THE AUGUST 6 2008 SOUTHERN ADDISON COUNTY VT FLASH FLOOD

Overview

On August 6 2008, heavy rainfall produced flash flooding in southern Addison, northern Rutland, and northwest Windsor Counties in Vermont. Heavy rain fell the morning of August 6 2008 in headwater basins of Otter Creek (Middlebury River, Sucker Brook), and the White River (Hancock Branch). A widespread 3 to 5 inches of rain was observed, with anecdotal reports of 6 to 7 inches of rain in some spots.

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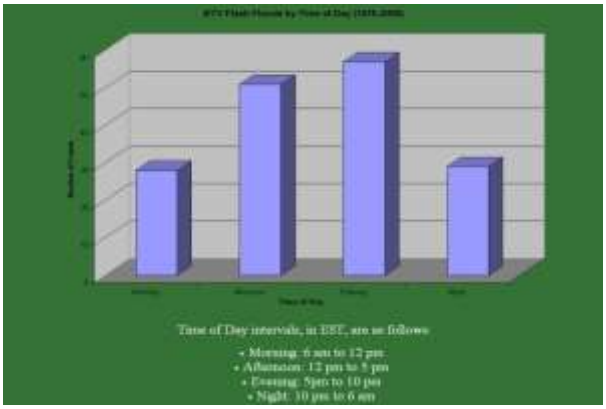
The time of day for this flooding was less common for flash floods in Vermont; most flash floods occur in the afternoon and evening than morning.



Many sections of Forest Service Roads were destroyed, isolating campers in the Green Mountain National Forest. Vermont Route 125 was extensively damaged in numerous locations between East Middlebury and Hancock VT, and a bridge on Route 53 was washed out on the east side of Lake Dunmore. In Brandon, the Neshobe Golf Course was flooded. Route 7 was closed south of East Middlebury, where the swollen Middlebury River inundated the highway.

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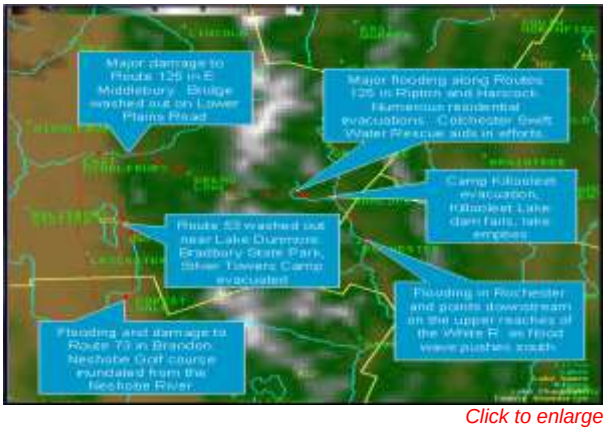

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Hancock Village was particularly hard hit, where the Hancock Branch flowed through several structures and flooded Route 100, forcing its closure. Water swept through Camp Killooleet, forcing campers to move to higher ground for safety.

The camp's lake emptied when the dam was washed away by floodwaters. After entering the White River in Hancock, the flood wave traveled south downstream, and created additional flooding near the village of Stockbridge VT, a distance of approximately 15 river miles.

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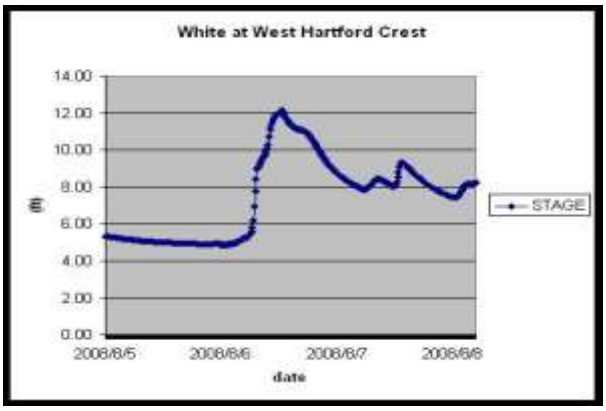
Further downstream and later in the day, the White River at West Hartford VT crested at 12.14 feet at 10:45 pm EDT (flood stage is 18 feet).



It took the flood wave eight to ten hours to travel the 57 miles from the headwaters that received the heavy rainfall to the West Hartford gage.

