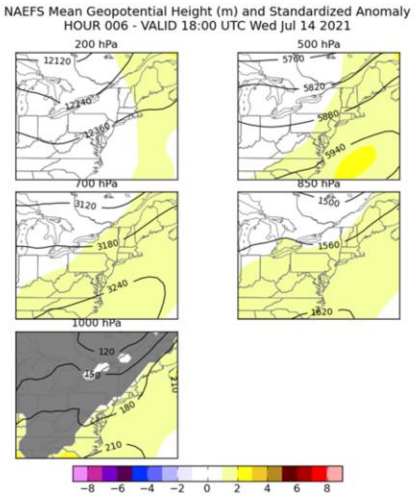
July 14, 2021 flash flooding in Rensselaer county

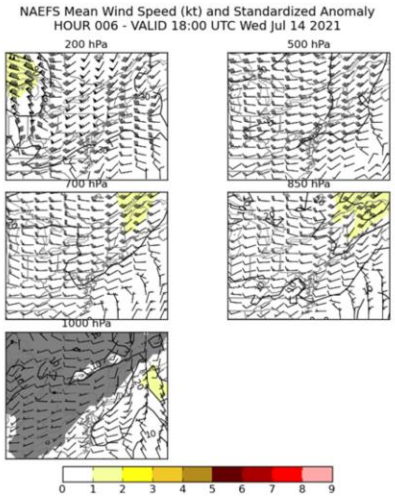
Mike Evans
WFO Albany, NY

Outline

- Large-scale pattern
- CAMS
- Forecasts
- Radar
- MRMS / FLASH guidance
- Observations

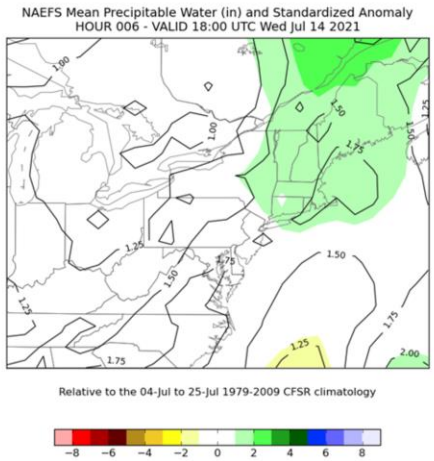
Height and wind speed anomalies at 18z





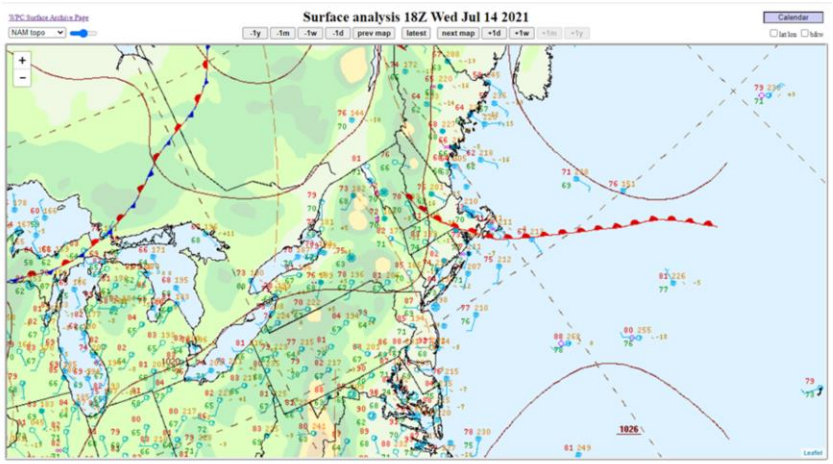
The mid-level flow on July 14, 2021 featured a weak, broad trough over the eastern Great Lakes with southwesterly flow across New York and New England. The height and flow pattern was not anomalous across the area.

Moisture anomalies at 18z



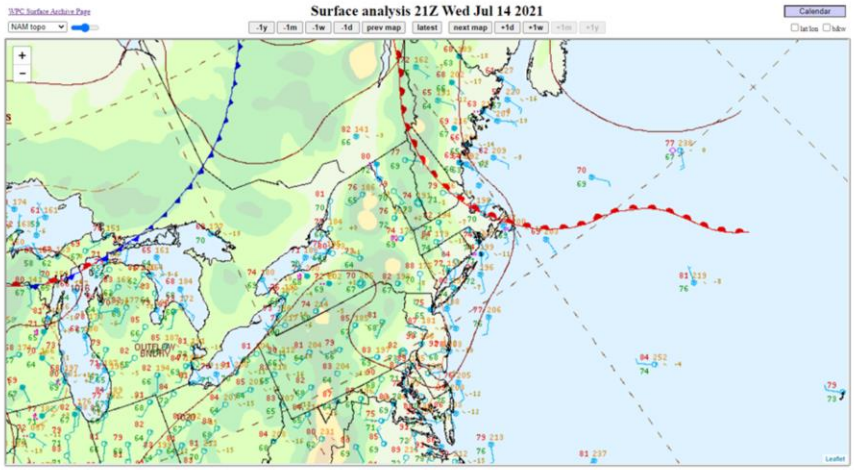
An axis of precipitable water with values greater than 1.5 inches was located along the east coast. Moisture was anomalously high over eastern Canada on the northern edge of this plume of moisture.

