The April 21st 2021 Amenia, New York and Kent, Connecticut Tornadoes

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NBC Connecticut Severe Weather Workshop
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Outline

- Overview/Motivation
- Tornado Survey/Damage Assessment
- Meteorological Analysis (Synoptic, Sounding, Environmental Conditions)
- Radar Analysis
- Satellite Analysis
- Summary/Conclusion

Overview/Motivation

- Dynamic late April storm system produced severe weather and record-breaking tornadoes in its warm sector, and thundersnow/accumulating snow in its cold sector

- As much as 4” of snow fell in Indian Lake (Herkimer County). As much as a coating was reported over the lower elevations including 0.5” in Schenectady and 0.1” in Albany

- Rapid changeover from rain to snow

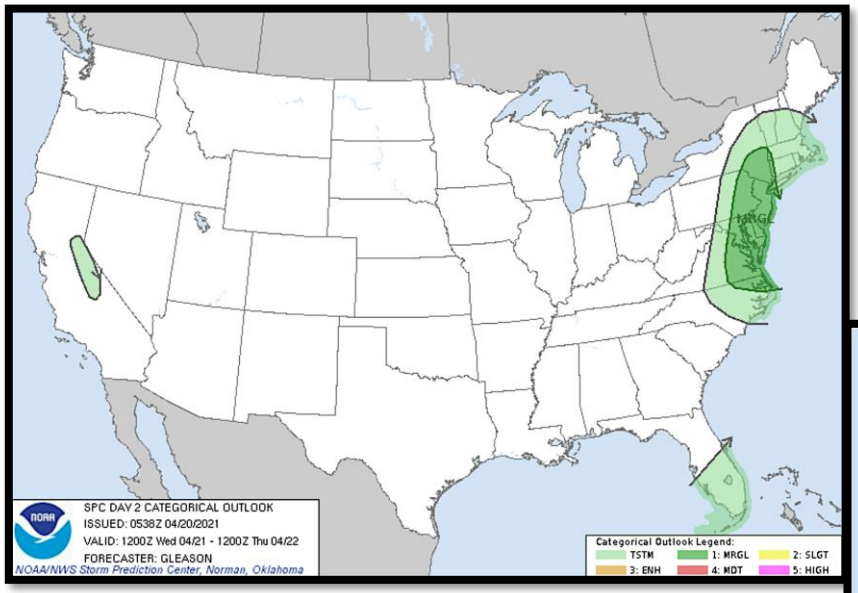
- Large temperature gradient was in place over our cwa (20s north, 60s-near 70F south)

- Several small hail reports, a number of damaging wind reports (Litchfield, Dutchess, and Ulster), and a couple of tornadoes (Amenia, NY and Kent, CT)

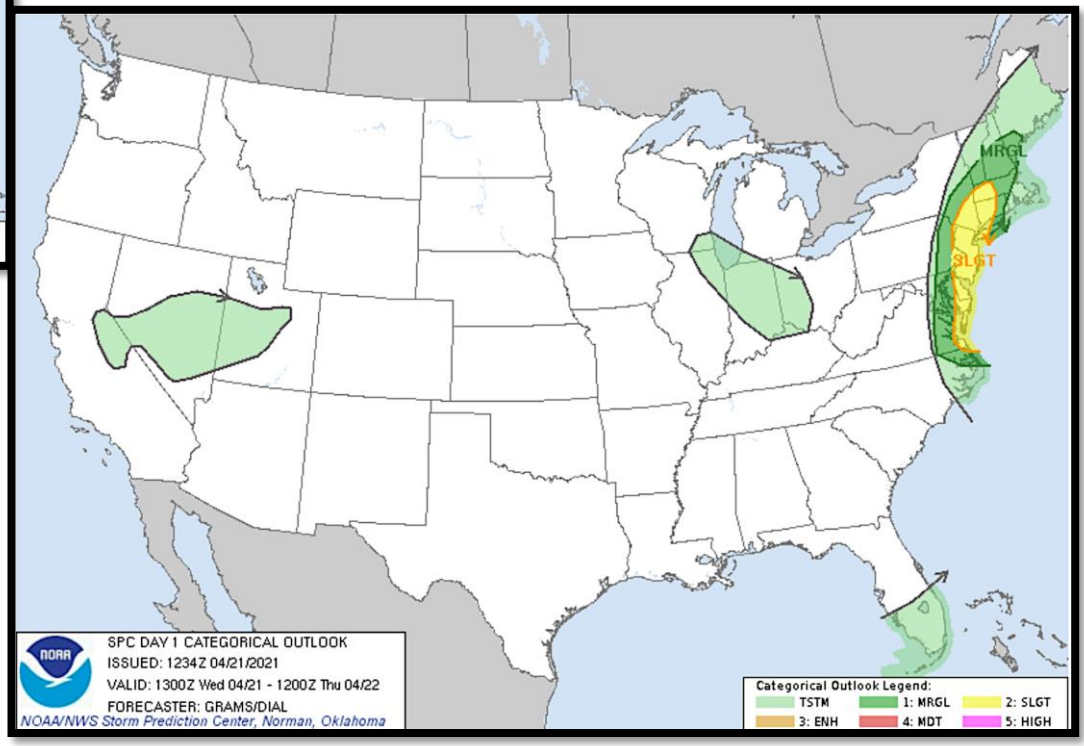
- Low CAPE/High Shear environment

- Environment was favorable for low top, rotating storms (south/southeast)

April 20-21, 2021 SPC Day 1 and Day 2 Outlooks

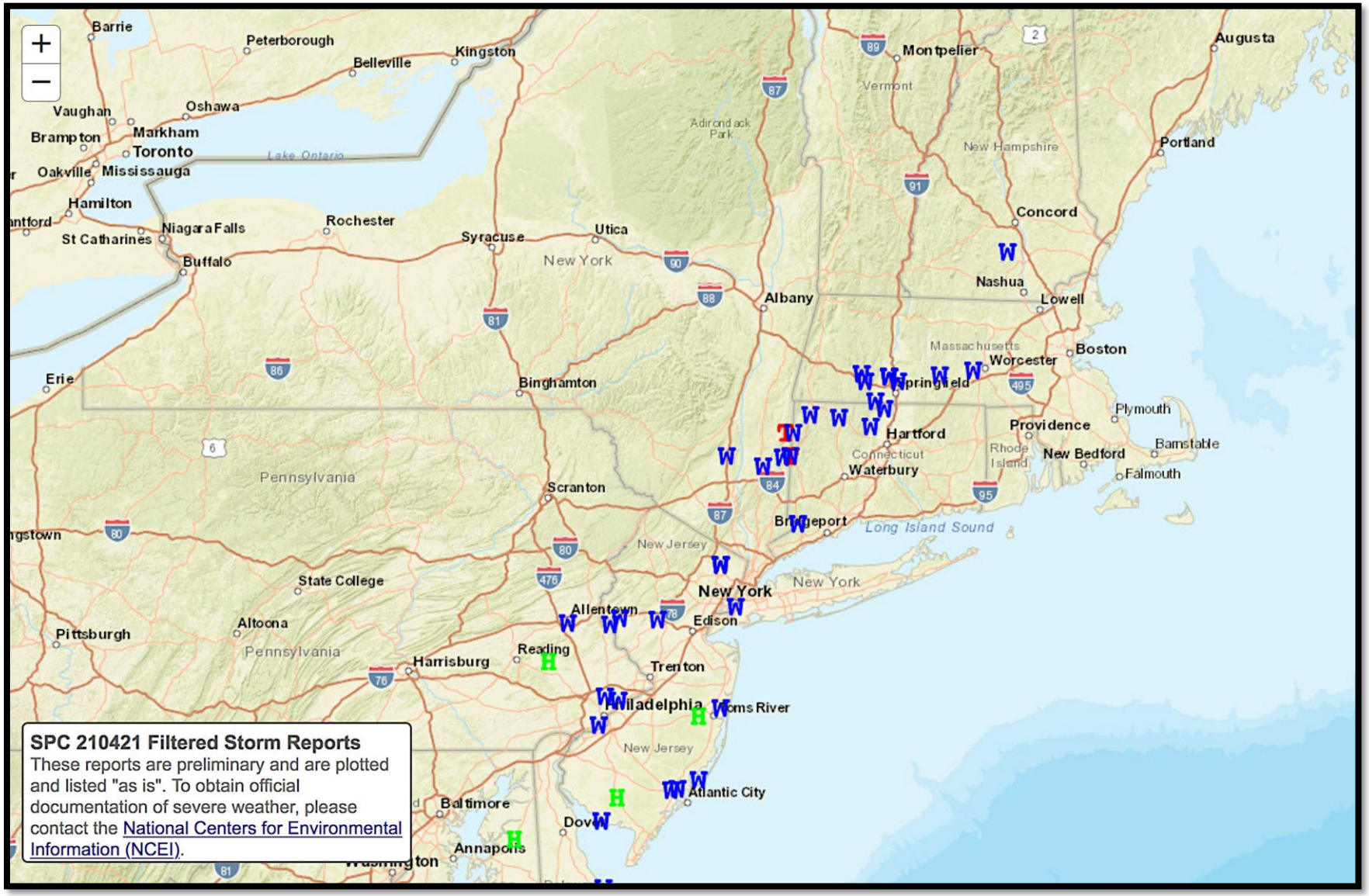


0600 UTC Day 2 Outlook



1300 UTC Day 1 Outlook

Storm Reports



NWS Damage Team Survey Results

Tornadoes

Tornado - Amenia, NY
Dutchess County, NY

Date	Wed April 21, 2021
Time (EDT)	2:49 PM to 2:51 PM
EF Rating	EF - 1
Est. Peak Winds	100 mph
Path Length	0.6 miles
Max Width	100
Injuries/Deaths	0/0

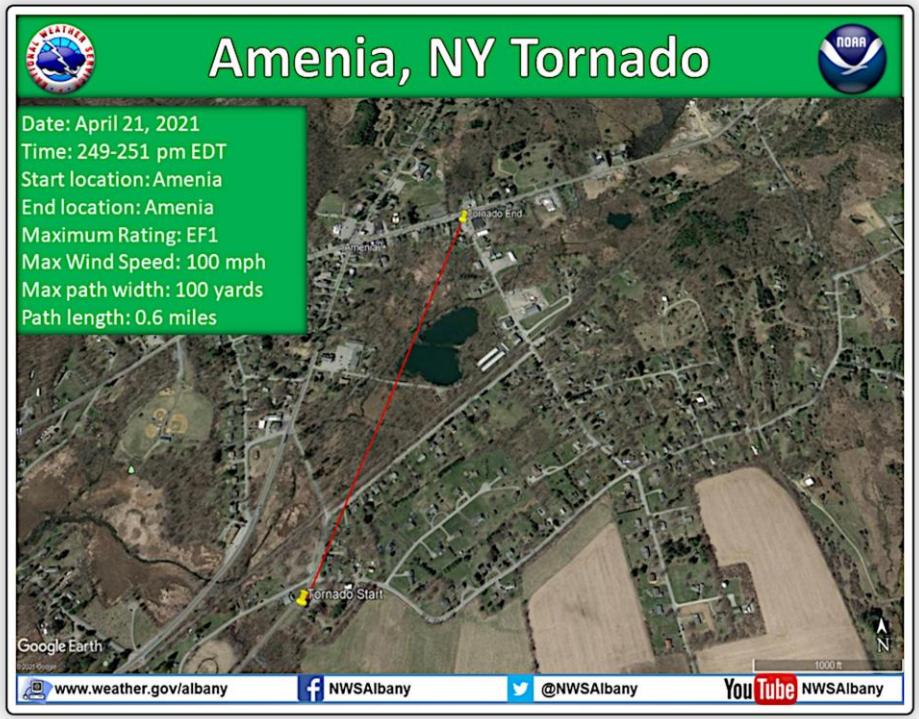
Summary:

A tornado briefly touched down just south of Amenia, New York and moved north northeast into the village. The tornado started near the intersection of Powder House Road and Ohandley Drive and caused sporadic damage along its path length. One house along Ohandley drive had partial roof damage and a two by four and a small branch driven into the side of the home. Nine out of ten homes on Ohandley Drive sustained damage. The tornado ended near the intersection of Mechanic Street and East Main Street where it ripped the roof off a restaurant.