Weather Analysis

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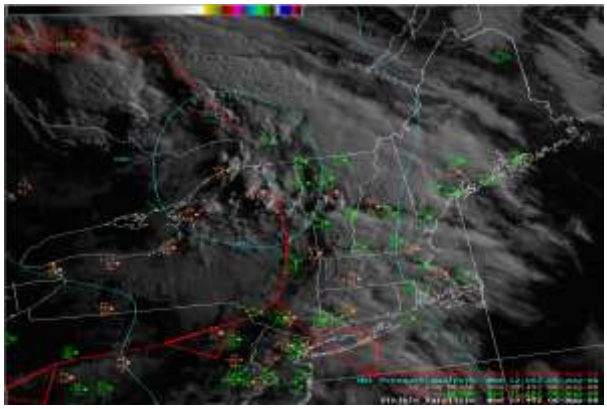

At the surface, a weak area of low pressure was centered over northern New York, with a surface boundary trailing southward. East to southeast flow across New England tapped into an Atlantic Ocean airmass, with surface temperatures in the low to mid 60s, and dewpoints in the upper 50s to lower 60s.

Further south over southern New England, Pennsylvania, and New Jersey, dewpoints in the upper 60s to around 70 and south to southwest flow indicated an airmass with more tropical origins. This deep tropical moisture flowing north above the surface warm front would help fuel the heavy rain. Behind the front, west winds turned northwest over western New York, with slightly cooler temperatures and dewpoints.

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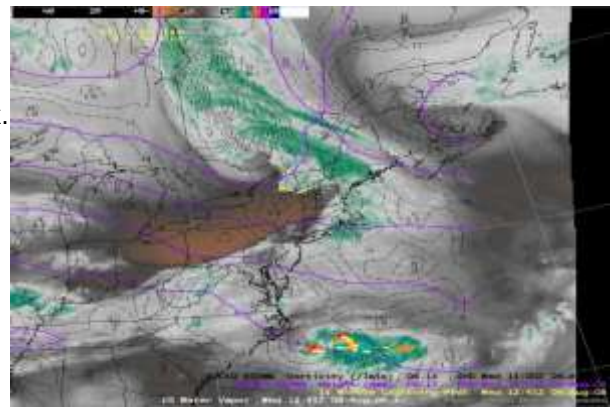
The Water Vapor satellite image shows an upper lowover southern Quebec, with an intrusion of mid level dry air moving in from the west over northern Pennsylvania and New York.



Moisture can be seen associated with the day's convection over the Adirondacks in New York and west-central Vermont.

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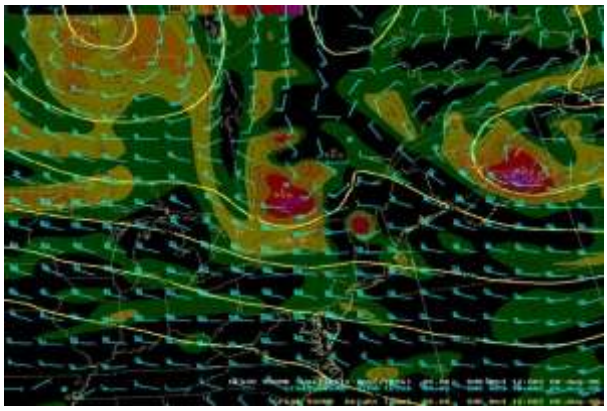
At the 500 mb level, the general flow was west-northwest, with a shortwave ridge exiting the north country at 12z, and an approaching shortwave trough beginning to move along the Canadian border with northern New York.



Also note the small vorticity maximum located over north central Vermont at 12 UTC, which will be more apparent in the upcoming radar data.

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The North American Mesoscale (NAM) model 8 hour forecast sounding for Rutland VT (KRUT) valid at 14 UTC showed winds that weren't particularly light through the low layers. The presence of a low level jet (absent for this case) usually indicates strong advection of moisture to help feed any storms.

In addition, the convergent area at the nose of the low level jet is a preferred area for initiation and growth of storms. Another indicator of storm motion, the MBE velocities, were near 20 kts, indicating that any storms that developed would keep moving, and not have a tendency to remain over the same area and backbuild. In addition, precipitable water was 1.54 inches, which is notable, but not exceptionally excessive for this time of year.

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Upon closer examination however, it is important to note the depth of the saturated layer extends around 6 km (20,000 feet) into the atmosphere, and the very low LCL and deep warm coalescence depth of 3 km indicates a very efficient rain producing process for any storms that do develop.

Warm process rainfall also presents itself on radar as only moderate rainfall with lower reflectivities than deeper convection, and therefore may be more prone to be overlooked for the flash flood threat.

