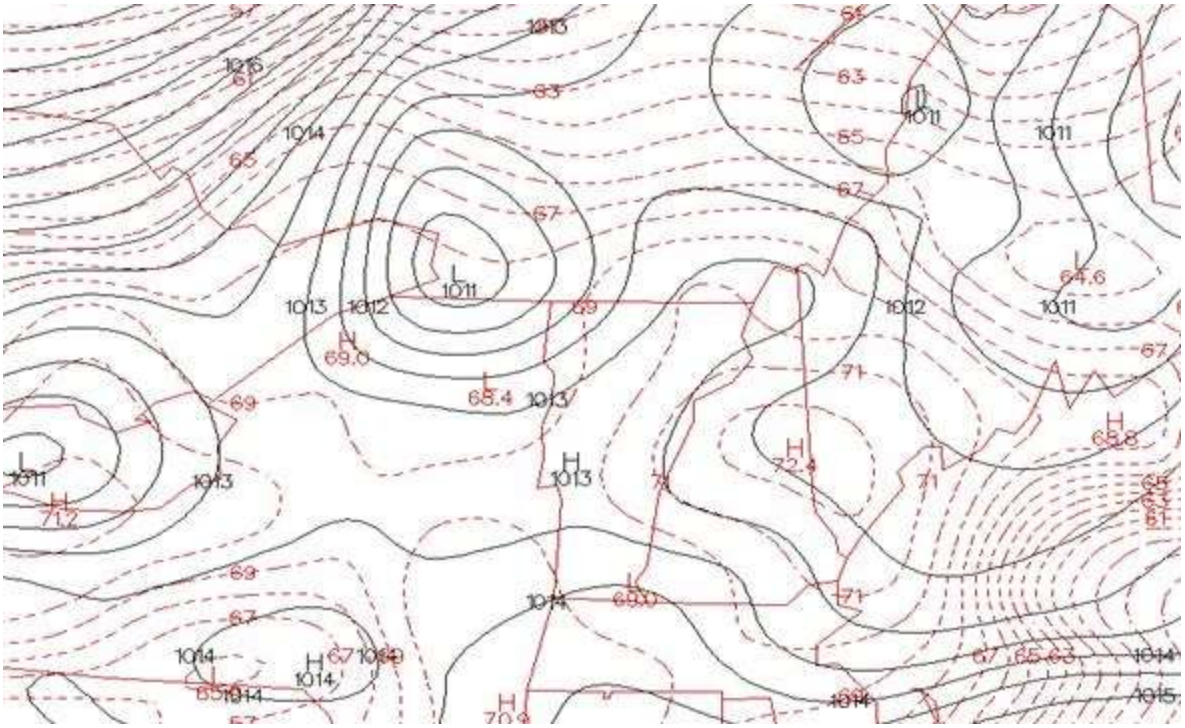
The June 29, 2005 Williston Thunderstorm and Flash Flooding Event

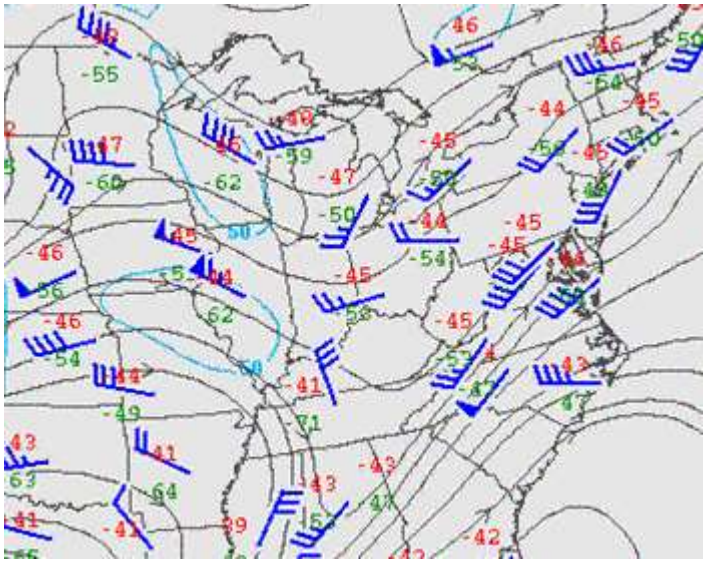
On June 29, 2005 a strong thunderstorm produced down burst winds of 50 to 60 mph, along with 4 to 6 inches of rain in three hours. This heavy rainfall in this short period of time caused roads to wash out, numerous areas of ponding of water on roads/golf courses, and localized small stream flooding. The strong winds associated with several embedded wet microbursts caused trees to be uprooted and power lines to be knocked down.