Key Stats:

- The April 21 Amenia, NY Tornado in Dutchess County was the **earliest tornado on record in Dutchess County**
- Previous record for earliest tornado in Dutchess County was on May 12, 1984.

Track Map



NWS Damage Team Survey Results

Tornado - Kent, CT
Litchfield County, CT

Date	Wed April 21, 2021
Time (EDT)	2:49 PM to 2:51 PM
EF Rating	EF - 0
Est. Peak Winds	85 mph
Path Length	1 mile
Max Width	30 yards
Injuries/Deaths	0/0

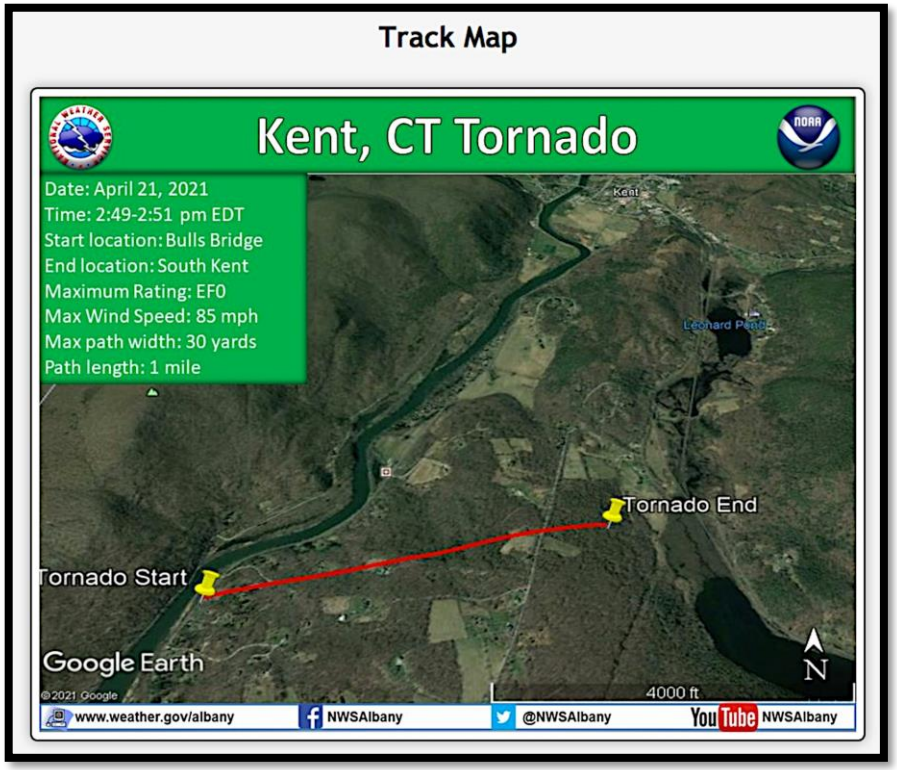
Summary:

A tornado briefly touched down just north of Bulls Bridge, Connecticut and moved east northeast into South Kent. The tornado damage was sporadic along the path which began along Route 7 just north of Bulls Bridge and consisted mostly of downed tree limbs. A few hardwood trees were snapped and uprooted and one home owner lost part of a solid wooden fence along Spooner Hill Road. A car tent canopy was blown away by the strong winds. No damage to buildings was noted. The tornado ended in a forested area east of Spooner Hill Road.

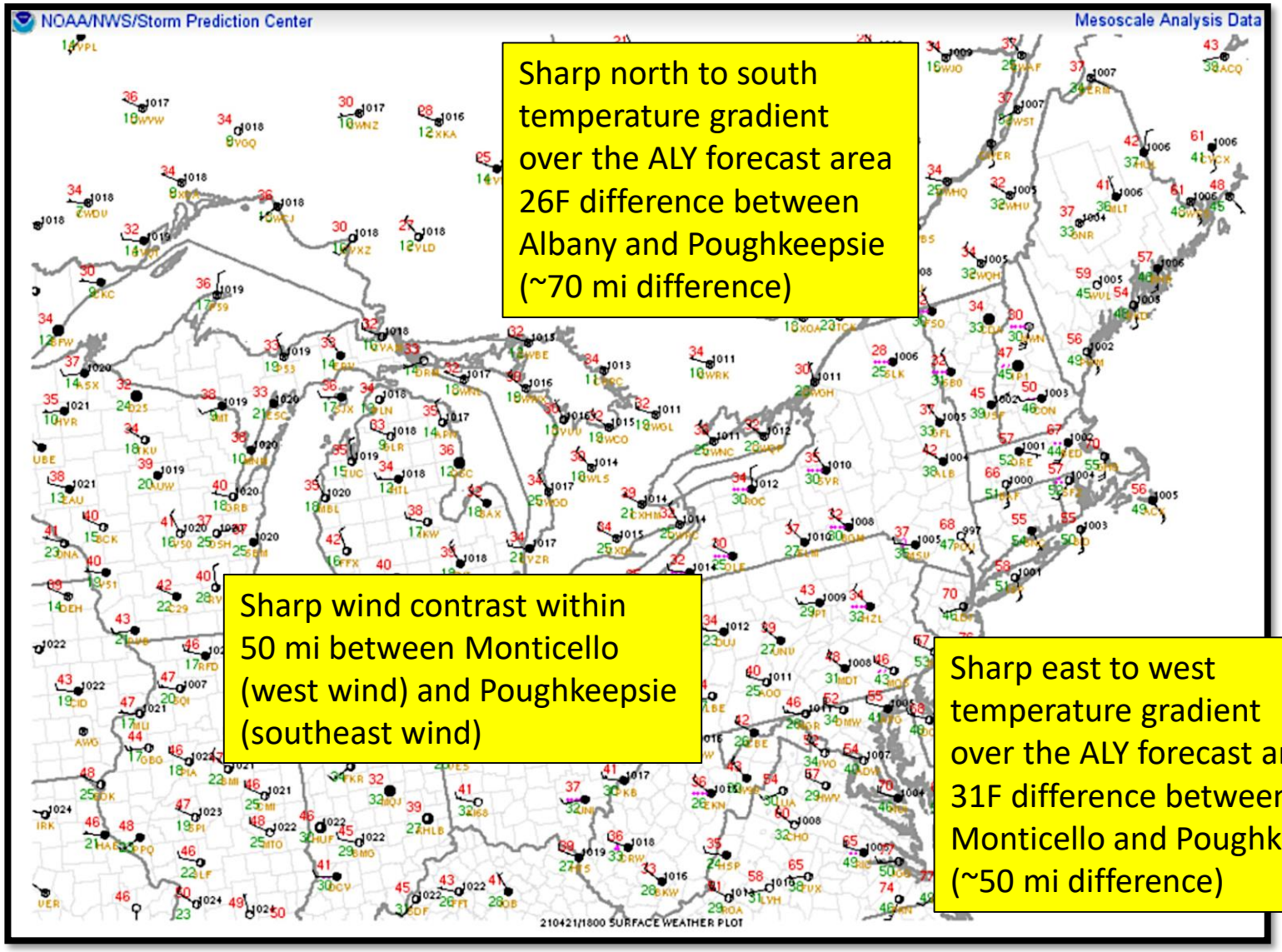
Key Stats:

- The April 21 Kent, CT Tornado in Litchfield County was the **earliest tornado in CT** on record.
- Previous record for earliest tornado in CT was on April 26, 1961 in Tolland County.
- Previous record for earliest tornado in Litchfield Co. was on May 12, 1959.
- **This tornado started 0.9 miles to the south/southwest from where the Kent, CT tornado of last year (August 27, 2020) began.**

