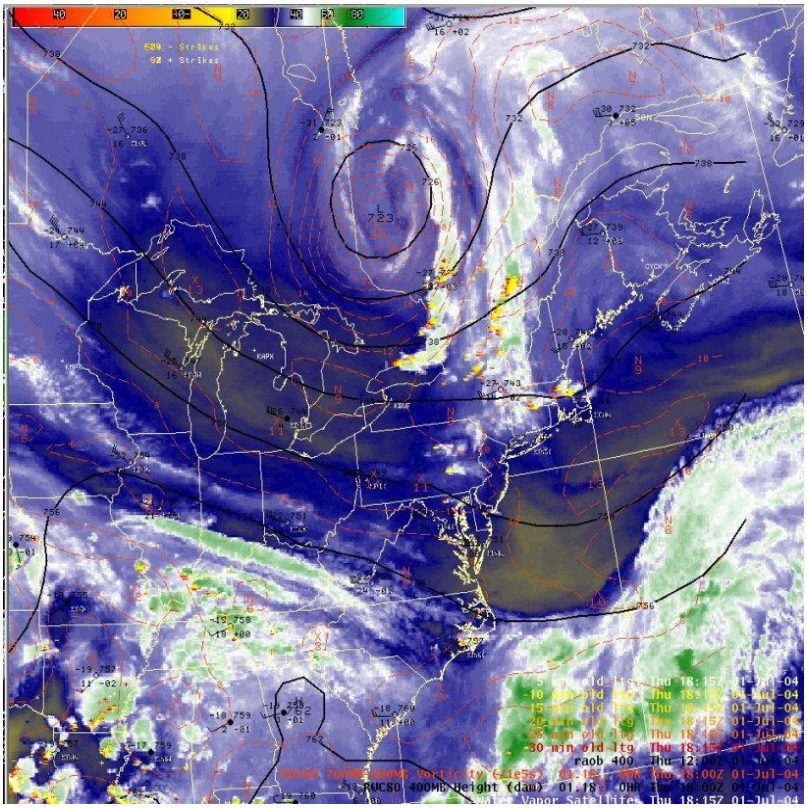

Figure 1: 18z Water Vapor

The next water vapor picture was taken around 22z on July 1st. This continues to show strong 500mb short wave energy across southern Canada with several lines/cluster of storms across northern New York and Vermont at this time. Also, note how the dry air aloft has inhibited thunderstorm development across the Saint Lawrence Valley. Also, helping prevent storm formation was large area of subsidence associated with initial short wave. This display shows RUC 400mb height analysis, along with 700-300mb vorticity and lightning data at 22z.