Surface plot – 1800 UTC, July 14



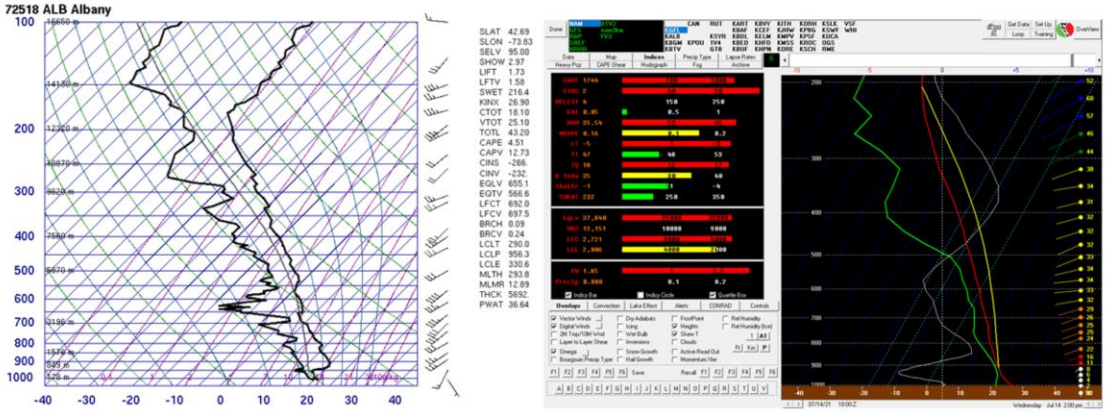
At the surface, a weak warm front was analyzed across New England and a surface trough was located across eastern New York.

Surface plot – 2100 UTC, July 14



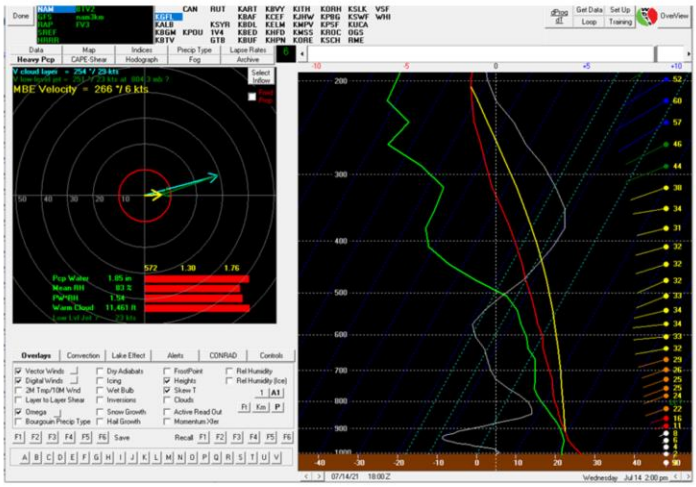
By 21 UTC, both the warm front and surface trough had progressed slowly eastward.

12 UTC observed and 18 UTC forecast soundings



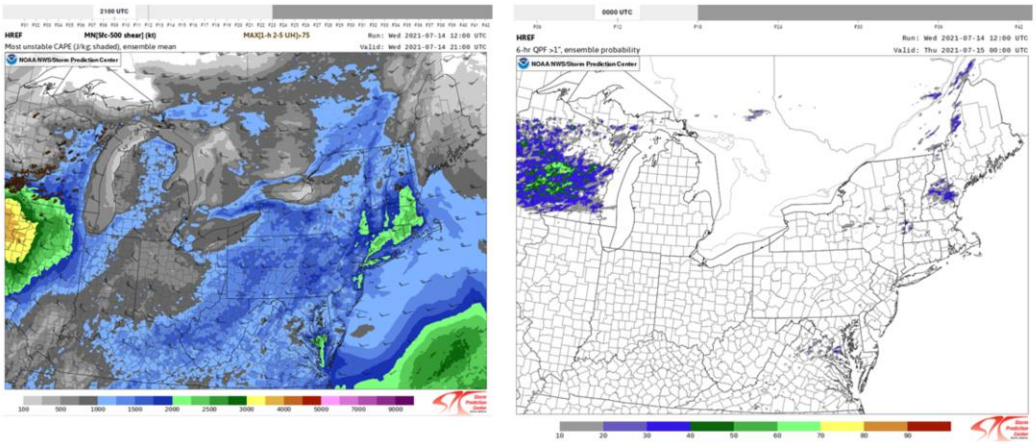
Observed and forecast soundings at Albany on the 14th indicated that moderate amounts of instability would develop across the area during the afternoon. Mid-level flow would average 30 to 35 kts from the west-southwest.

BUFKIT sounding – heavy precipitation display



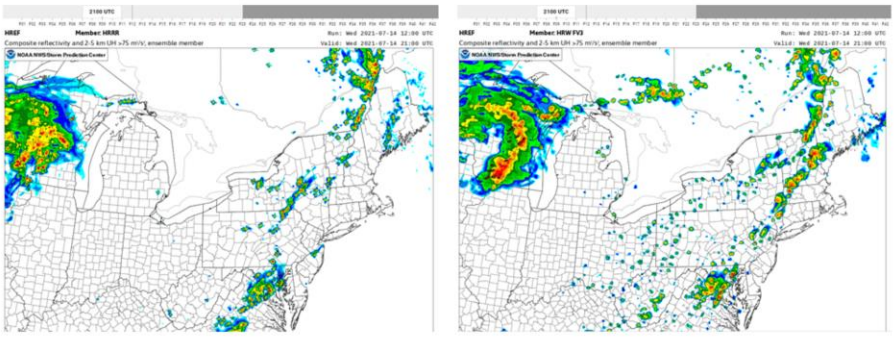
Precipitable water values were forecast to increase to between 1.5 and 2.0 inches with a warm cloud depth greater than 11,000 feet.