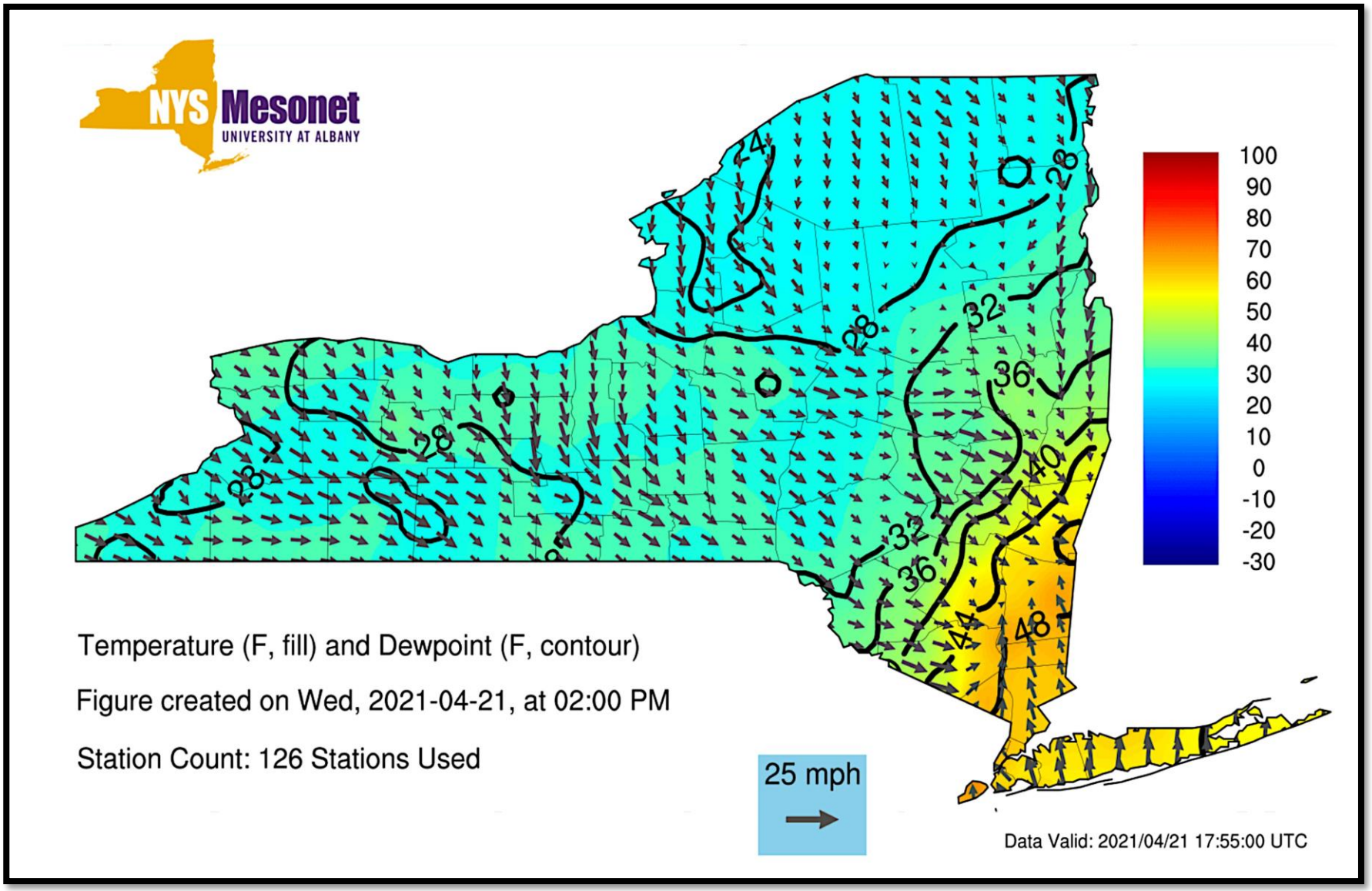
Track Map



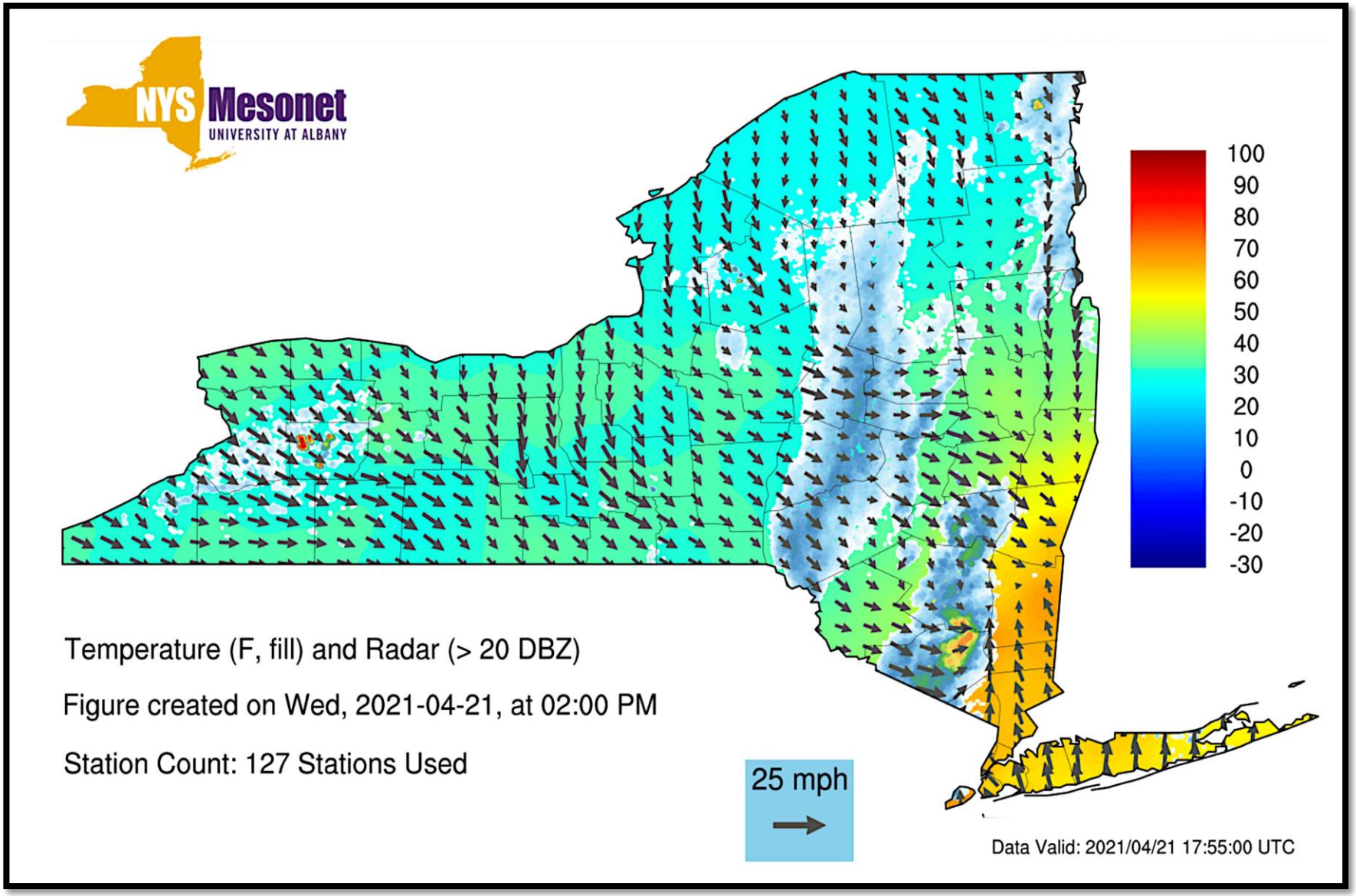
1800 UTC April 21, 2021 Surface Analysis



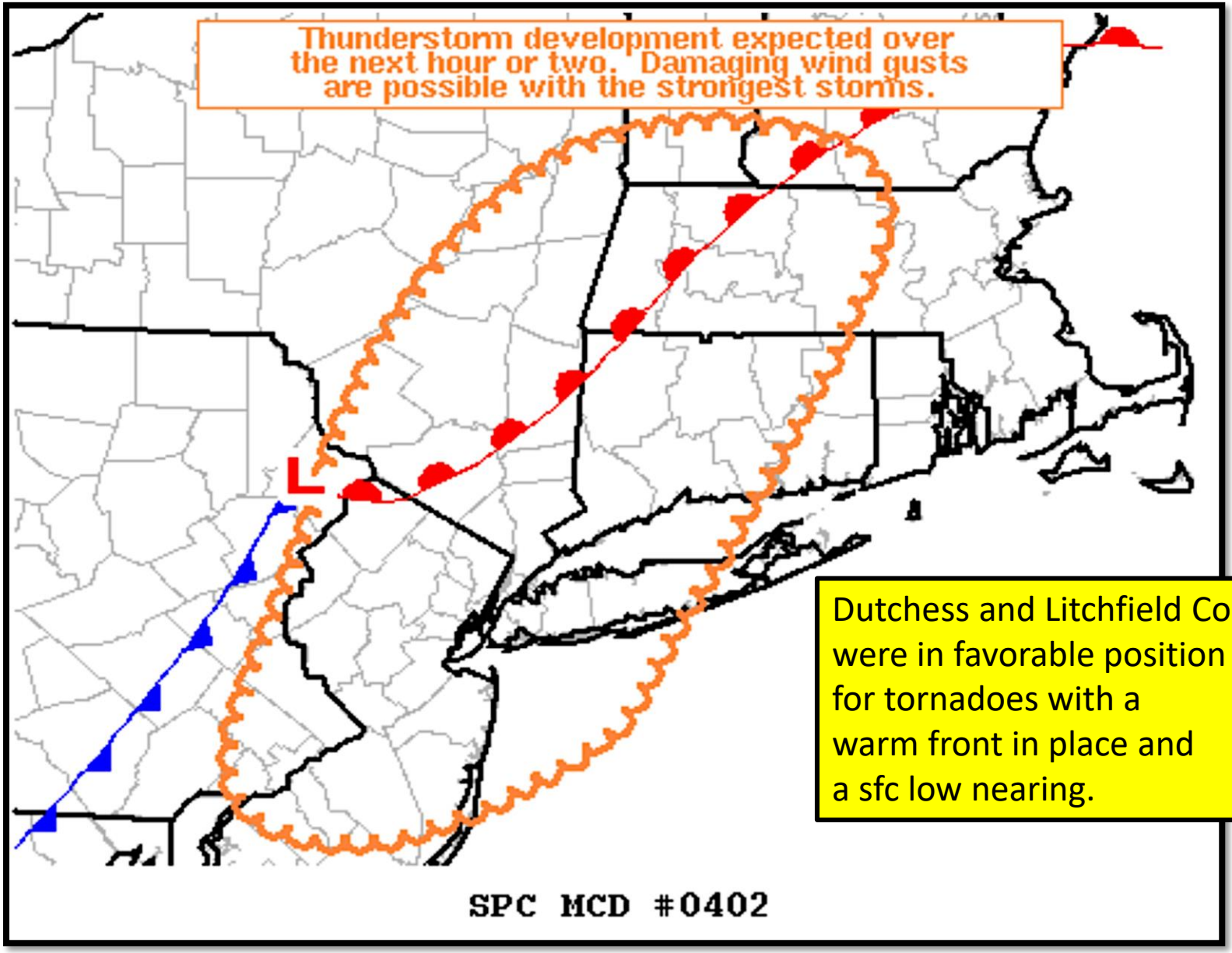
1755 UTC April 21, 2021 Temp, Dewpt, Winds