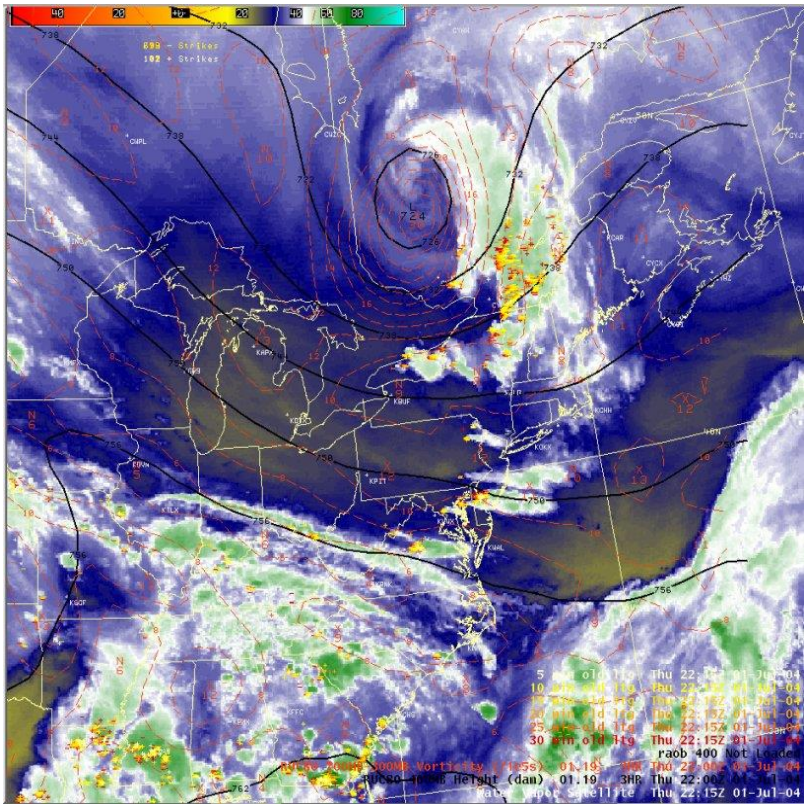

Figure 2: 22z Water Vapor

The 18z surface observational and visible satellite picture showed plenty of surface heating with temperatures well into the upper 70s to lower 80s. This combined with surface dew points in the upper 50s to lower 60s helped to create an unstable air mass across the region. In addition, the 18z surface analysis placed a cold front across southern Canada with a weak pre-frontal trough over the eastern Adirondack Mountains. The visible satellite picture showed plenty of breaks in the clouds across central and northern Vermont which helped in surface heating. Also, noted was the broken line of strong to severe storms along the pre frontal trough across the eastern Adirondack Mountains and Champlain Valley at 18z. The picture below is a visible satellite, along with surface analysis, lightning data, and metar reports at 18z.

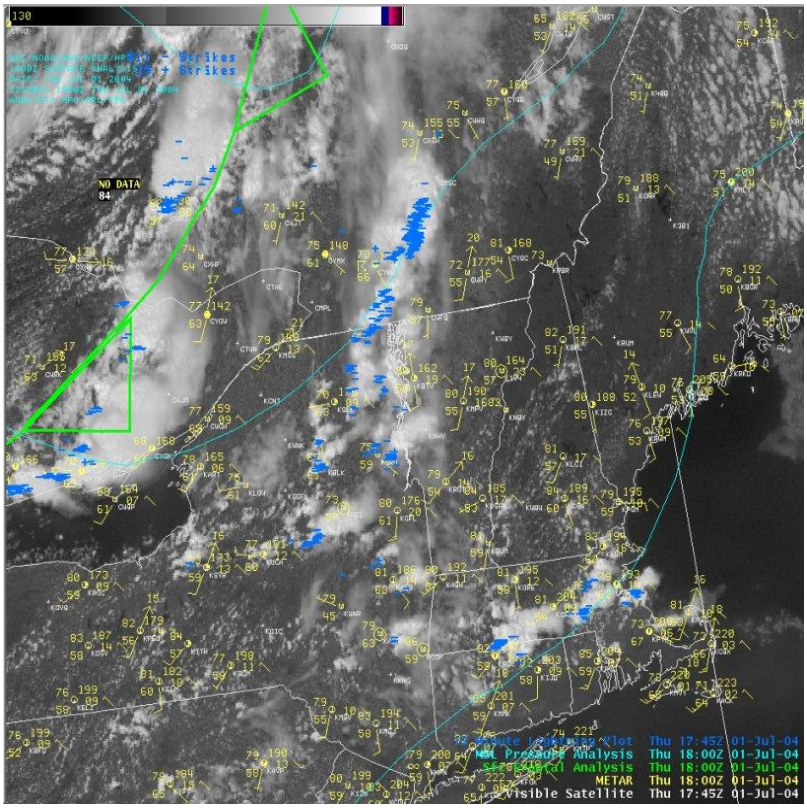

Figure 3: 18z Satellite and Surface Analysis

At 20z the surface analysis showed the cold front slowly approaching the Saint Lawrence Valley with numerous clusters of thunderstorms along the pre frontal trough across northeast New York and western Vermont. At this time surface temperatures continued in the upper 70s to near 80 with dew point values near 60. Also, several thunderstorm outflow boundaries were noted across the Adirondack Mountains and central Vermont at this time. Note the cloud shadows associated with the higher cloud tops and stronger updrafts. The picture below is a visible satellite, along with surface analysis, lightning data, and metar reports at 20z.