HREF – MUCAPE at 21z and prob QPF > 1 inch



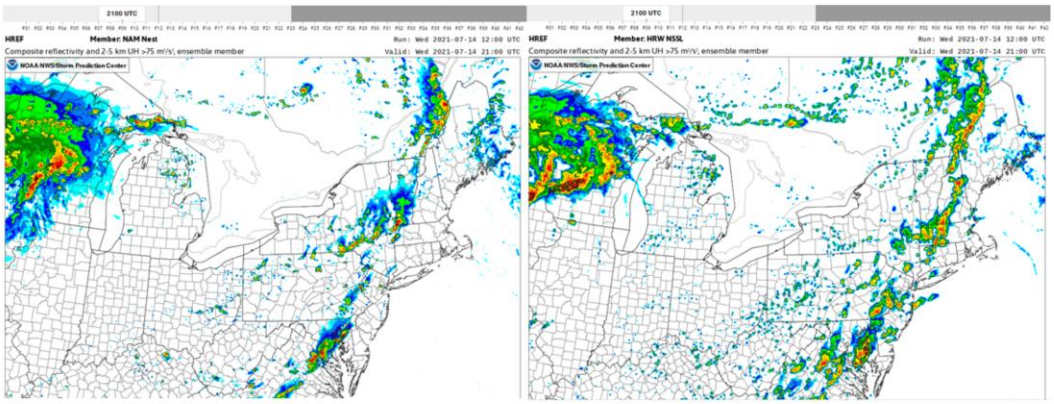
MUCAPE forecasts from the high resolution ensemble forecast (HREF) showed values near 2000 J/kg over the Hudson valley by late in the day. The high-resolution models in the ensemble did not indicate a strong signal for heavy precipitation at any one location, as shown by low probabilities of greater than 1 inch of precipitation.

HRRR and FV3 reflectivity valid 21 UTC, July 14



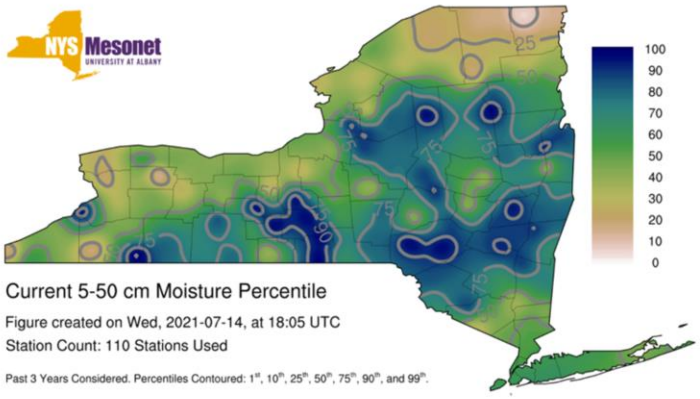
Reflectivity forecasts from the HRRR and FV3 high-resolution models indicated a broken line of showers and thunderstorms developing over eastern NY or western New England by late in the day, associated with the surface trough across that area.

NAM and NSSL WRF valid 21 UTC, July 14



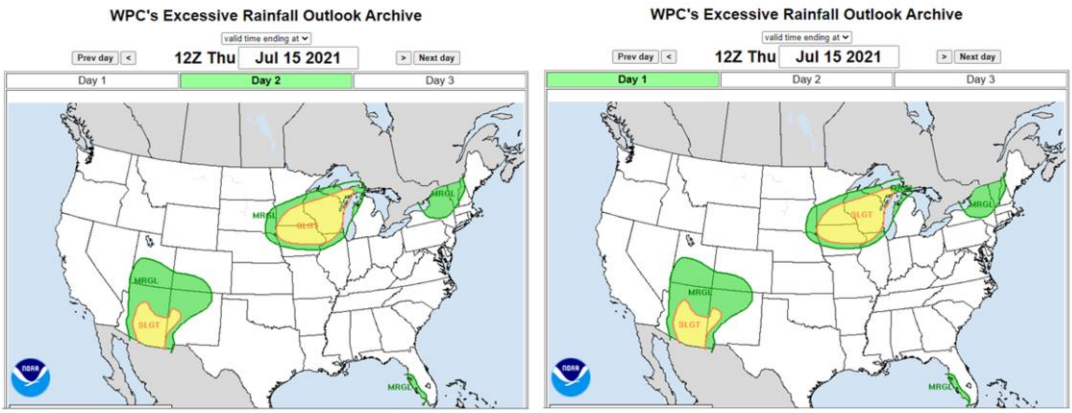
Forecasts from the NAM and NSSL were similar, showing broken lines of convection over eastern New York and western New England.