1755 UTC April 21, 2021 Temp, Radar, Winds

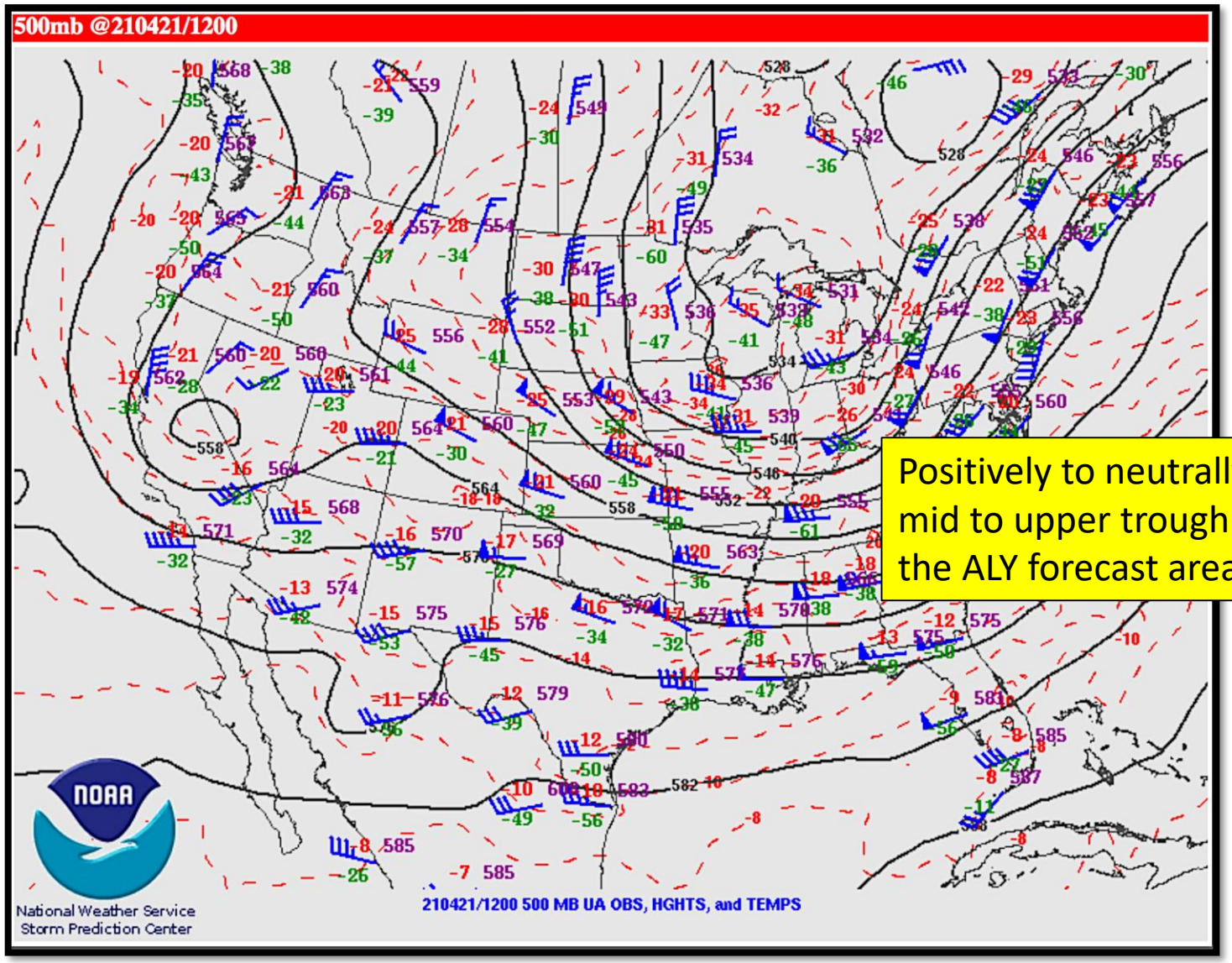


SPC issues Mesoscale Discussion at 11:49 am EDT



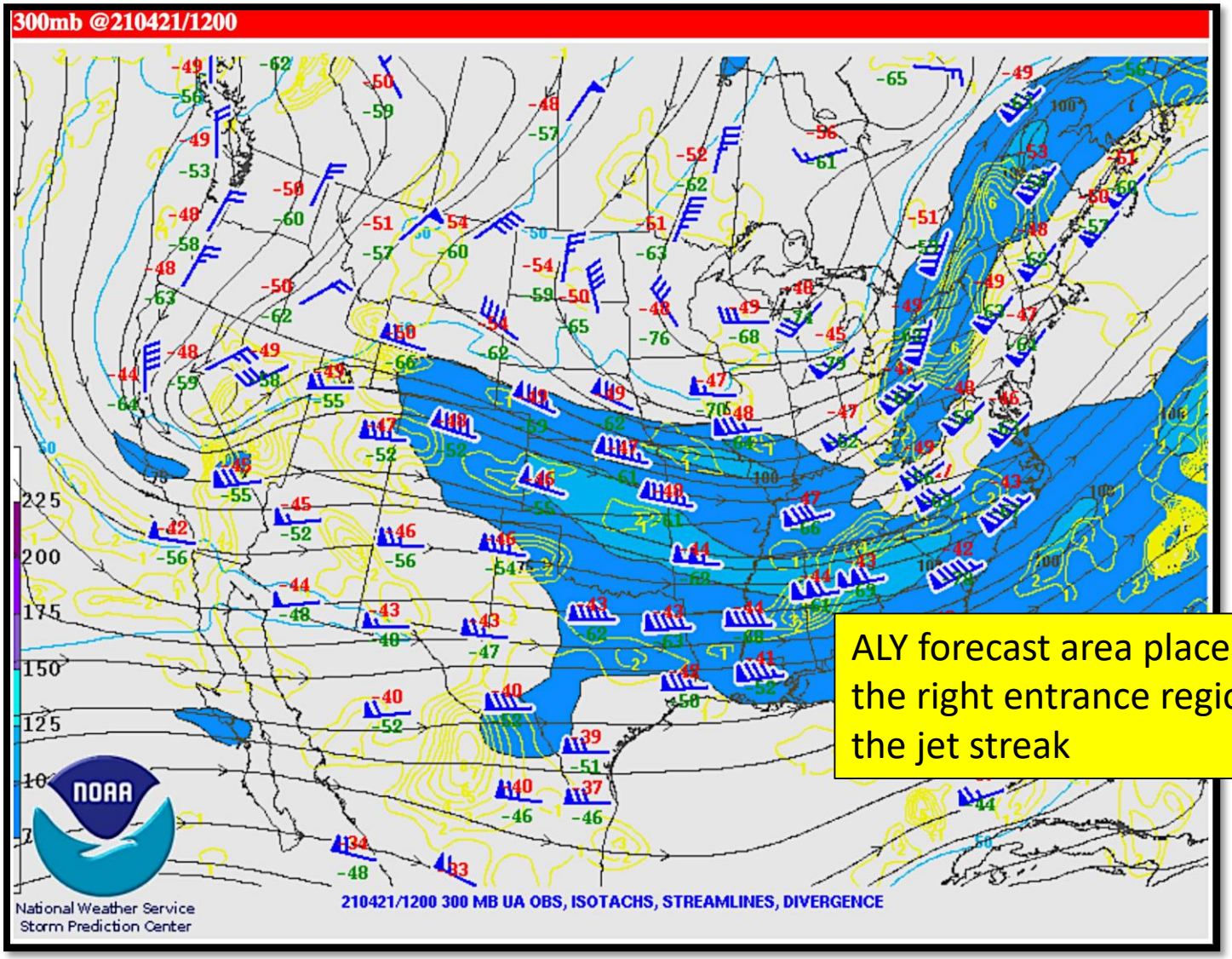
Dutchess and Litchfield Co. were in favorable position for tornadoes with a warm front in place and a sfc low nearing.

1200 UTC 500 mb Analysis



Positively to neutrally tilted mid to upper trough upstream the ALY forecast area

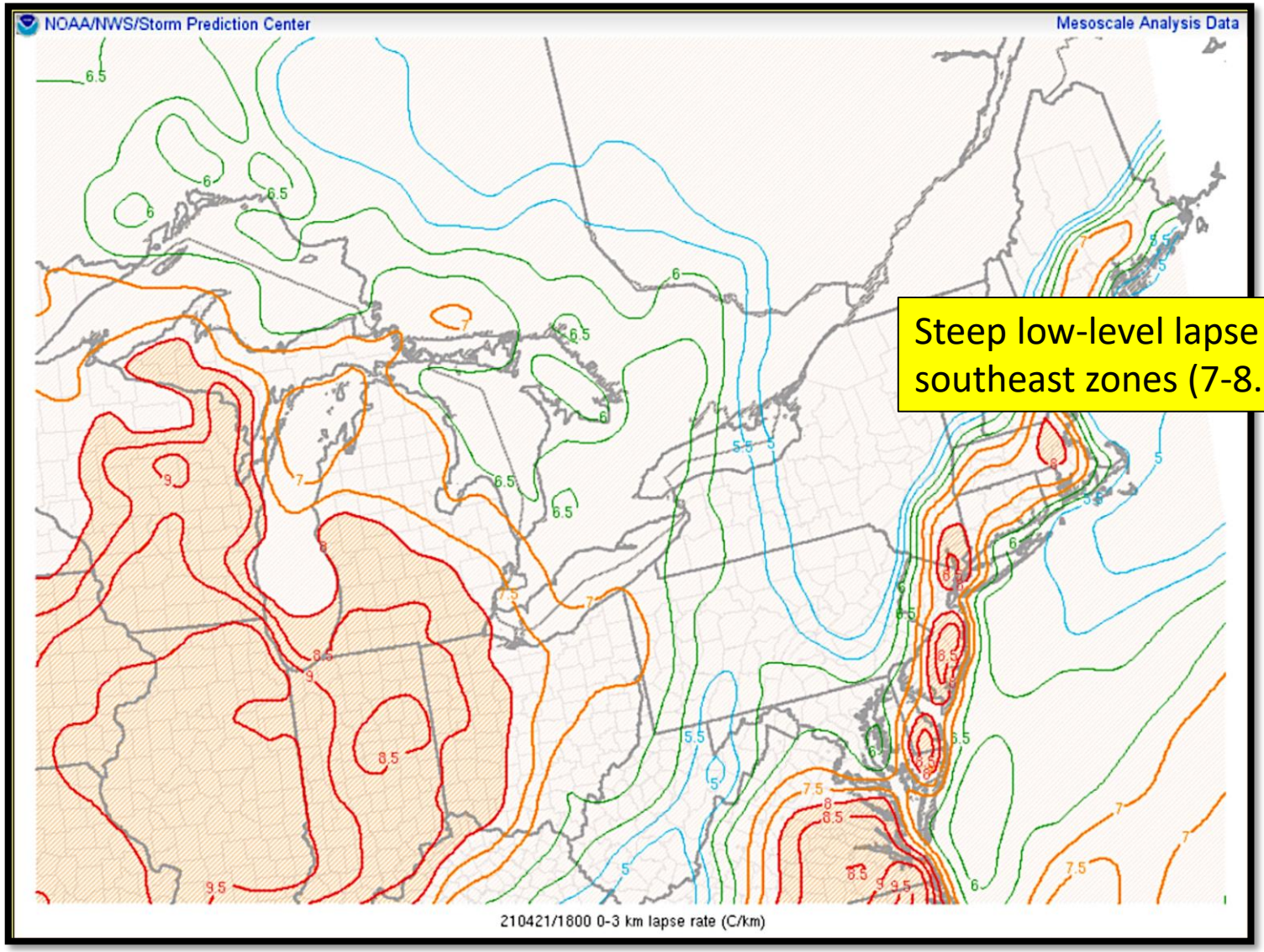
1200 UTC April 21, 2021 300 mb UA Observations