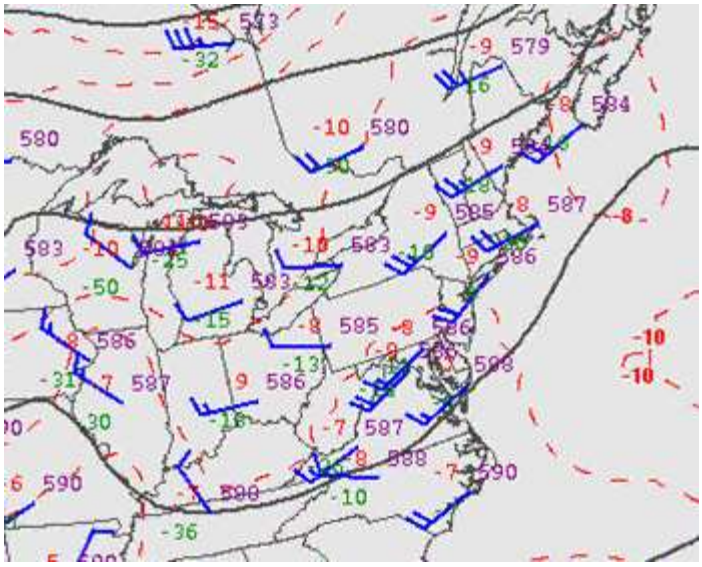
The heavy rain combined with strong winds created surface visibilities around one mile. The picture on the left shows the Allen Brook near Williston overflowing its banks. There were several reports of minor flooding along the Brook. Meanwhile, the picture on the right was taken on Governor Chittenden Road and shows the strong winds and heavy rains. At this time the wind was estimated to be around 40 mph.

The 18z surface analysis on June 29th showed a weak cold front approaching the Saint Lawrence Valley with departing high pressure located over northern Maine. Surface temperatures ranged in the upper 70s to near 80 with dewpoints in the upper 60s to near 70 with very light surface flow.



The upper air data on June 29th showed very weak winds aloft across northern New York and Vermont. At 250mb the strongest winds associated with the jet was located near the Hudson Bay with the best upper level divergence across southern Canada and northern New York. At 500mb the flow was very weak with winds less than 20 knots and temperatures around -8c. At 700mb and 850mb the flow was very weak (less than 15 knots) with a weak trough noted by the 12z upper air analysis. The picture on the left shows the 250 mb analysis and the right side diagram below shows the 500 mb upper air analysis.





The Albany 12z sounding on June 29th showed plenty of moisture through the column with precipitable water values near 2.0 inches. The Albany sounding also showed a weak cap around 850mb, but with surface heating the cap would quickly dissipate. In addition, the sounding indicated the potential to mix dry adiabatically from 700mb, and the CAPE profile was tall and skinny. The sounding also supported the potential for heavy rain based on a slow storm motion (270@10 knots) and a warm cloud depth near 4.0 km. The low level wind field helped to enhance the storm relative inflow of warm moist air into the storms and helped the storms back build and train over the same areas. Finally, the soundings showed CAPE values near 1000 j/kg2 total totals around 50 and K-Index values near 40. Little shear was evident from the Albany sounding, based on limited winds aloft and turning with height.