Meso-net 5-50 cm soil moisture



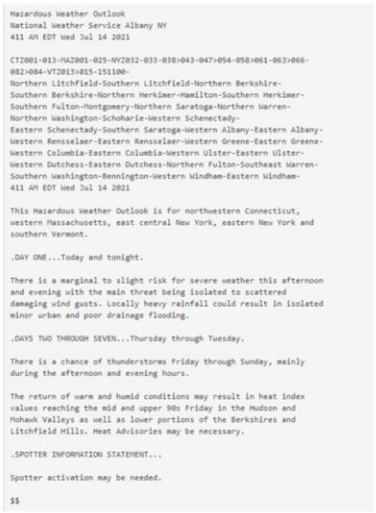
Soil moisture from the New York Meso-net indicated above normal values for most of eastern New York, with some areas near the 90th percentile of 5-50 cm soil moisture.

Excessive rainfall forecasts

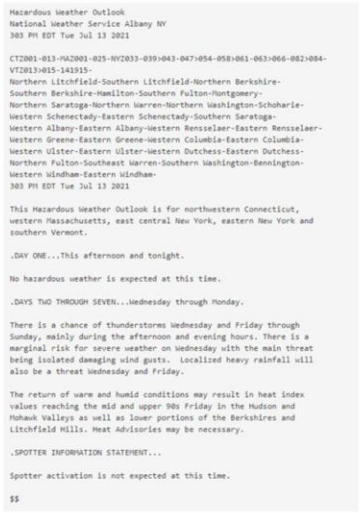


Excessive rainfall forecasts from the weather predication center (WPC) indicated a marginal potential for excessive rainfall across eastern upstate New York. The forecast from day 2 to day 1 did not change.

Hazardous weather outlooks



```
Hazardous Weather Outlook
National Weather Service Albany NY
411 AM EDT Wed Jul 14 2021

CTZ001-013-MAZ001-025-NYZ032-033-038>043-047>054-058>061-063>066-
082>084-VTZ013>015-151100-
Northern Litchfield-Southern Litchfield-Northern Berkshire-
Southern Berkshire-Northern Herkimer-Hamilton-Southern Herkimer-
Southern Fulton-Montgomery-Northern Saratoga-Northern Warren-
Northern Washington-Schoharie-Western Schenectady-
Eastern Schenectady-Southern Saratoga-Western Albany-Eastern Albany-
Western Rensselaer-Eastern Rensselaer-Western Greene-Eastern Greene-
Western Columbia-Eastern Columbia-Western Ulster-Eastern Ulster-
Western Dutchess-Eastern Dutchess-Northern Fulton-Southeast Warren-
Southern Washington-Bennington-Western Windham-Eastern Windham-
411 AM EDT Wed Jul 14 2021

This Hazardous Weather Outlook is for northwestern Connecticut,
western Massachusetts, east central New York, eastern New York and
southern Vermont.

.DAY ONE...Today and tonight.

There is a marginal to slight risk for severe weather this afternoon
and evening with the main threat being isolated to scattered
damaging wind gusts. Locally heavy rainfall could result in isolated
minor urban and poor drainage flooding.

.DAYS TWO THROUGH SEVEN...Thursday through Tuesday.

There is a chance of thunderstorms Friday through Sunday, mainly
during the afternoon and evening hours.

The return of warm and humid conditions may result in heat index
values reaching the mid and upper 90s Friday in the Hudson and
Mohawk Valleys as well as lower portions of the Berkshires and
Litchfield Hills. Heat Advisories may be necessary.

.SPOTTER INFORMATION STATEMENT...

Spotter activation may be needed.

$$
```



```
Hazardous Weather Outlook
National Weather Service Albany NY
303 PM EDT Tue Jul 13 2021

CTZ001-013-MAZ001-025-NYZ033-039>043-047>054-058>061-063>066-082>084-
VTZ013>015-142015-
Northern Litchfield-Southern Litchfield-Northern Berkshire-
Southern Berkshire-Hamilton-Southern Fulton-Montgomery-
Northern Saratoga-Northern Warren-Northern Washington-Schoharie-
Western Schenectady-Eastern Schenectady-Southern Saratoga-
Western Albany-Eastern Albany-Western Rensselaer-Eastern Rensselaer-
Western Greene-Eastern Greene-Western Columbia-Eastern Columbia-
Western Ulster-Eastern Ulster-Western Dutchess-Eastern Dutchess-
Northern Fulton-Southeast Warren-Southern Washington-Bennington-
Western Windham-Eastern Windham-
303 PM EDT Tue Jul 13 2021

This Hazardous Weather Outlook is for northwestern Connecticut,
western Massachusetts, east central New York, eastern New York and
southern Vermont.

.DAY ONE...This afternoon and tonight.

No hazardous weather is expected at this time.

.DAYS TWO THROUGH SEVEN...Wednesday through Monday.

There is a chance of thunderstorms Wednesday and Friday through
Sunday, mainly during the afternoon and evening hours. There is a
marginal risk for severe weather on Wednesday with the main threat
being isolated damaging wind gusts.  Localized heavy rainfall will
also be a threat Wednesday and Friday.

The return of warm and humid conditions may result in heat index
values reaching the mid and upper 90s Friday in the Hudson and
Mohawk Valleys as well as lower portions of the Berkshires and
Litchfield Hills. Heat Advisories may be necessary.

.SPOTTER INFORMATION STATEMENT...

Spotter activation is not expected at this time.

$$
```

Hazardous weather outlooks from the National Weather Service Forecast Office in Albany mentioned the potential for localized heavy rainfall with minor urban and poor drainage flooding.