ALY forecast area placed near the right entrance region of the jet streak

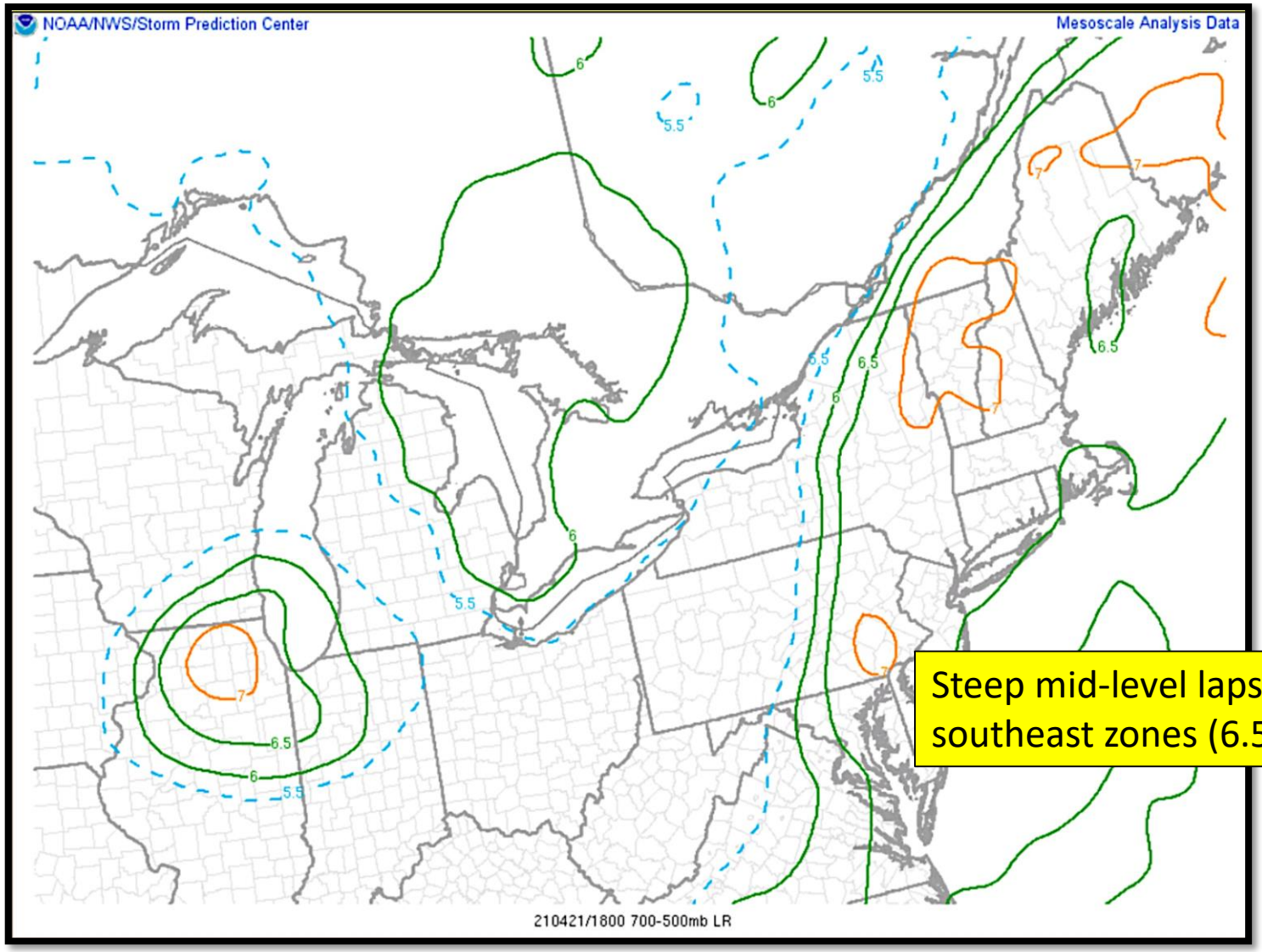
Right entrance region of jet streak

1800 UTC April 21, 2021 Low-Level Lapse Rates (C/km)



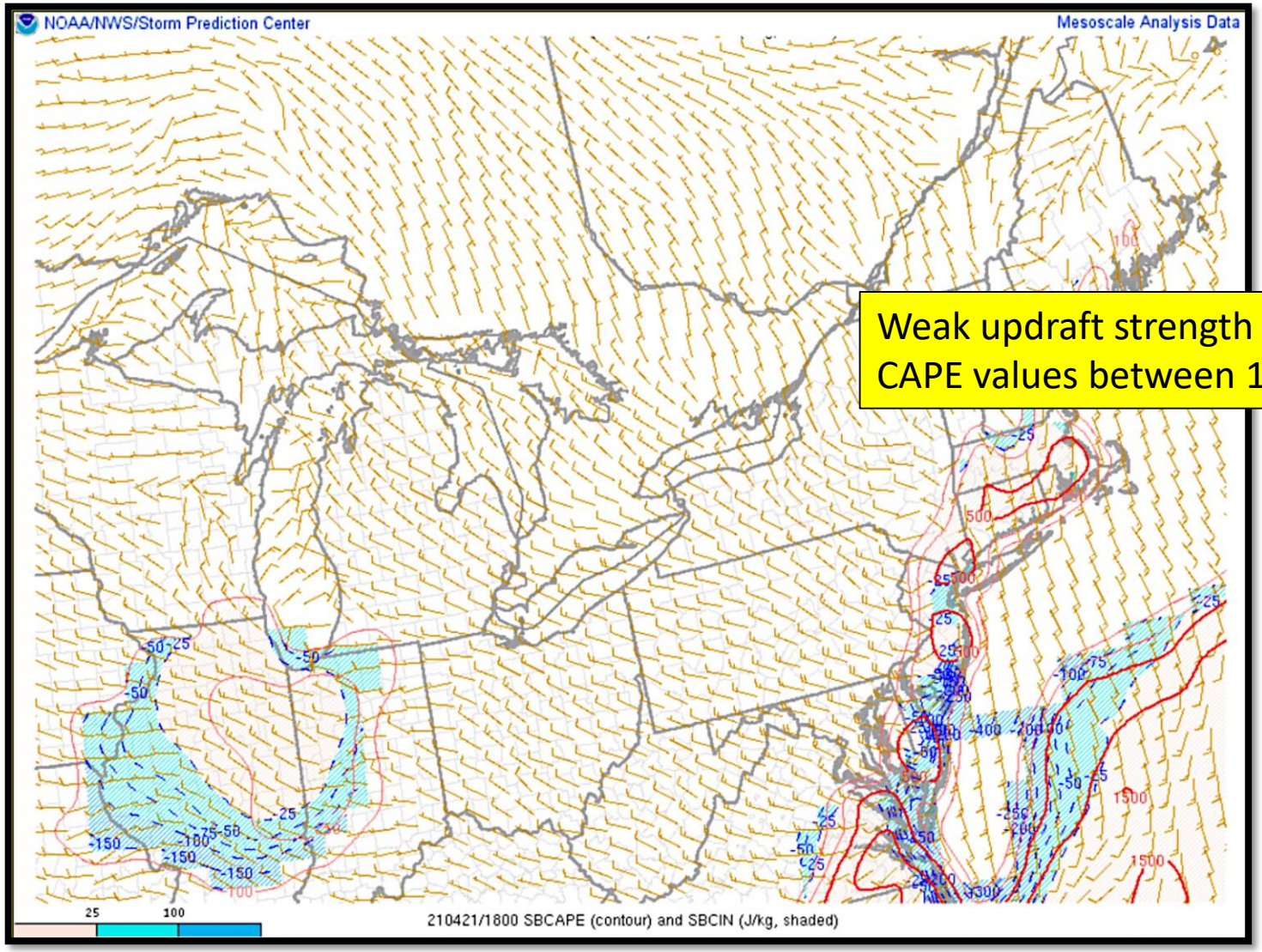
Steep low-level lapse rates southeast zones (7-8.5 C/km)

1800 UTC April 21, 2021 Mid-Level Lapse Rates (C/km)



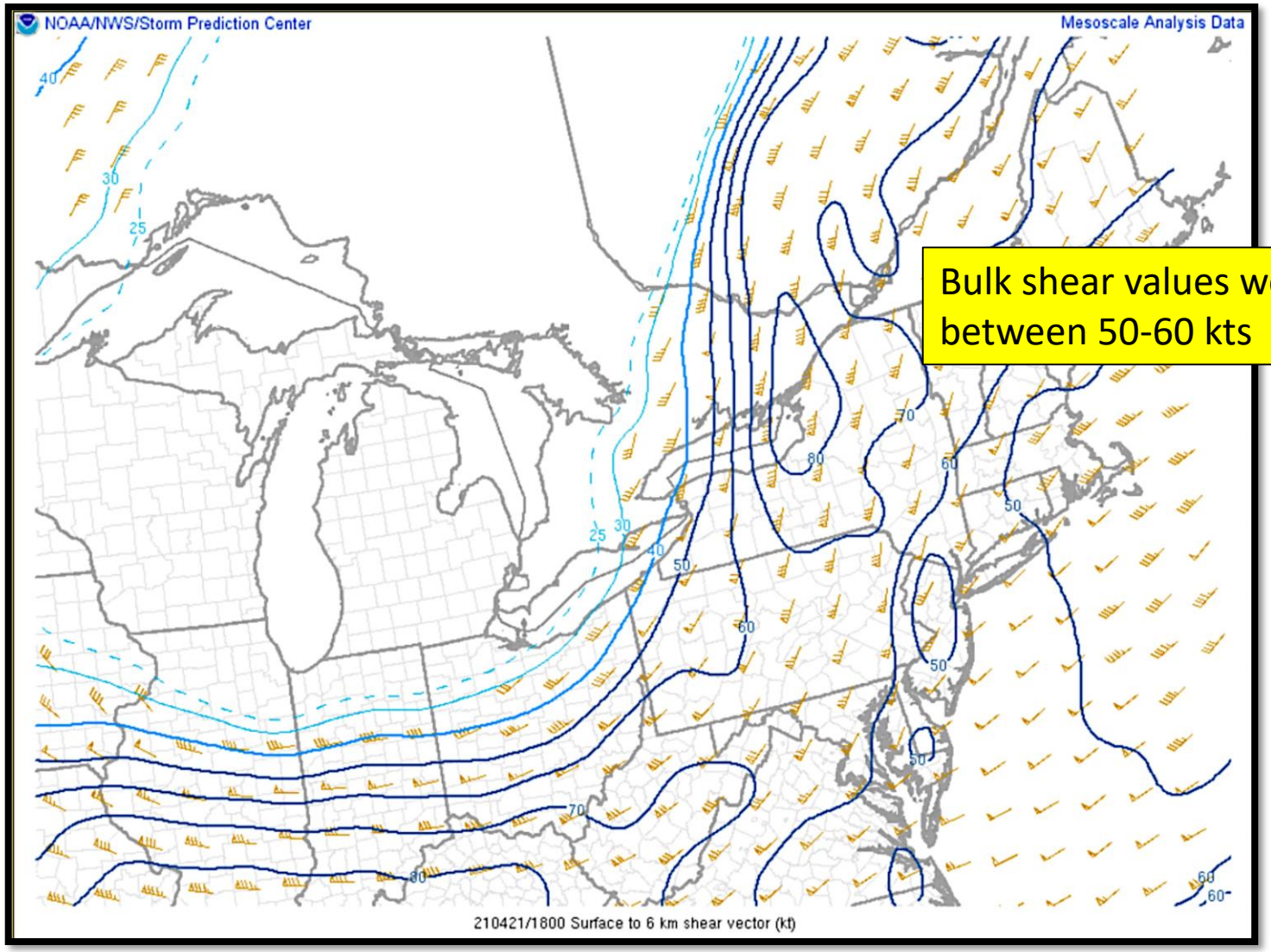
Steep mid-level lapse rates southeast zones (6.5-7 C/km)

1800 UTC April 21, 2021 SBCAPE and SBCIN (J/kg)



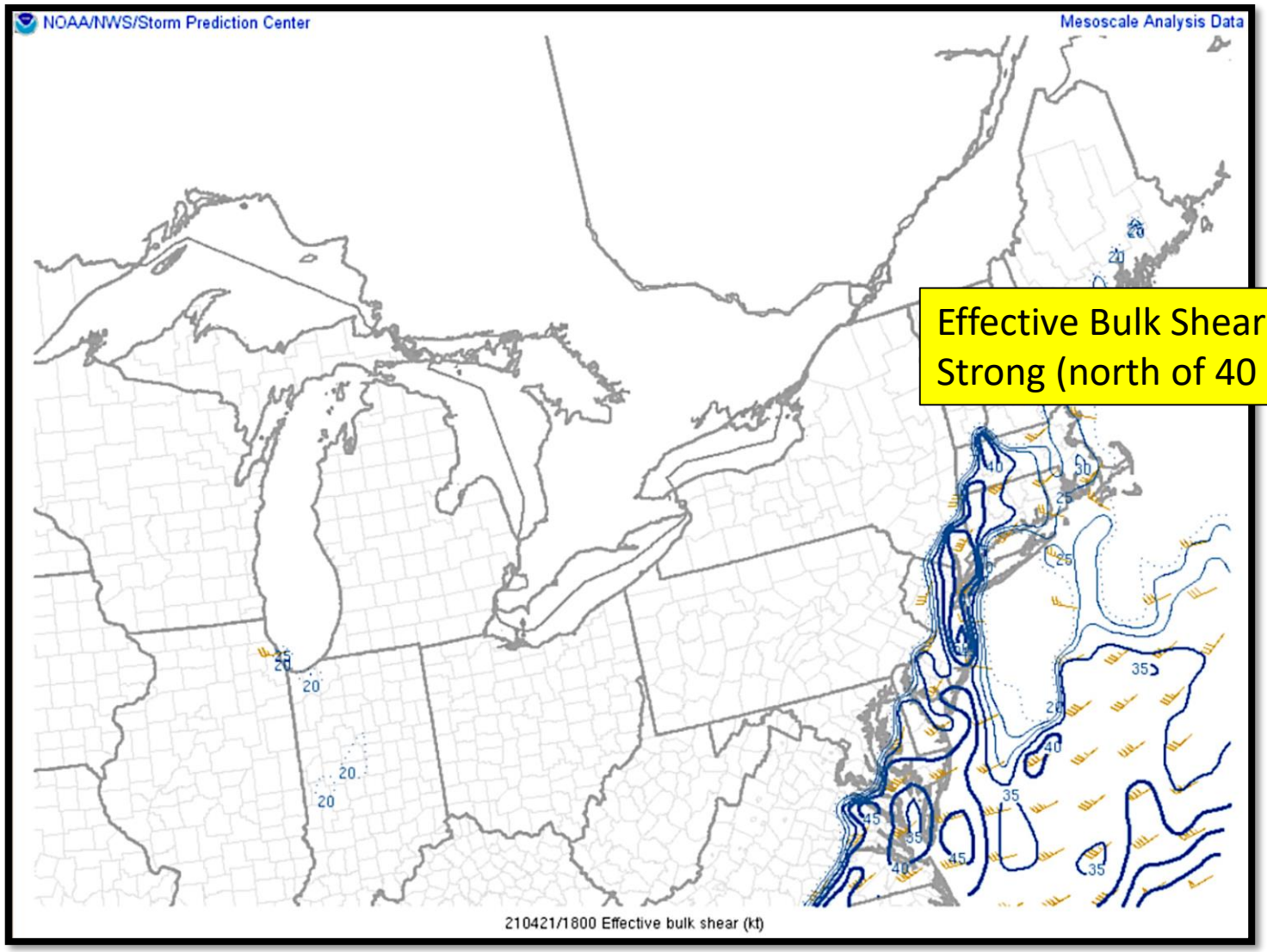
Weak updraft strength with
CAPE values between 100-500 J/kg