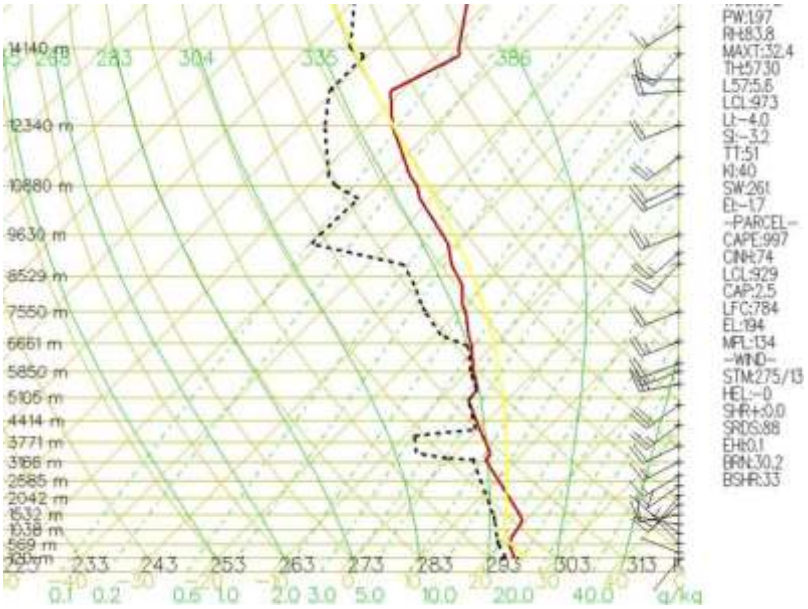
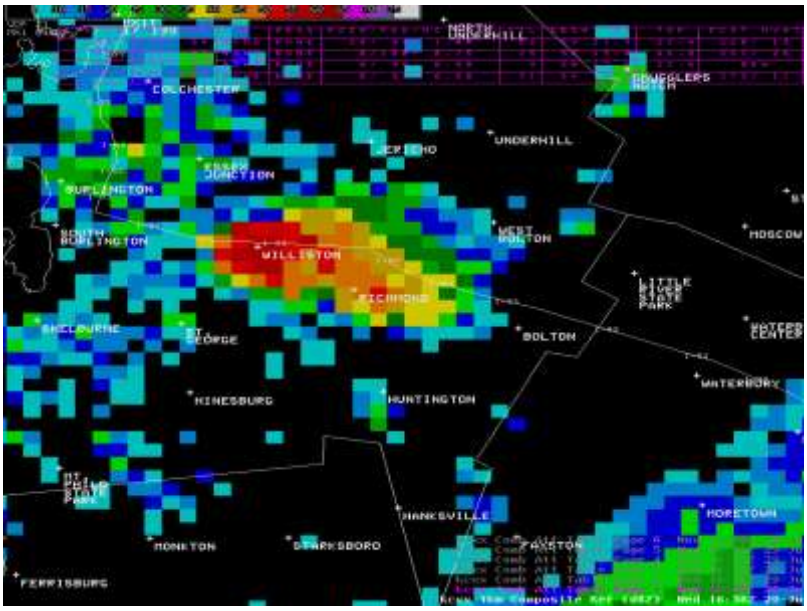