Briefing

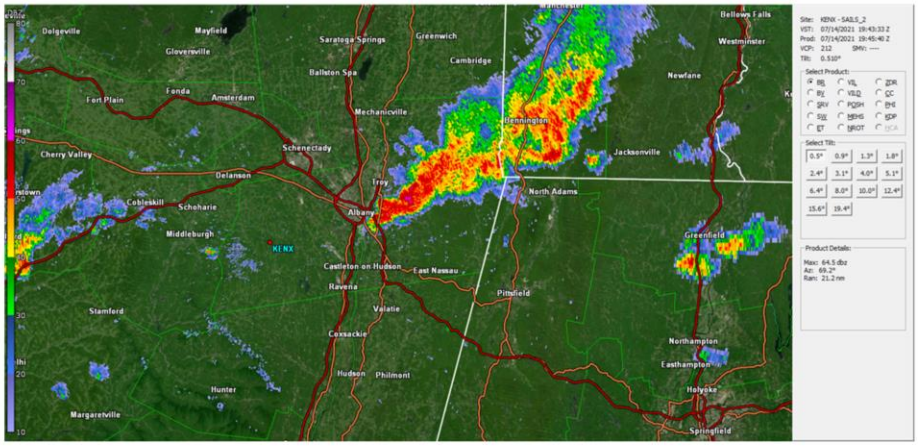
NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Main Points

Hazard	Impacts	Location	Timing
Severe Storms 	Damaging wind gusts resulting in isolated to scattered downed trees, large tree limbs and power lines.	Across east central New York and adjacent western New England	This afternoon
Heavy Rainfall 	Minor flooding of poor drainage and low lying areas. Ponding of water on roadways. An isolated flash flood is possible.	Across east central New York from the Capital Region northward and southern VT	This afternoon into this evening

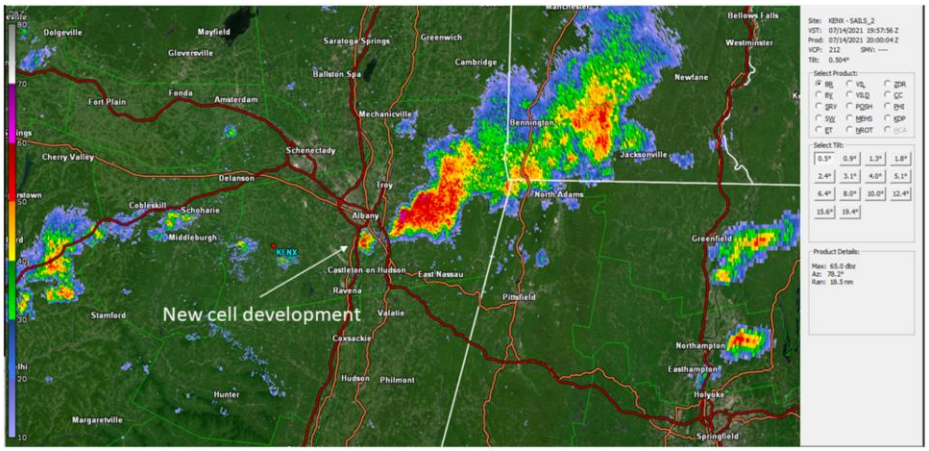
A briefing from the NWS at Albany issued early on the 14th highlighted the potential for heavy rain from the Capital District northward during the afternoon on the 14th.

Radar reflectivity – 1945 UTC



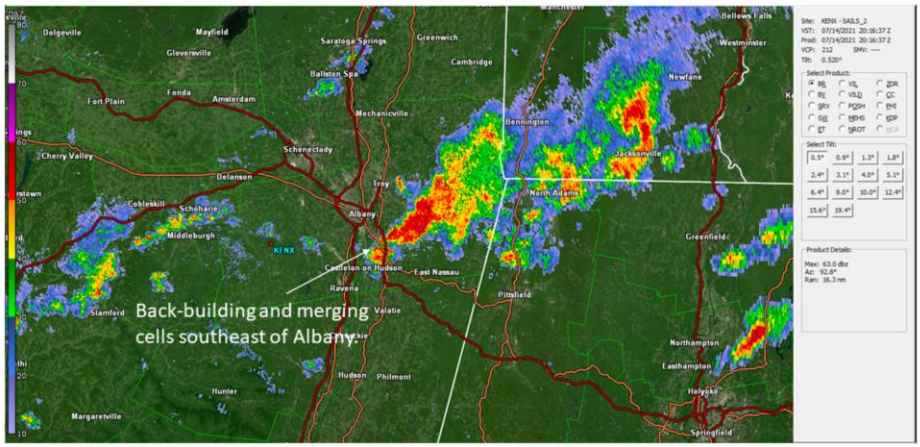
Radar at 1945 UTC showed a band of heavy rain east of Albany over northern and central Rensselaer county.