1800 UTC April 21, 2021 0-6 km Bulk Shear (kts)



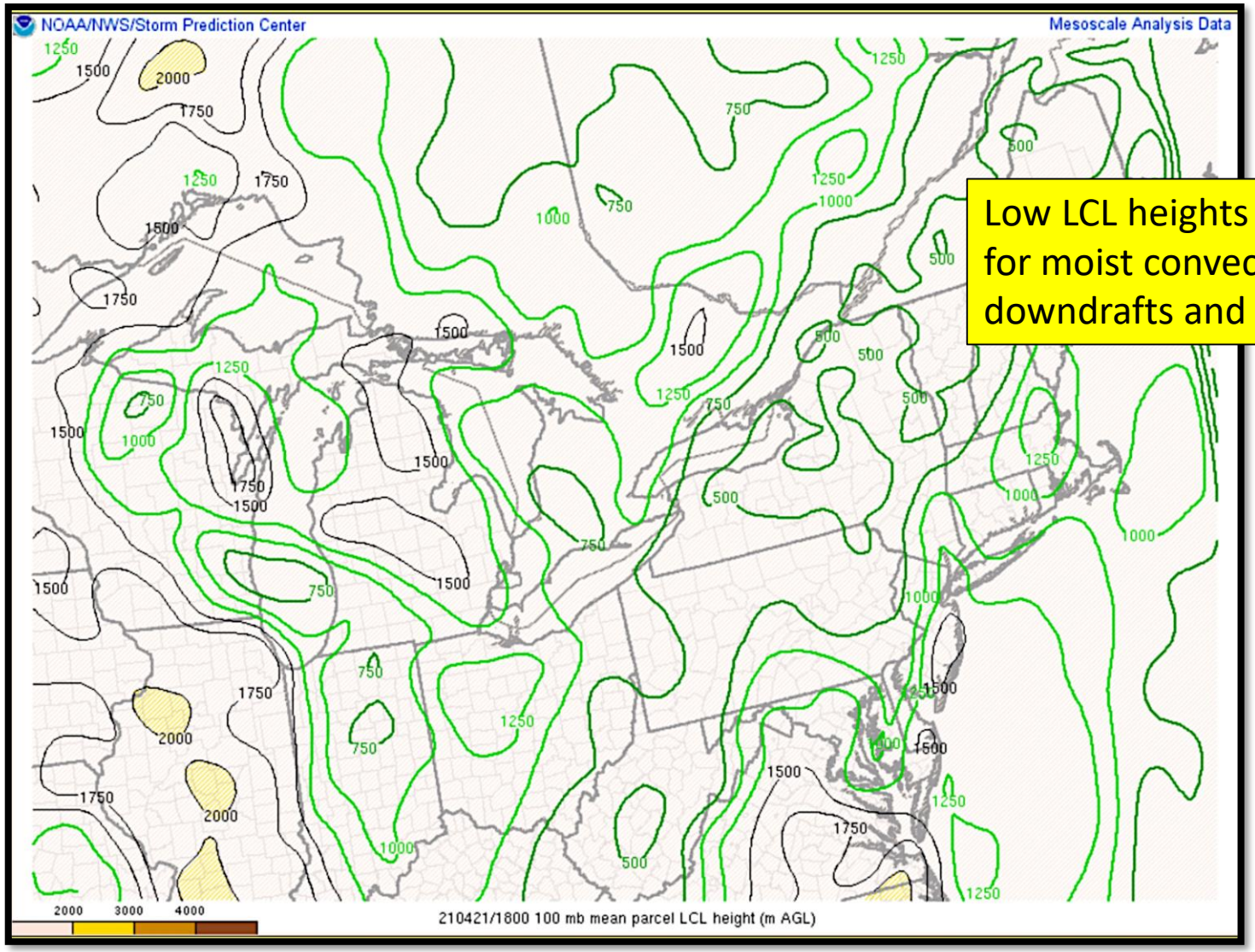
Bulk shear values were strong between 50-60 kts

1800 UTC April 21, 2021 Effective Bulk Shear (kts)



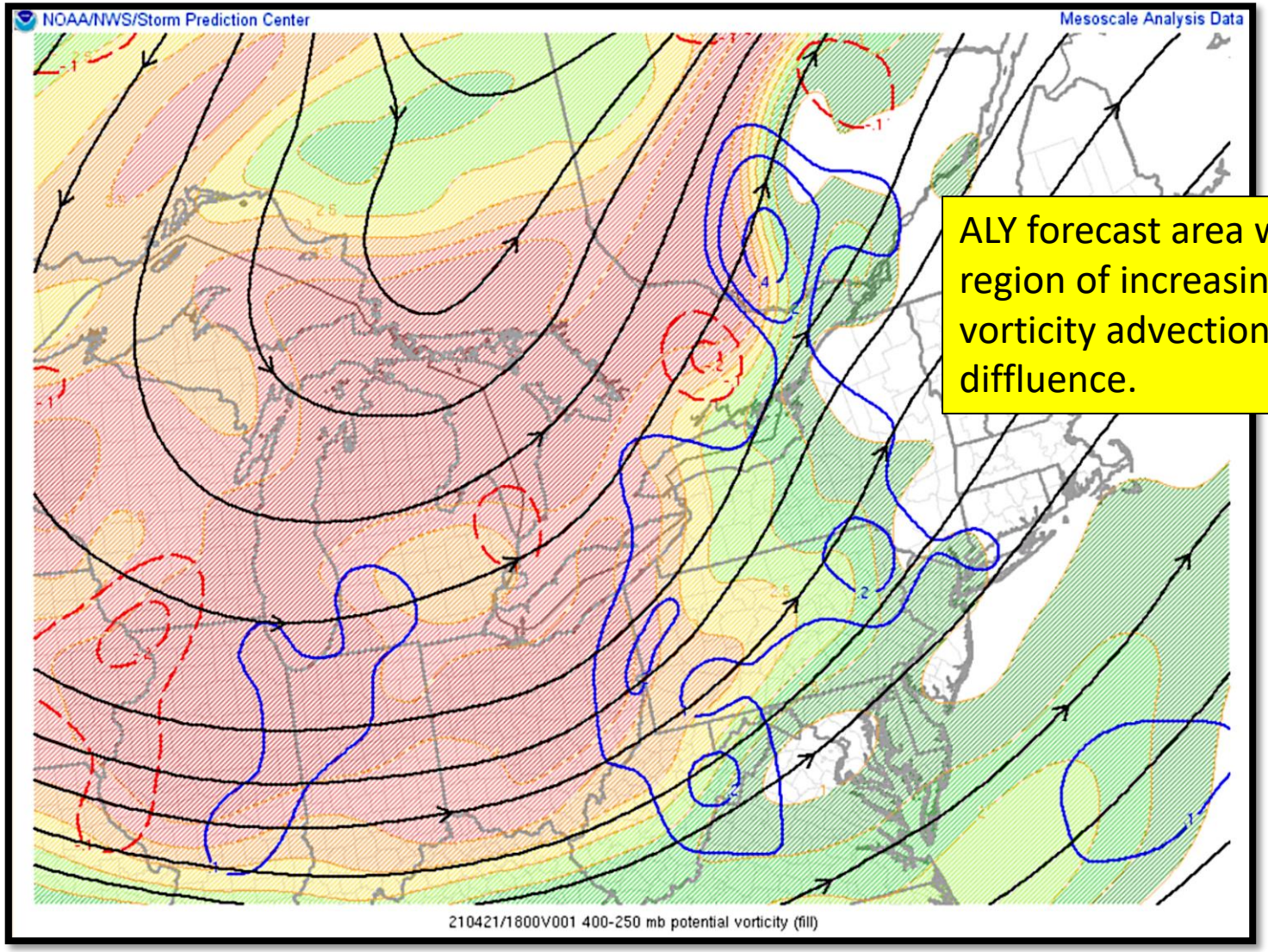
Effective Bulk Shear values Strong (north of 40 kts)

1800 UTC April 21, 2021 LCL Heights (m AGL)



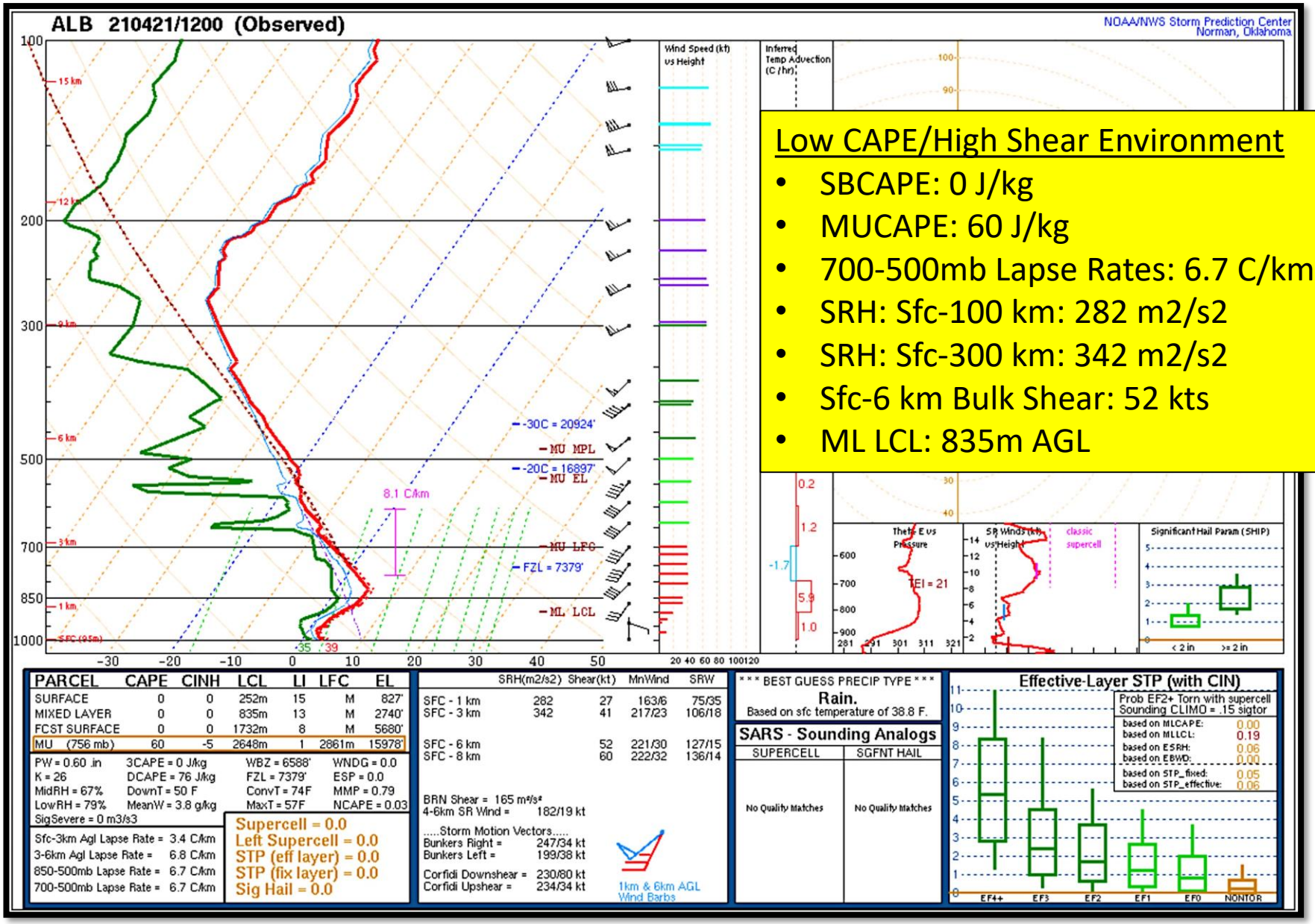
Low LCL heights favorable for moist convective downdrafts and tornadoes

1800 UTC April 21, 2021 Potential Vorticity



ALY forecast area was in a region of increasing cyclonic vorticity advection and upper diffluence.