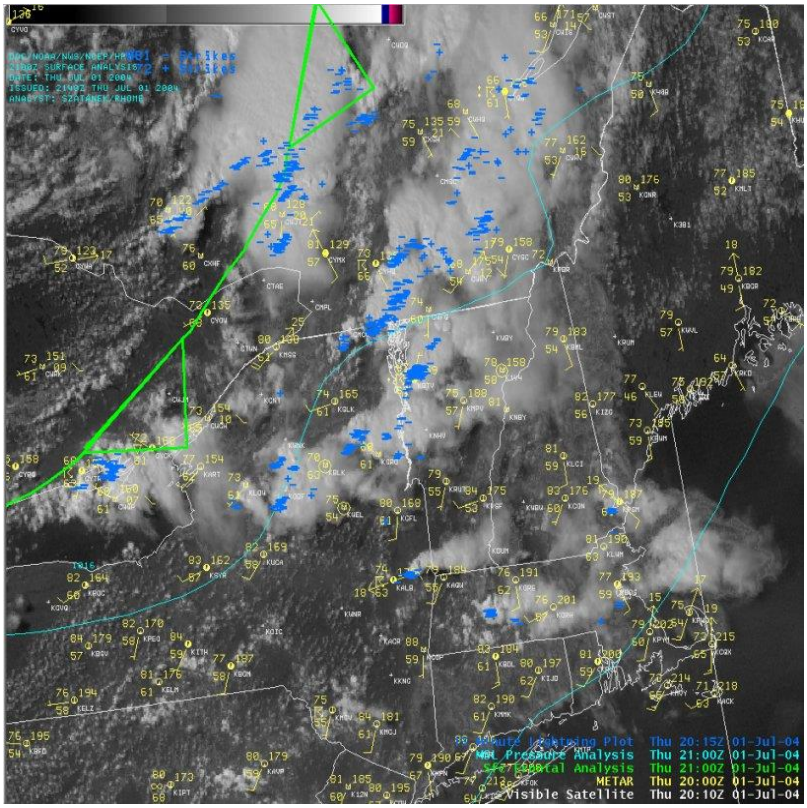

Figure 4: 20z Satellite and Surface Analysis

The image below is a 4 panel analysis of LAPS data displaying the position and amount of low level instability across the forecast area. The LAPS analysis showed the best low level instability axis across the Champlain Valley and Saint Lawrence Valley at 18z. Surface based cape values were around 2000 j/kg over the Saint Lawrence Valley and near 1200 j/kg over the Champlain Valley. In addition, the lifted index values were around -4 across the North Country. Temperatures near 80 and surface dew points around 60 helped contribute to the unstable air mass across the region. This 4 panel display shows LAPS 18z analysis of surface based cape (upper left), Cin and Observations (upper right), 0-3 km most unstable cape (lower left), and lifted index (lower right).