Radar reflectivity – 20 UTC



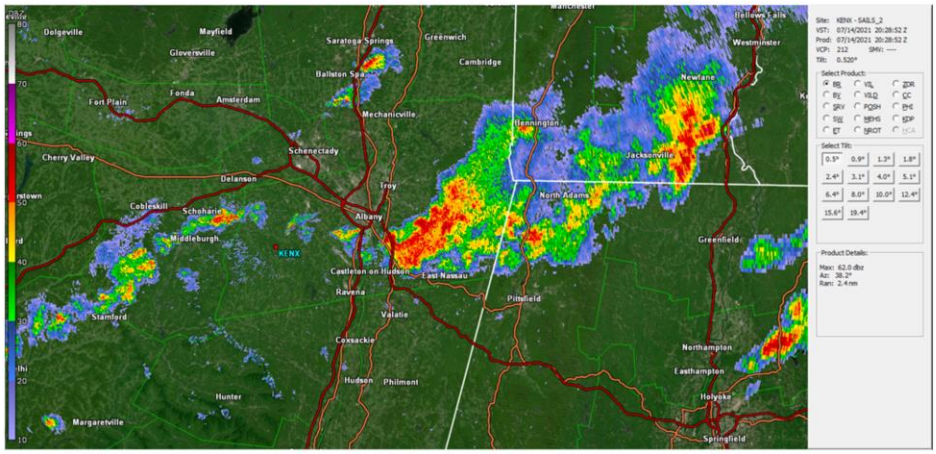
At 20 UTC, the band was moving slowly east, however another small area of heavy rain was developing just to the south of Albany.

Radar reflectivity – 2015 UTC



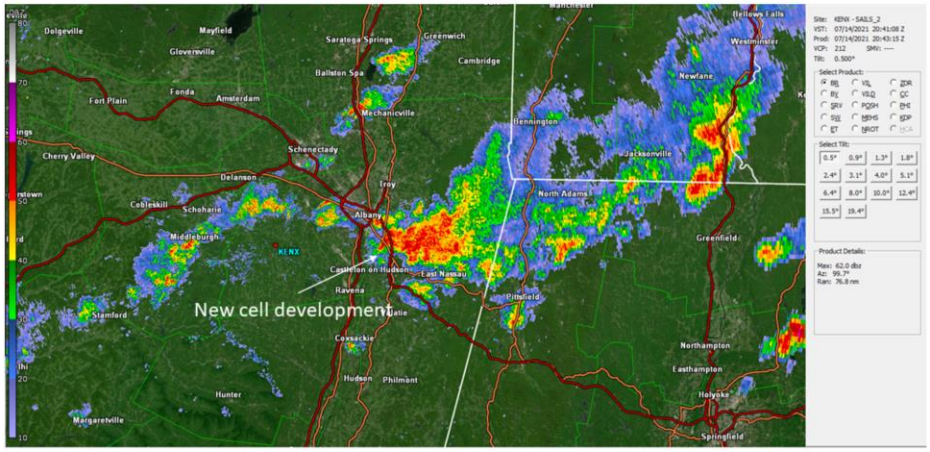
At 2015 UTC, the southwest part of the heavy rain band was beginning to build back to the southwest, and was about to merge with the developing rain area south of Albany.

Radar reflectivity – 2030 UTC



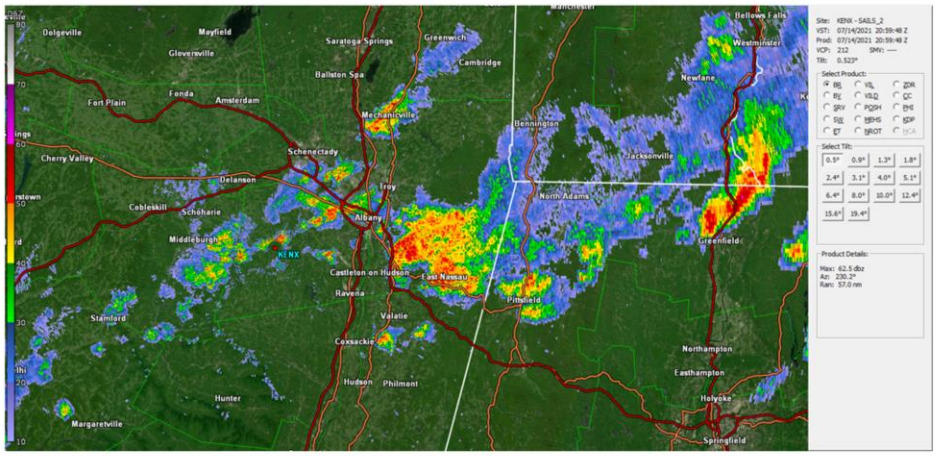
At 2030 UTC the merger occurred, resulting in a prolonged period of heavy rain southeast of Albany over Rensselaer county.