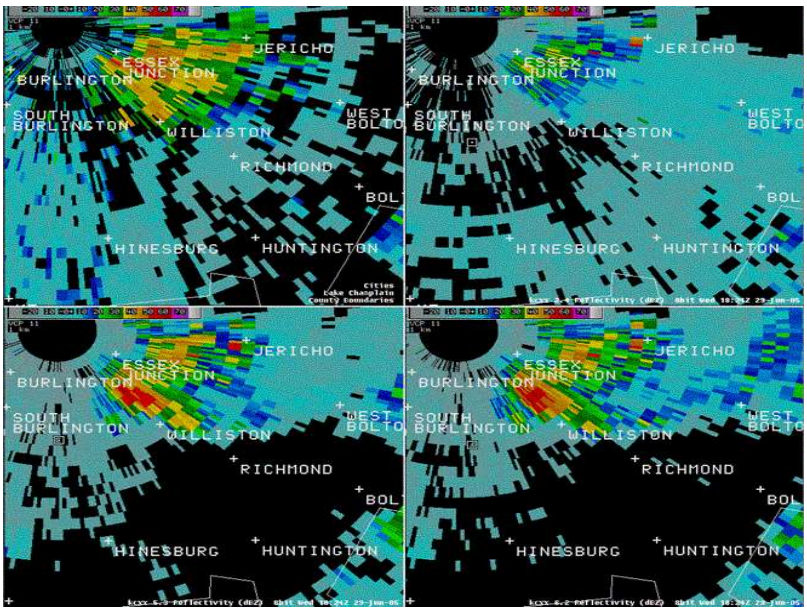
Figure 1: Albany 12z Sounding

The radar analysis for this event showed several interesting features. One important factor was the limited movement of the heavy rain producing storm near Williston. In addition, this storm had several pulses of higher reflectivity cores aloft, which transferred momentum to the surface per the 0.5 velocity data from the CXX radar. These reflectivity cores also transferred to the ground and produced areas of very heavy rain and strong winds. The following image is a composite reflectivity loop from the CXX radar. Please note the strong >60 DBZ returns around 1824z and the several increased reflectivity cores the

storm cycles through during the loop. This loop also shows very slow storm movement and a trend for the cells to back build south toward Richmond and Interstate 89.

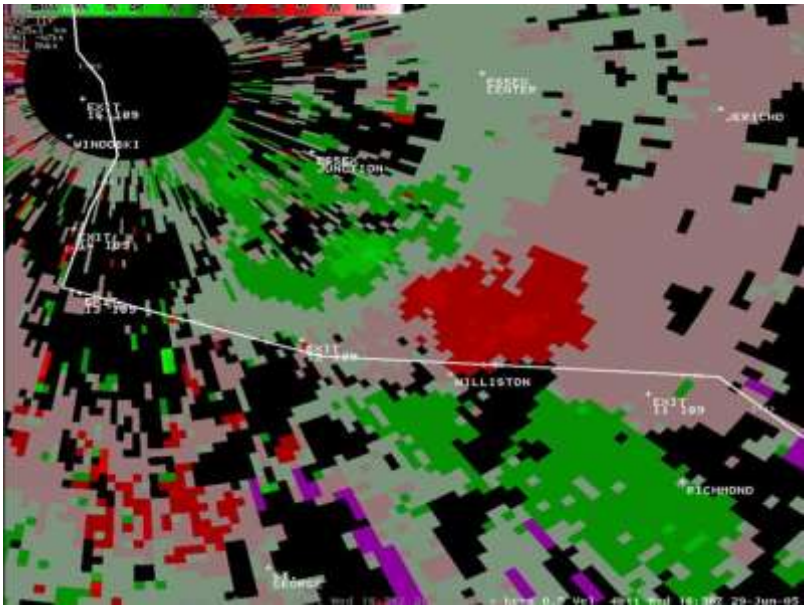


This 4 panel reflectivity display of the mid layer DBZ returns show a strong core aloft. This was 5 to 6 minutes prior to the strongest winds reaching the ground. These cores of strong reflectivity occurred several times in the life span of the storm.