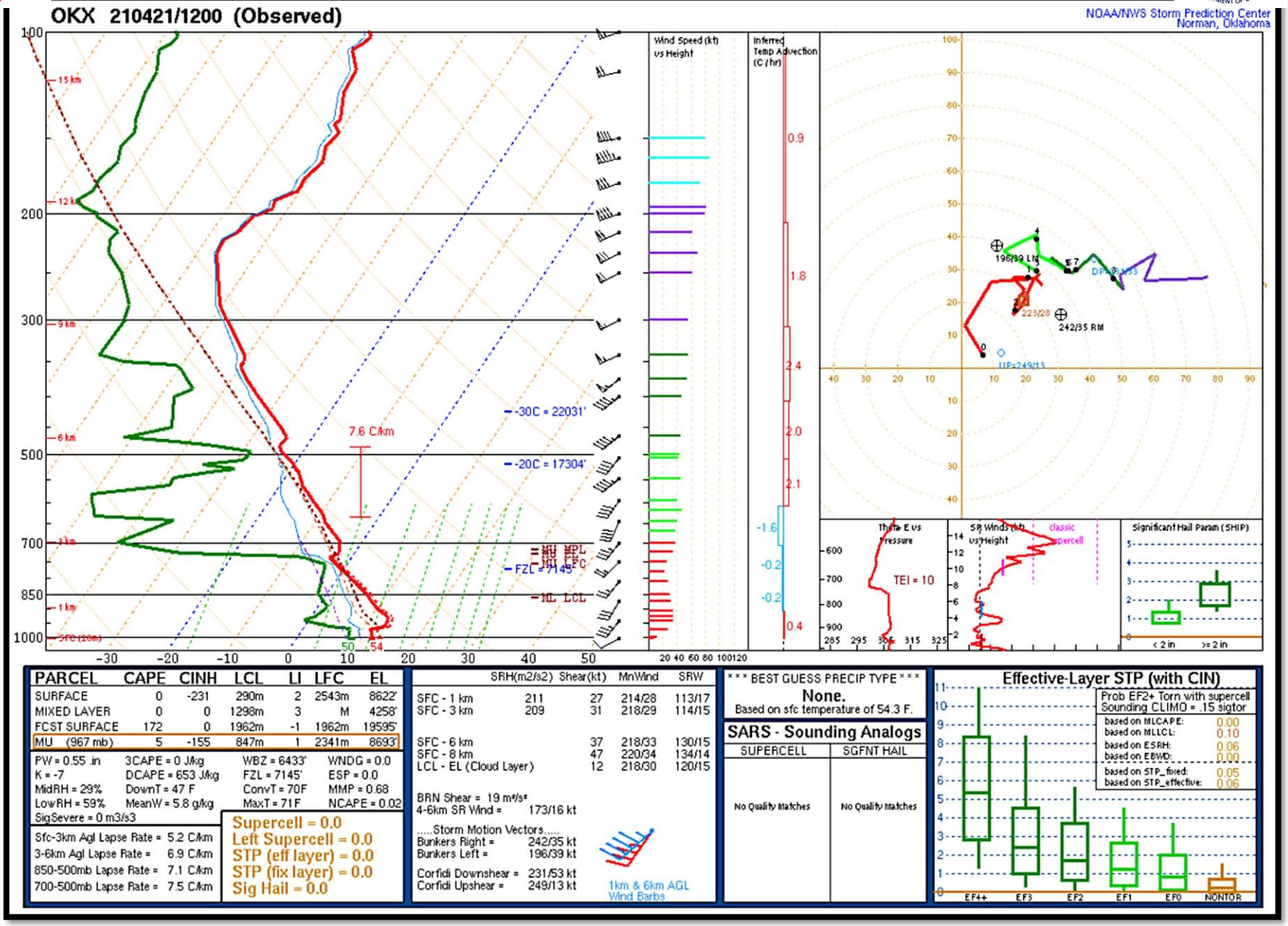
1200 UTC April 21, 2021 KALY Sounding



Low CAPE/High Shear Environment

- SBCAPE: 0 J/kg
- MUCAPE: 60 J/kg
- 700-500mb Lapse Rates: 6.7 C/km
- SRH: Sfc-100 km: 282 m2/s2
- SRH: Sfc-300 km: 342 m2/s2
- Sfc-6 km Bulk Shear: 52 kts
- ML LCL: 835m AGL

1200 UTC April 21, 2021 KOKX Sounding



PARCEL	CAPE	CINH	LCL	LI	LFC	EL
SURFACE	0	-231	290m	2	2543m	8622'
MIXED LAYER	0	0	1298m	3	M	4258'
FCST SURFACE	172	0	1962m	-1	1962m	19595'
MU (967 mb)	5	-155	847m	1	2341m	8693'

PW = 0.55 in	3CAPE = 0 J/kg	WBZ = 6433'	WNDG = 0.0
K = -7	DCAPE = 653 J/kg	FZL = 7145'	ESP = 0.0
MidRH = 29%	DownT = 47 F	ConvT = 70F	MMP = 0.68
LowRH = 59%	MeanW = 5.8 g/kg	MaxT = 71F	NCAPE = 0.02
SigSevere = 0 m3/s3			

Sfc-3km Agl Lapse Rate =	5.2 C/km
3-6km Agl Lapse Rate =	6.9 C/km
850-500mb Lapse Rate =	7.1 C/km
700-500mb Lapse Rate =	7.5 C/km

Supercell = 0.0
Left Supercell = 0.0
STP (eff layer) = 0.0
STP (fix layer) = 0.0
Sig Hail = 0.0

	SRH(m2/s2)	Shear(kt)	MnWind	SRW
SFC - 1 km	211	27	214/28	113/17
SFC - 3 km	209	31	218/29	114/15
SFC - 6 km		37	218/33	130/15
SFC - 8 km		47	220/34	134/14
LCL - EL (Cloud Layer)		12	218/30	120/15

BRN Shear = 19 m²/s²
4-6km SR Wind = 173/16 kt

.....Storm Motion Vectors.....
Bunkers Right = 242/35 kt
Bunkers Left = 196/39 kt

Corfidi Downshear = 231/53 kt
Corfidi Upshear = 249/13 kt

*** BEST GUESS PRECIP TYPE ***
None.
Based on sfc temperature of 54.3 F.

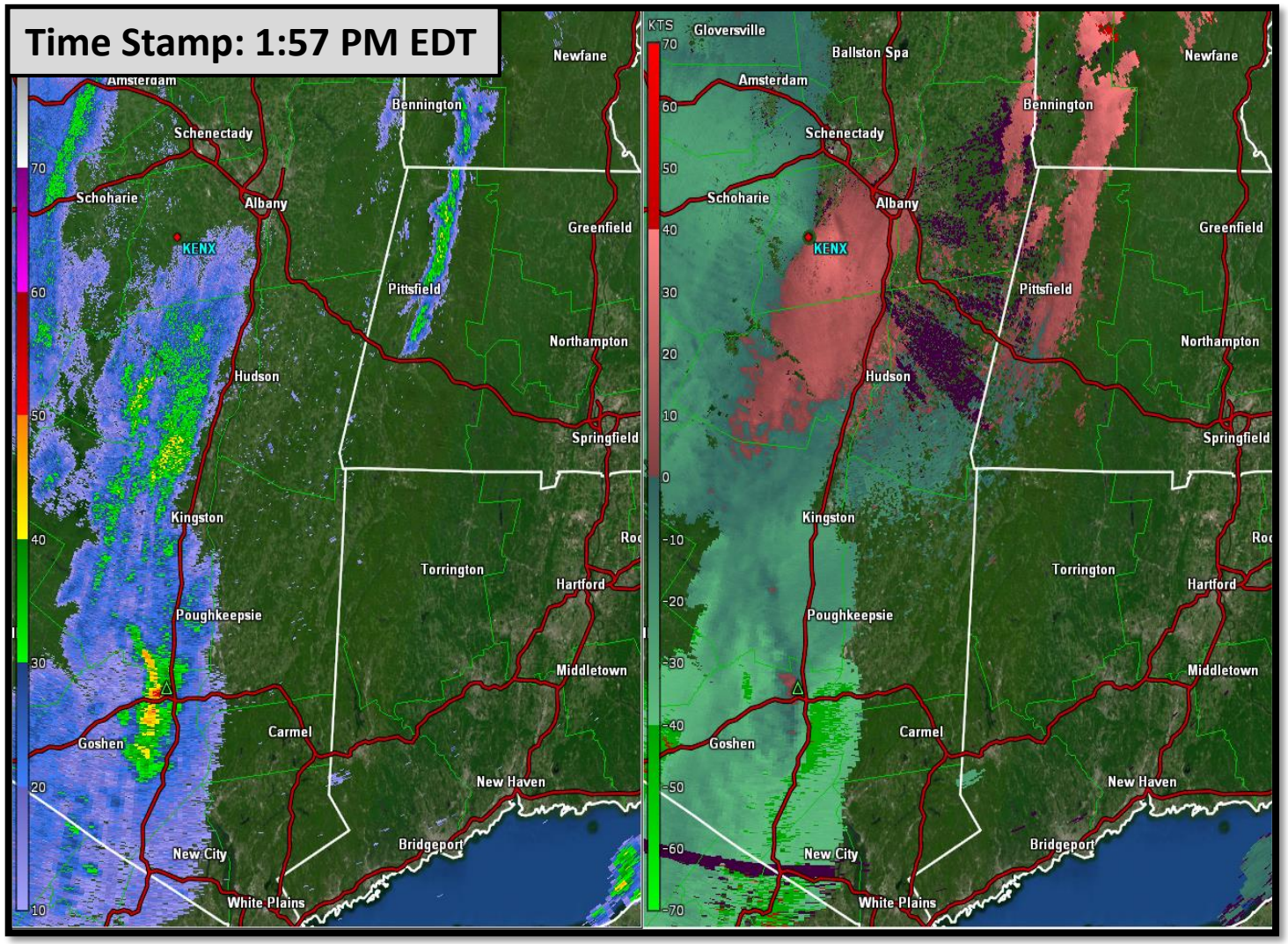
SARS - Sounding Analogs

SUPERCELL	SGFNT HAIL
No Quality Matches	No Quality Matches

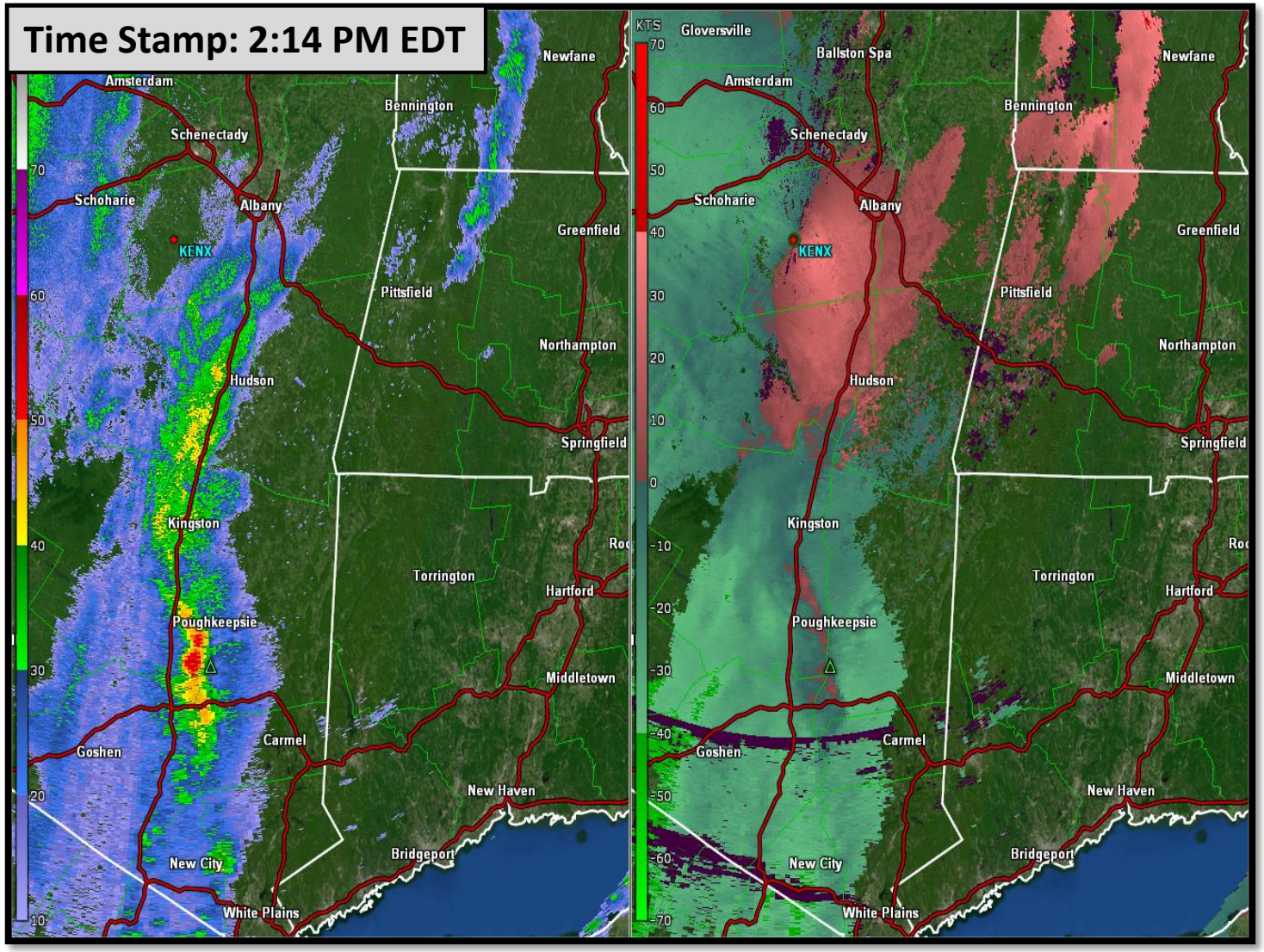
Prob EF2+ Torn with supercell
Sounding CLIMO = .15 sigtor

based on MLCAPE:	0.00
based on MLLCL:	0.10
based on ESRH:	0.06
based on EBWD:	0.00
based on STP_fixed:	0.05
based on STP_effective:	0.06