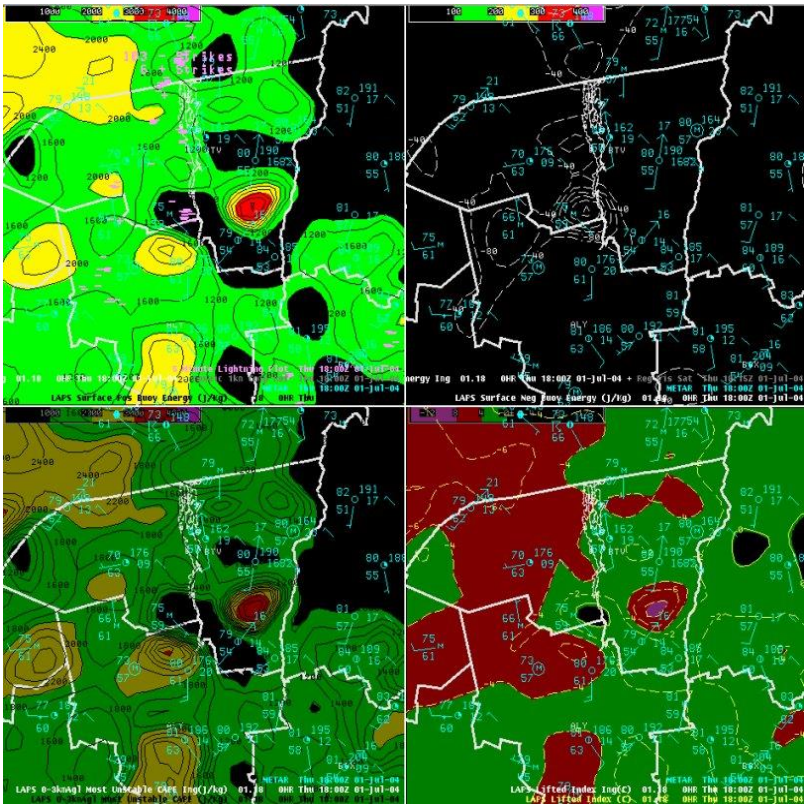

Figure 5: 18z LAPS Analysis

This shows a four panel meso-eta model 18z forecast display of the upper level features and associated cold fronts. In addition, this shows the mid level lift and moisture associated with the front approaching our forecast area from the west. The upper left shows 500mb heights along with vorticity in color. Meanwhile, the upper right shows the surface analysis with low pressure across central Canada and a cold front approaching the Saint Lawrence Valley at 18z. The bottom left shows forecasted precipitation associated with the front. Finally, the bottom right shows 700mb heights with lift and moisture fields being displayed.

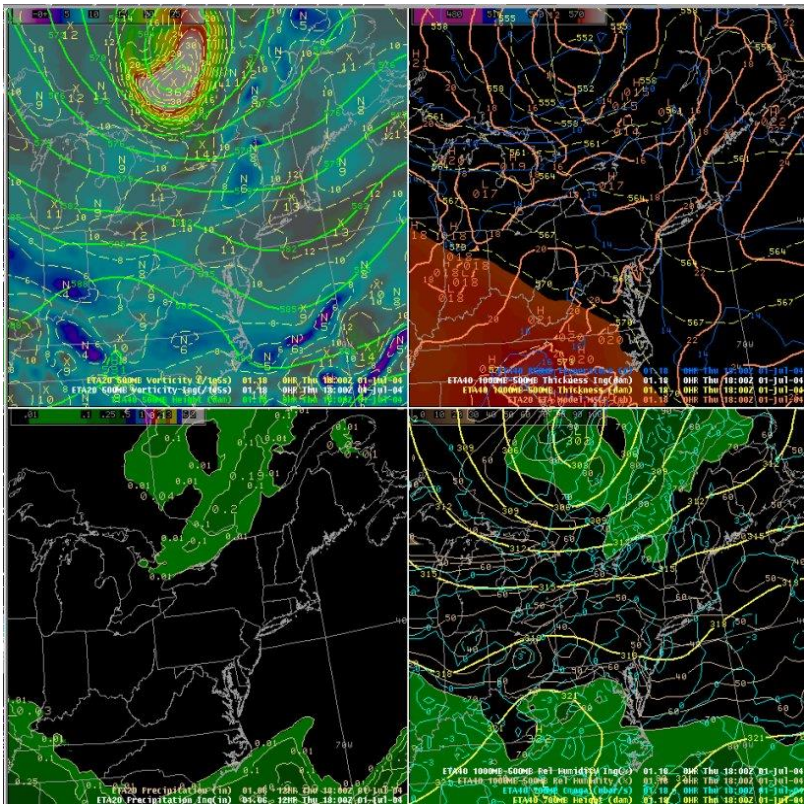

Figure 6: 18z Meso ETA

This display shows the meso-eta 00z analysis for upper level features, as well as progged surface front positions and forecasted precipitation. Note the development of precipitation associated with the surface trough and upper level support across our forecast area. Also, the moisture fields have increased across the region, along with stronger mid level omega values. This is a result of, strong surface convergence associated with the front and enhance lift from the 500mb vort and jet couplet moving across the region. The upper left shows 500mb heights along with vorticity in color. Meanwhile, the upper right shows the surface analysis with low pressure across central Canada and a cold front approaching the Saint Lawrence Valley at 18z. The bottom left shows forecasted precipitation by the meso-eta model.