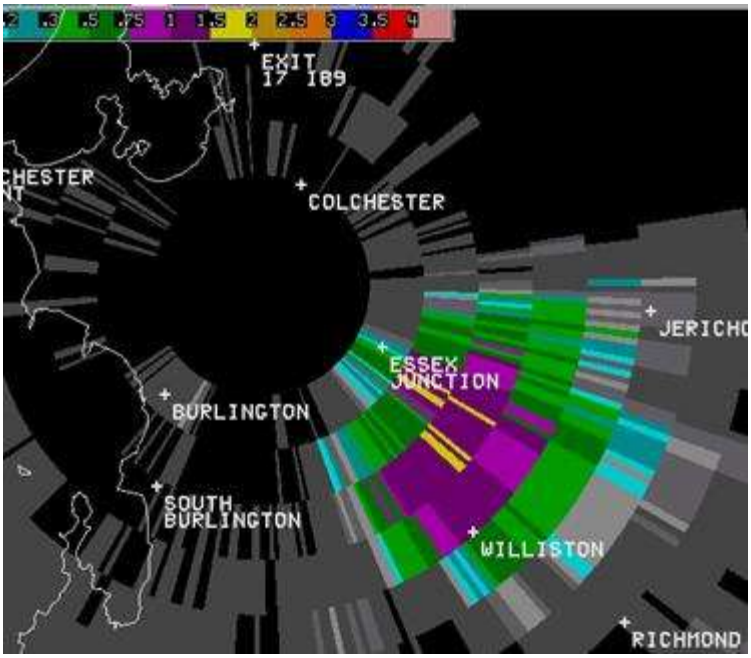


The velocity loop below shows several pulses of increased surface divergences associated with the wet microburst. The 0.5 degree velocity shows maximum low level divergences of 40 knots outbound and 40 knots inbound. Given the close proximity of the cell to the radar, this higher velocity couplet was just off the surface and based on photos, was definitely transferred to the ground. Also, you can see several enhanced inbound and outbound areas in the data as the storm pulsed up and down and transferred down drafted winds to the surface. This is noted by the closeness of the divergence pattern, then having the winds separate through time and then come back together as another burst hits the surface.

At 1838z the 0.5 velocity display indicated two separate pulses of inbound and outbound winds associated with the cell located near Williston. The maximum inbound and outbound velocities for these pulses were 40 knots. This is a classic velocity pattern associated with a wet microburst and its associated downdraft.



The one hour and storm total precipitation displayed showed that this storm produced a very isolated rainfall amounts near Williston of 2 to 3 inches. There were several reports of local residents reporting 4 to 6 inches of rain in less than two hours near the town of Williston. Given the close proximity to the radar, the storm entering the cone of silence, and the type of clutter suppression used impacted the radar′s ability to estimate the precipitation. The two maps below show the one hour storm total precipitation and the storm total precipitation from the CXX radar.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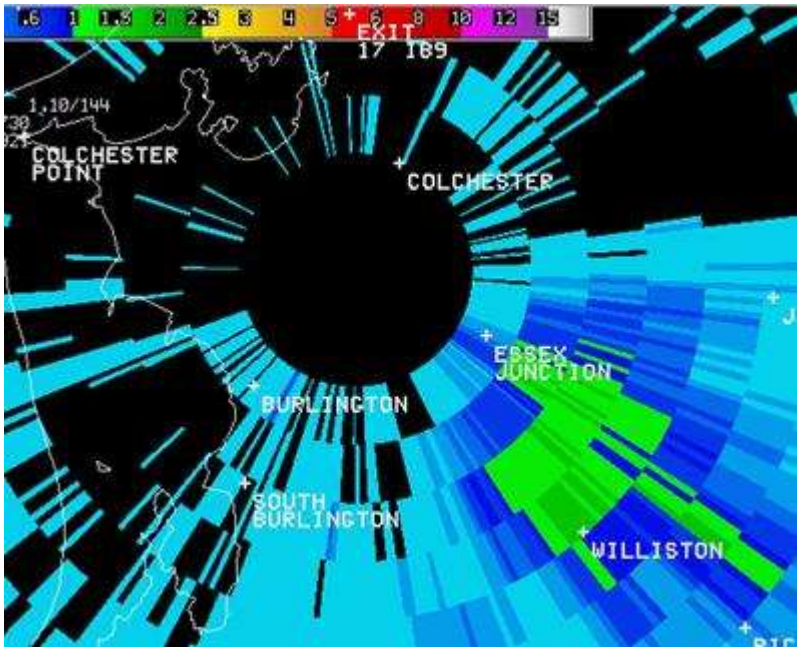
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