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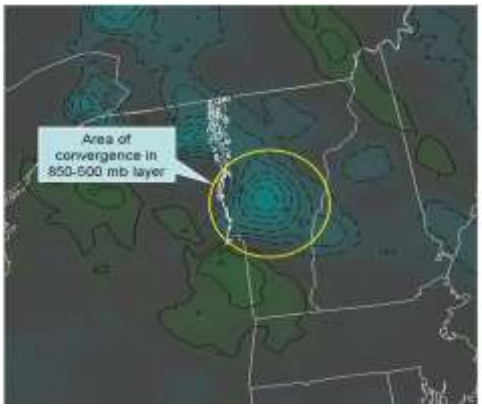
Deep moisture and warm rain processes have been identified, however a triggering mechanism and focus for convection is not readily apparent. There is an upper level shortwave trough and surface low, however they are well to the north of the area of interest.



In addition, there is no low level convergence to be found. However, a quick look at the 850-500 mb divergence field indicates an area of convergence over central Vermont.

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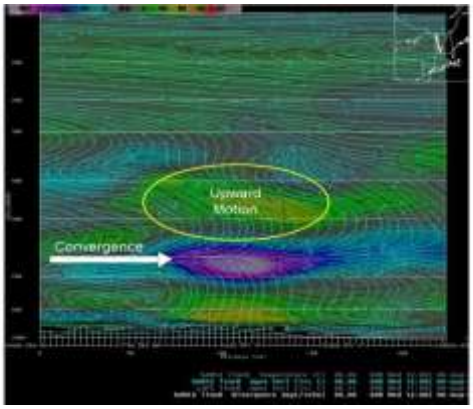
A cross section running north/south through western vermont reveals an area of convergence centered at the 600 mb level, with ageostrophic upward vertical motion from 600 mb up to 300 mb.



This area provides the lift required for heavy rain, rather than convergence along a surface front or at the nose of a low level jet.

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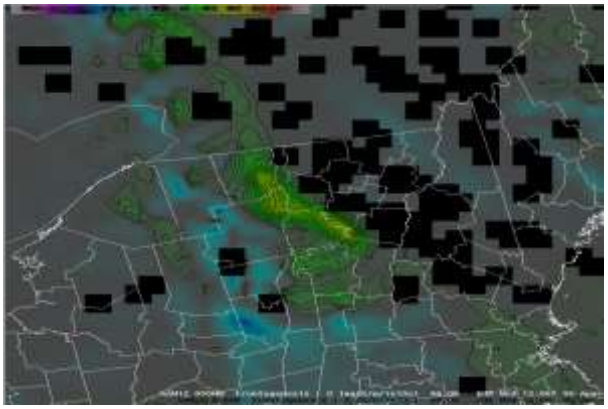
The area of frontogenesis at 650 mb infers an area of convergent horizontal flow being converted to upward vertical motion over west central Vermont.



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The radar loop to the right illustrates how the event played out. A broad area of moderate to heavy rain moved across the area of interest from about 08 UTC through 11 UTC. Note the cyclonic (counterclockwise) spin of this rainfall, associated with the small vorticity maximum seen on the 500 mb chart above.

The cyclonic motion of the rain area as it moves west to east keeps southern Addison county in the inflection point and under more prolonged moderate to heavy rainfall. The final blow is dealt from 11 UTC to 13 UTC, when a line of convective showers trains over southern Addison county, just north of the Rutland county line. This line of showers produces the final burst of heavy rains that takes this event from minor nuisance flooding to a devastating flash flood.

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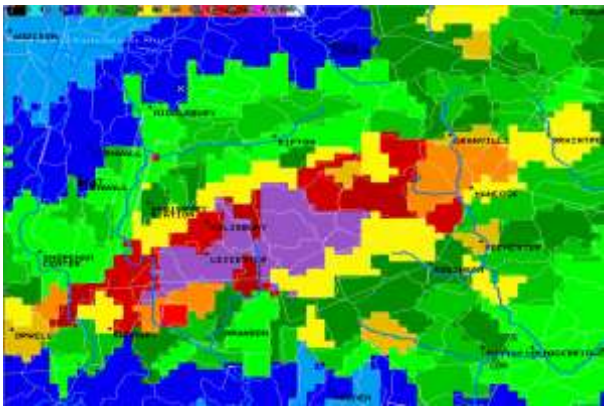

The Flash Flood Monitoring & Prediction (FFMP) tool was essential to the successful warnings issued on this flash flood event. FFMP automatically compares radar rainfall estimates to flash flood guidance, and gives the forecaster a quick visual indicator of the areas that have received the most rainfall, and may be the most susceptible to flooding.

In this event, FFMP accurately highlighted the excessive rainfall in the flood area, and alerted the forecaster that had just begun his workday.

Photographs

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A description and photographs of Camp Killooleet flooding in Hancock can be found here:
http://www.tom-perera.com/flood/