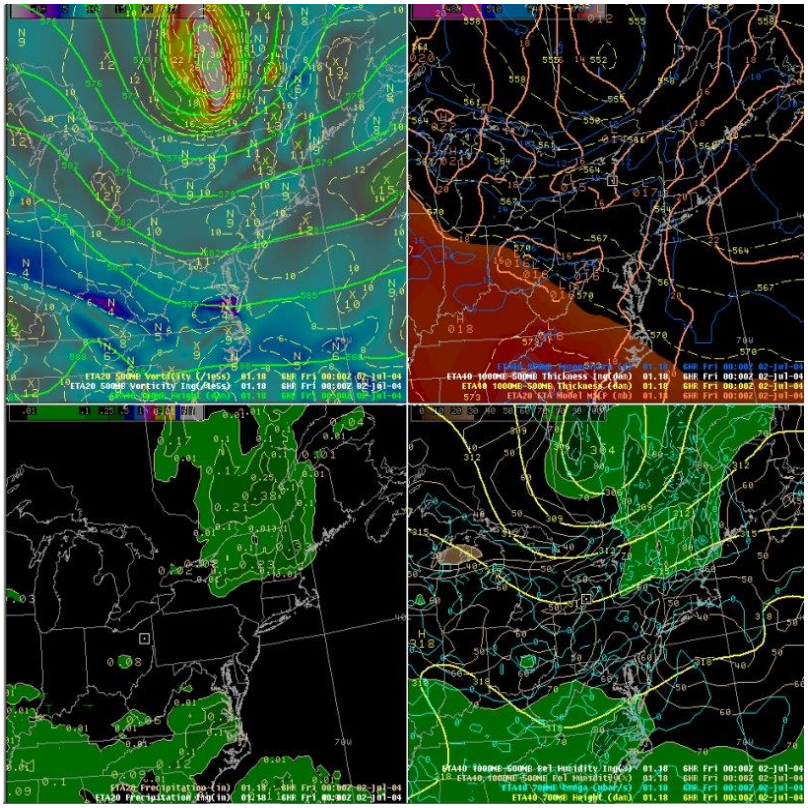

Figure 7: 00z Meso Eta

The four panel radar display was taken at 1835z on July 1st. Note the strong cells near Burlington, Vermont in Chittenden County and another significant cell across southern Essex County in New York State. The Essex County storm was producing nickel sized hail at this time near Ticonderoga. The following four panel shows composite reflectivity (upper left), digital VIL (upper right), enhanced echo top (lower left), and VIL (lower right). This showed DBZ returns near 65 with digital VIL readings near 75 kg/m^2, and echo top values near 45,000 feet. The old VIL product showed VIL readings which were near 60 kg/m^2 for this cell across southern Essex County.

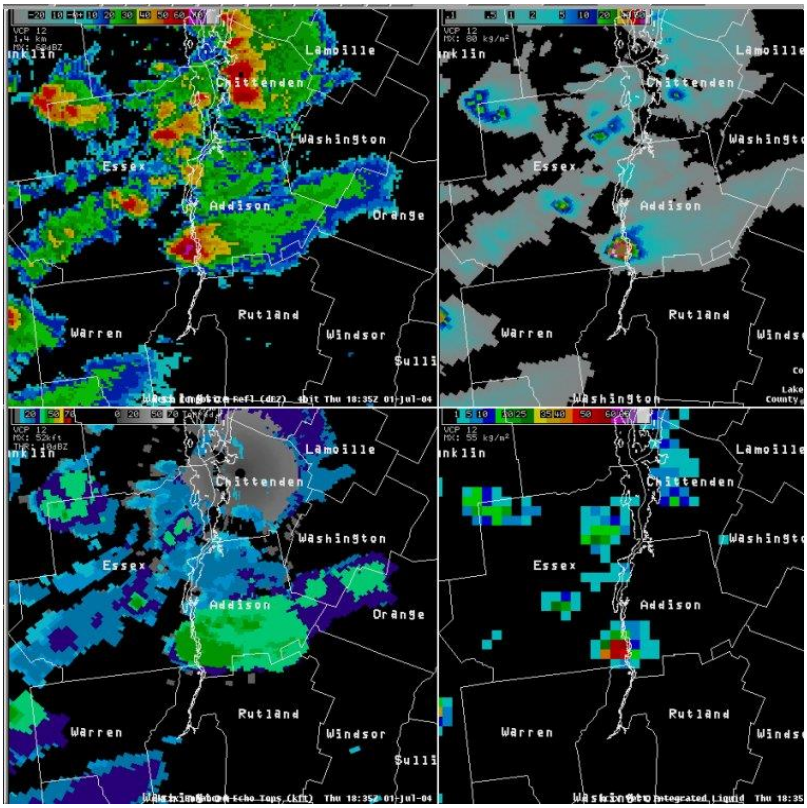

Figure 8: 4 Panel Radar at 1835z

This 4 panel display shows the strong cell that produced nickel hail across the Burlington area at 1930z on July 1st. Also, notice the coverage of strong to severe cells across northern New York in Clinton County and another significant cell in northeast Essex County New York. Both storms produced nickel to quarter sized hail. The VIL of the day value used for warnings was around 50. The following four panel shows composite reflectivity (upper left), digital VIL (upper right), enhanced echo top (lower left), and VIL (lower right).