Radar reflectivity – 2045 UTC



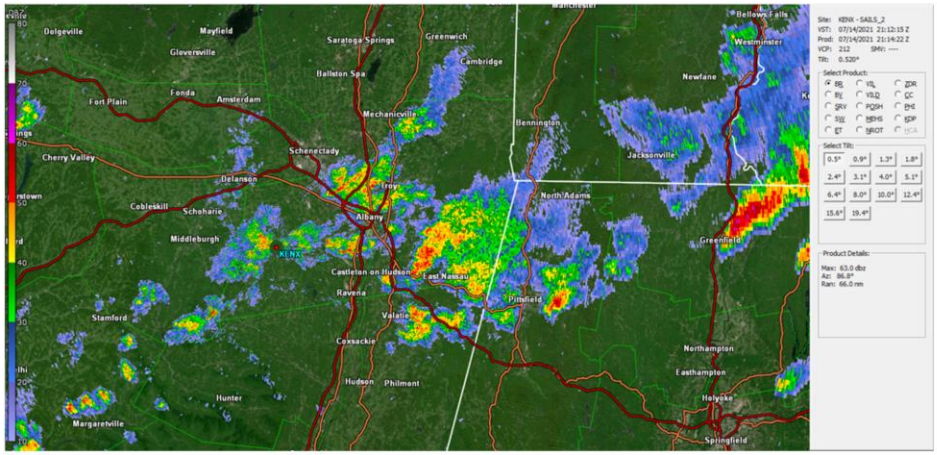
More new cell development occurred south of Albany by 2045, with these new cells merging into the southwest flank of the convective storms covering central Rensselaer county.

Radar reflectivity – 21 UTC



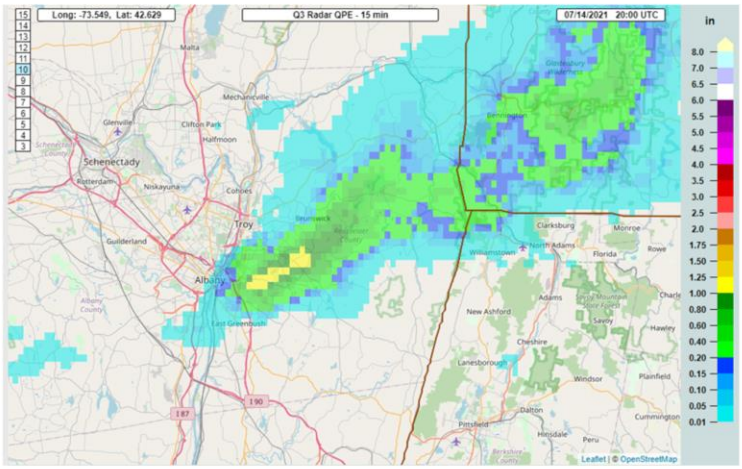
By 21 UTC, a large area of heavy rain covered central and southern Rensselaer county. Very heavy rain had fallen over this area for the past hour.

Radar reflectivity – 2115 UTC



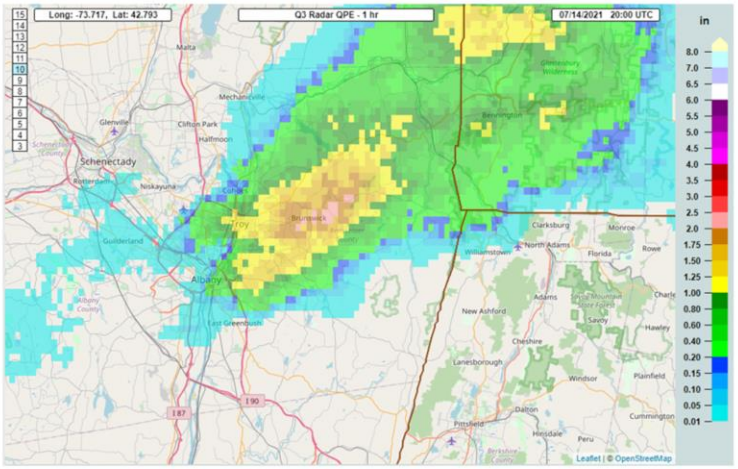
By 2115 UTC, the heavy rain was beginning to break up and move off to the east.

MRMS 15 minute QPE at 20 UTC



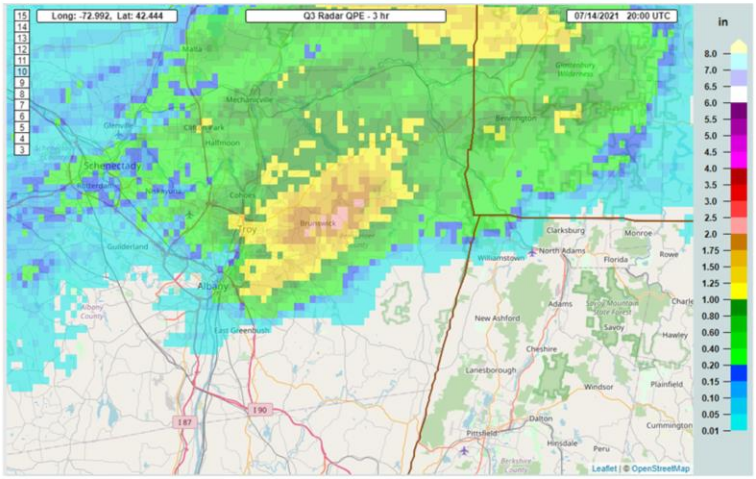
MRMS 15 minute QPF indicated that rainfall rates east of Albany were over one inch in 15 minutes around 20 UTC.