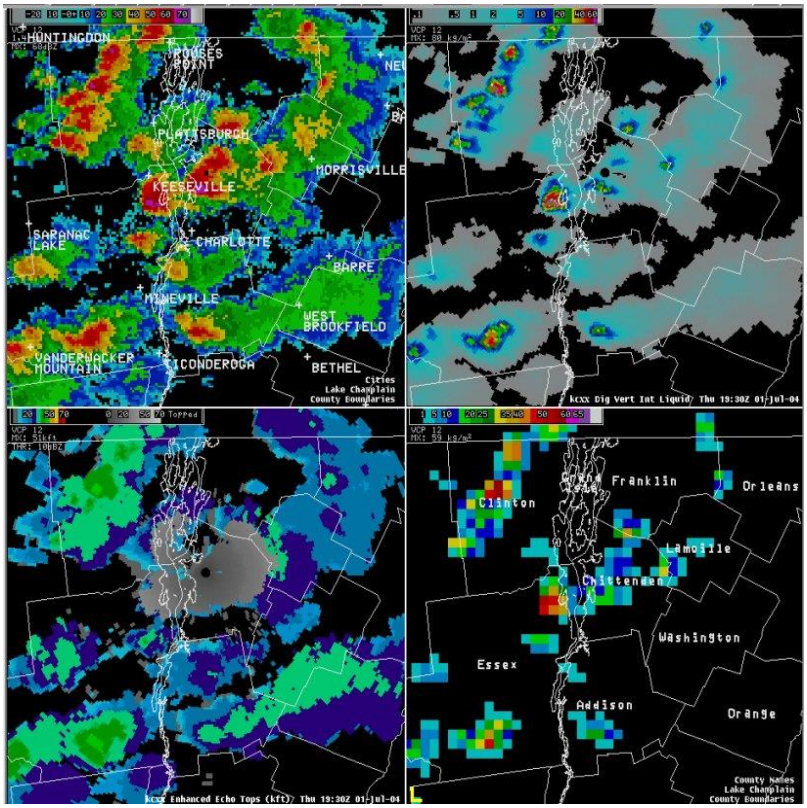

Figure 9: 4 Panel Radar 1930z

This display once again shows a four panel of the thunderstorms across the forecast area. At this time hail up to 1.25 inches in diameter was reported near Altona in Clinton County, New York. This storm had a digital VIL value near 80, Echo Tops near 50,000 feet, DBZ returns of 65, and a VIL core of near 65. The following four panel shows composite reflectivity (upper left), digital VIL (upper right), enhanced echo top (lower left), and VIL (lower right).