MRMS 1 hour QPE at 20 UTC



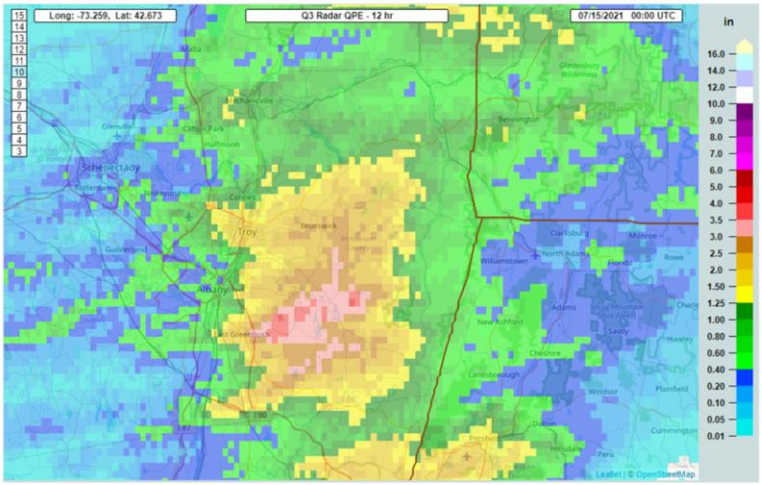
One hour QPE was over 2.0 inches in that same area.

MRMS 3 hour QPE at 20 UTC



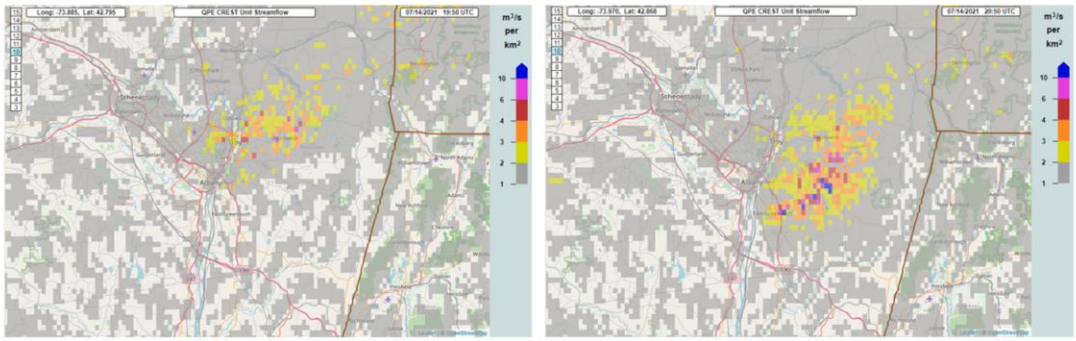
3 hour QPE was also from 2.0 to 2.5 inches across the area east-northeast of Albany.

MRMS 12 hour QPE at 00 UTC



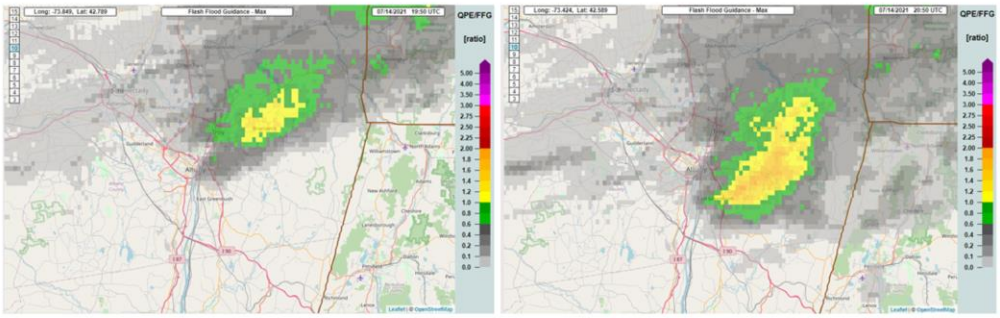
12-hour, or storm total QPE ranged from 3.0 to 4.0 inches over hardest hit areas east of Albany.

FLASH – unit stream flow at 1950 UTC and 2050 UTC



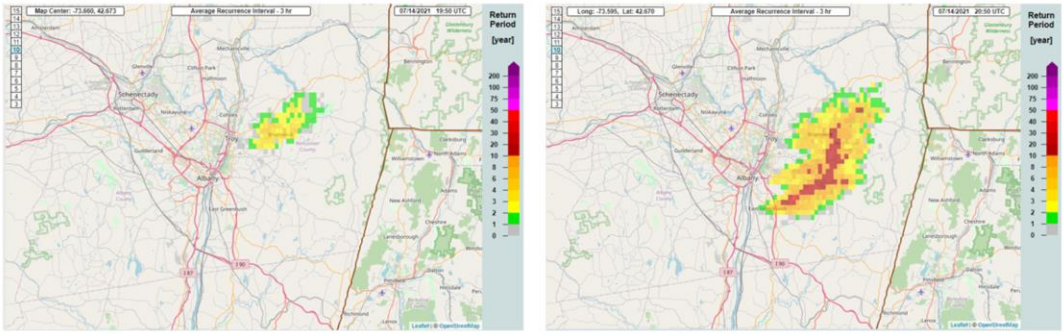
Unit streamflow from the CREST model indicated values of over 10^3/s per km^2, or the equivalent of 1000 m^3/s.

Max QPE / FFG ratio at 1950 UTC and 2050 UTC



Rainfall rates exceeded 150 percent of rain required to initiate flash flooding around 2000 UTC.

Recurrence – 3 hour – 1950 UTC and 2050 UTC



The recurrence interval for the 3 hour rainfall rate for this case was between 10 and 20 years.

Flash flooding in Rensselaer county

Significant flooding occurred in Rensselaer county to the east of Albany.