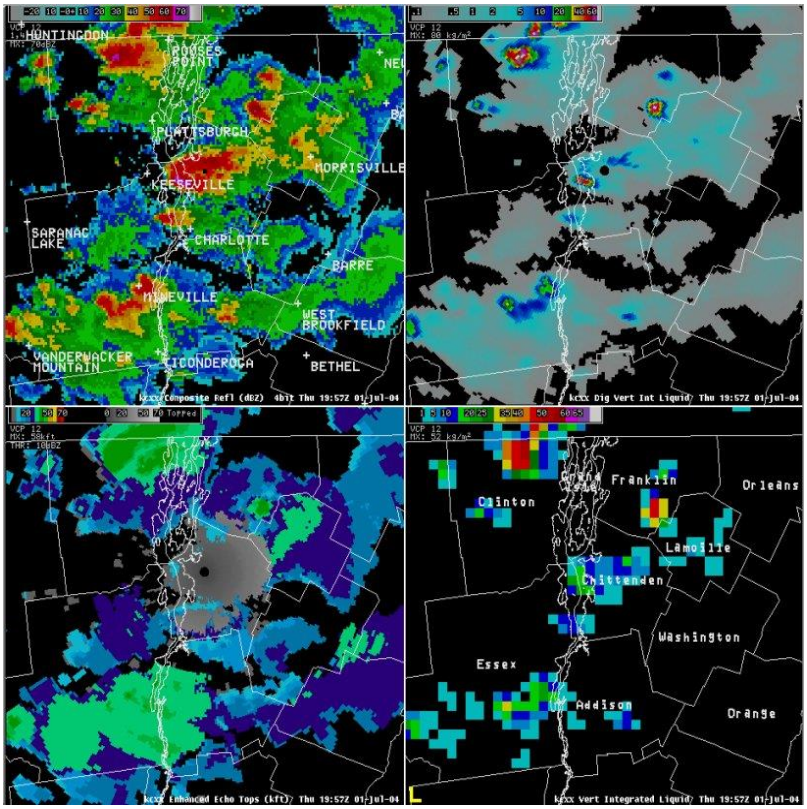

Figure 10: 4 Panel Radar 1957z

The finally radar product shows storm total precipitation across the region. This depicts nicely the track and movement of the strongest cells across our forecast area. Rainfall amounts associated with the strongest cells were between 1.0 and 2.0 inches. The heaviest rain occurred across northern Clinton County and Southern Essex County in northern New York. In addition, some heavy rainfall amounts were noted in the Burlington area and along the western slopes of the Green Mountains. The National Weather Service in South Burlington received 0.75 inches of precipitation. Please note some values maybe higher than actual ground observations, because of hail contamination.

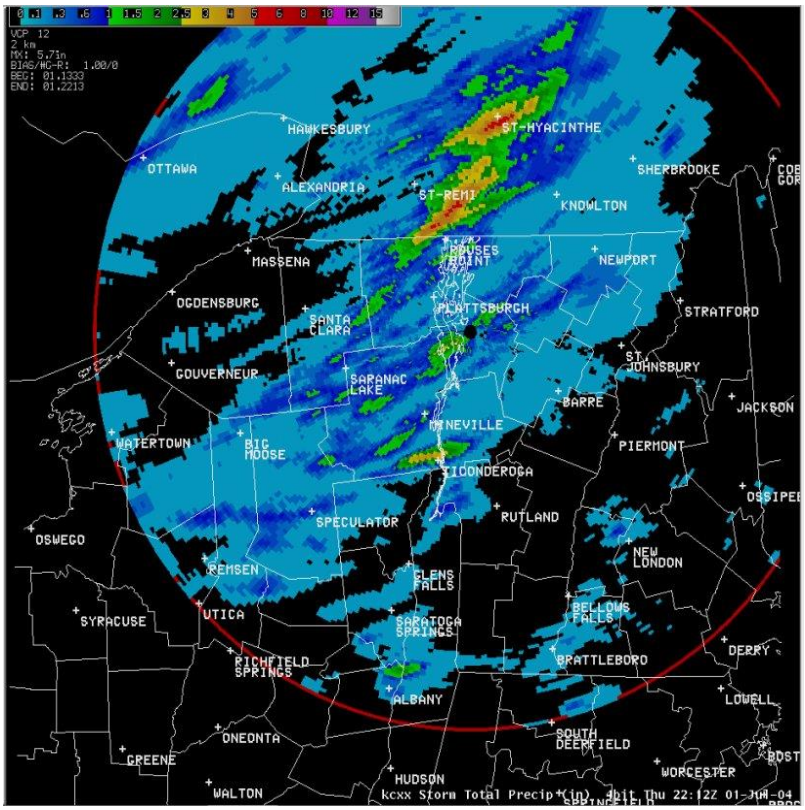

Figure 11: Storm Total Precip

The following pictures were taken by our DAPM Bill Grady. These pictures were taken about one hour after the hail had fallen in Bill's backyard. The pictures show a couple hail stones up to penny size.

Overall, the National Weather Service issued 17 warnings on July 1st. Many of the warnings were verified with hail reports, with a couple being verified by wind damage. In addition, several severe weather outlooks and special weather statements were issued well in advance of this significant severe weather outbreak. No deaths or injuries were reported with this event, but several places received lightning damage, along with power outages. Also, no flooding occurred with the slow moving, pulse-like thunderstorm cells.