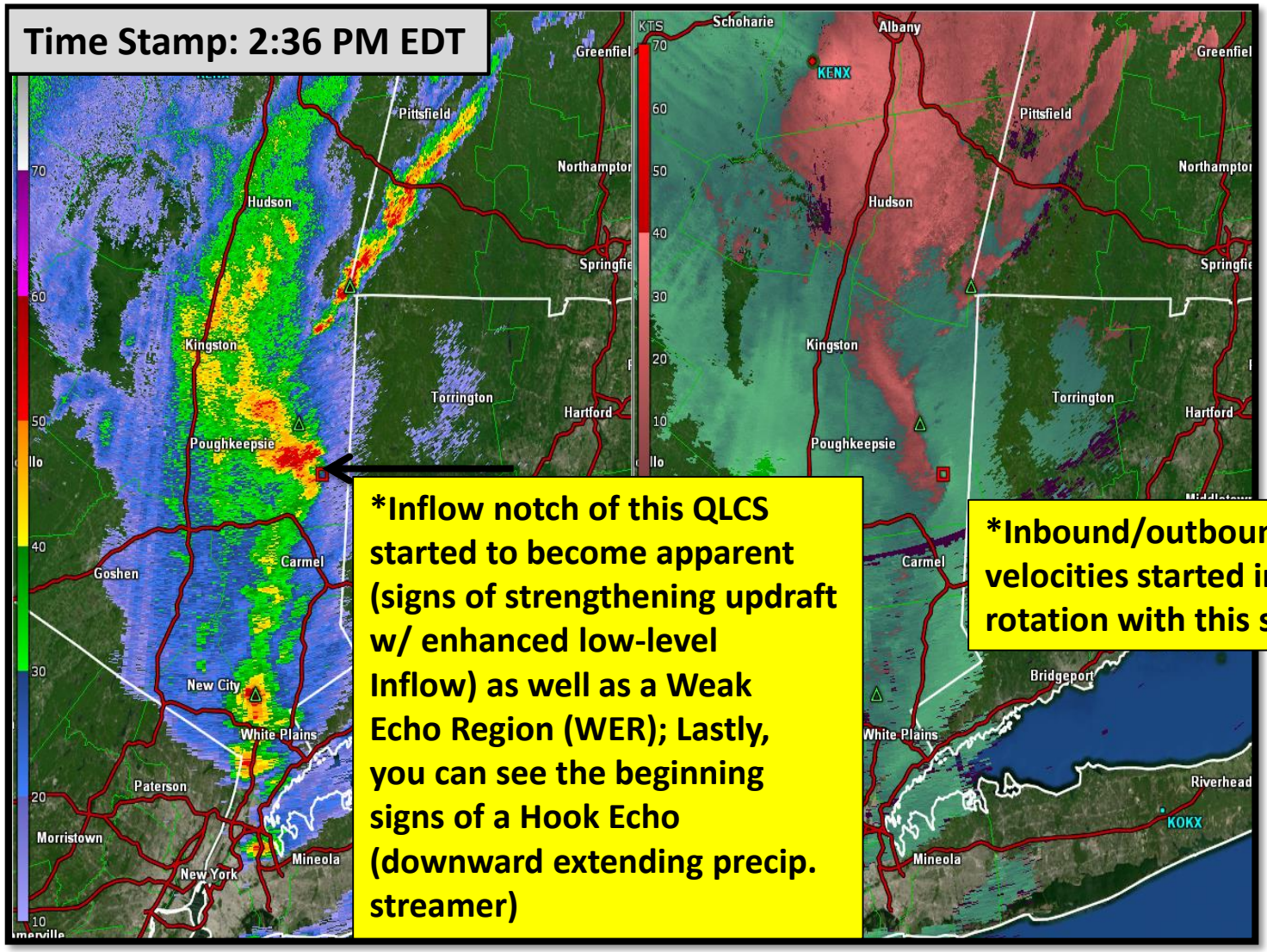
Radar Analysis



Radar Analysis



Radar Analysis



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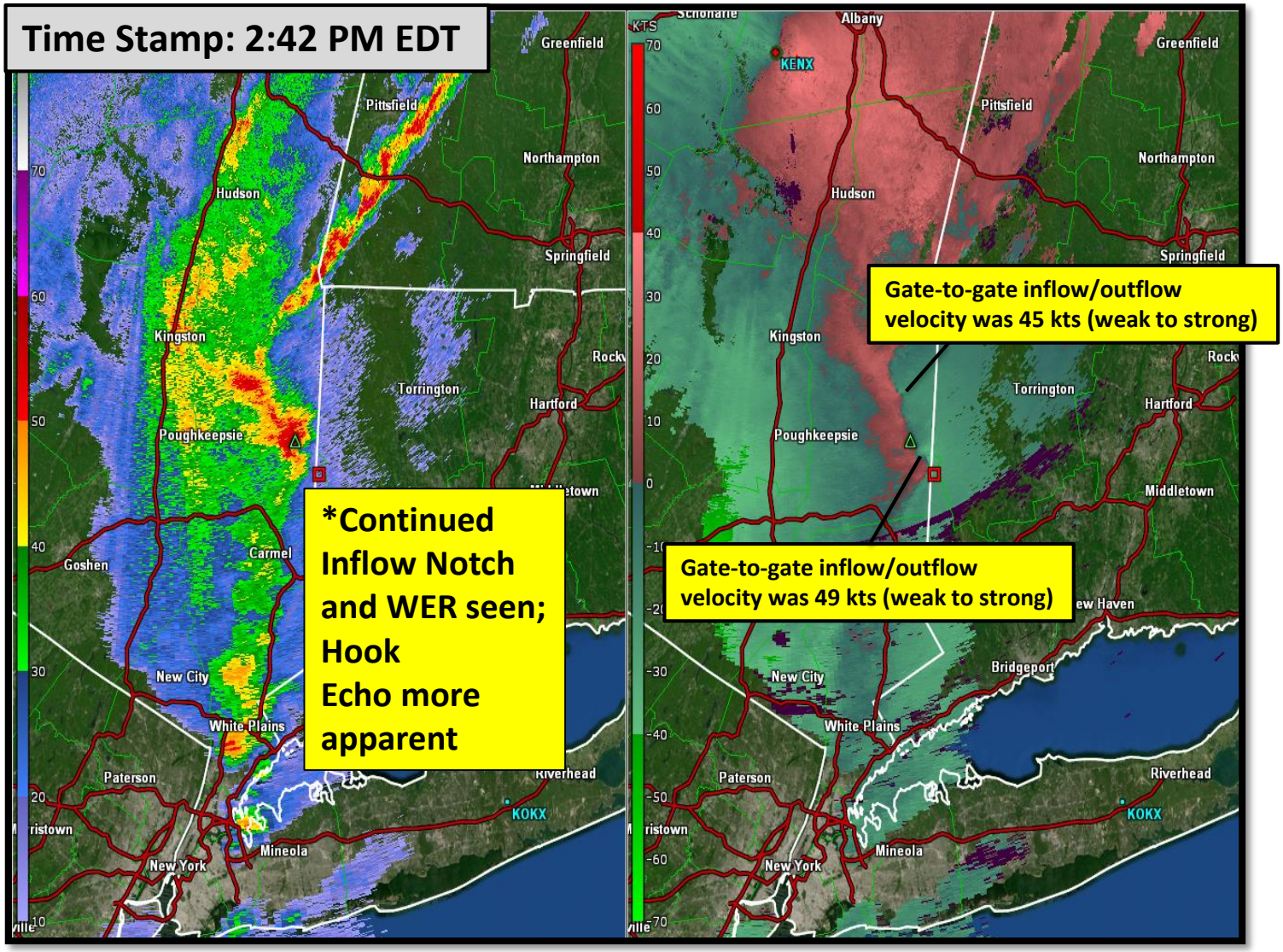
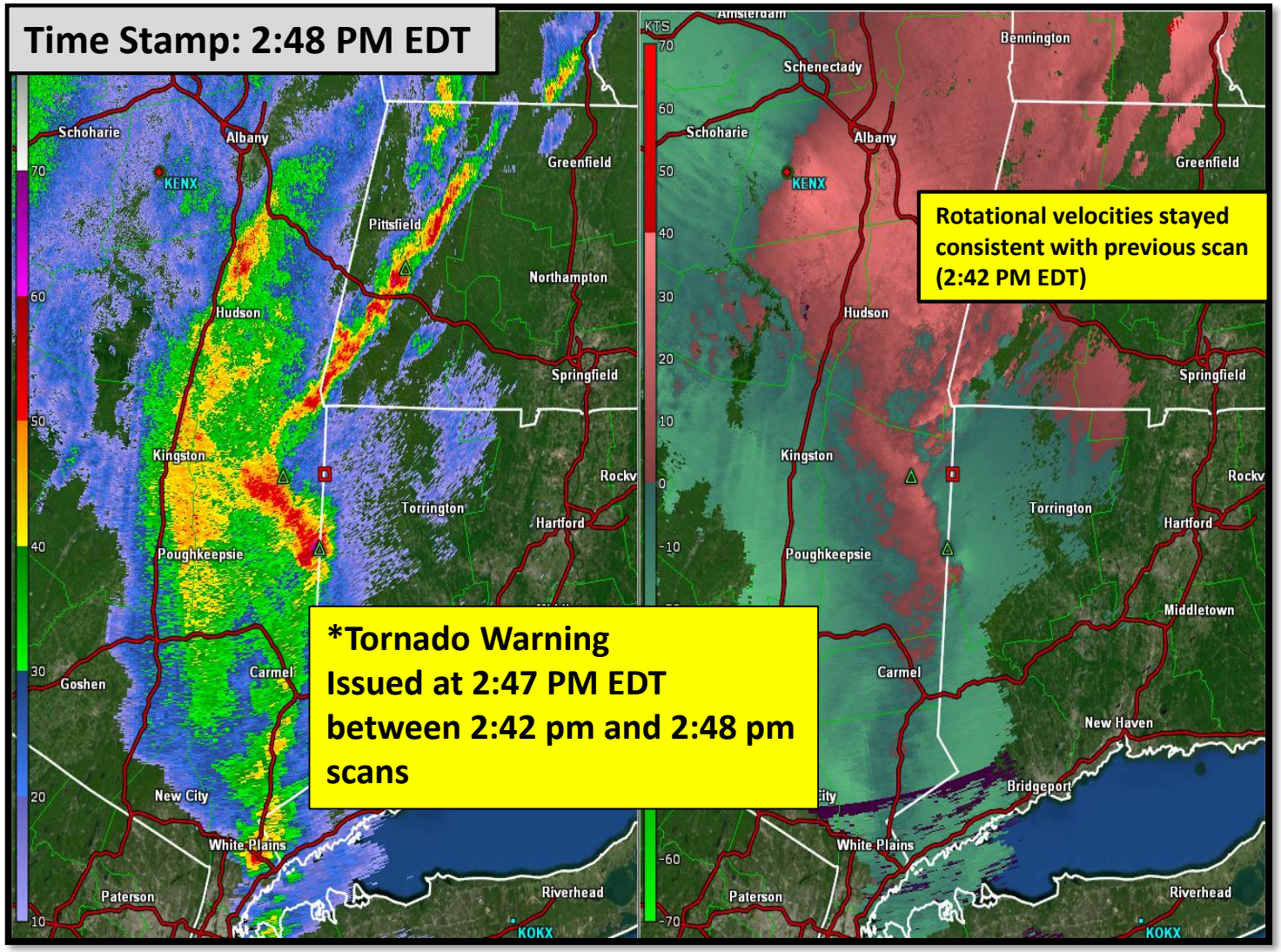
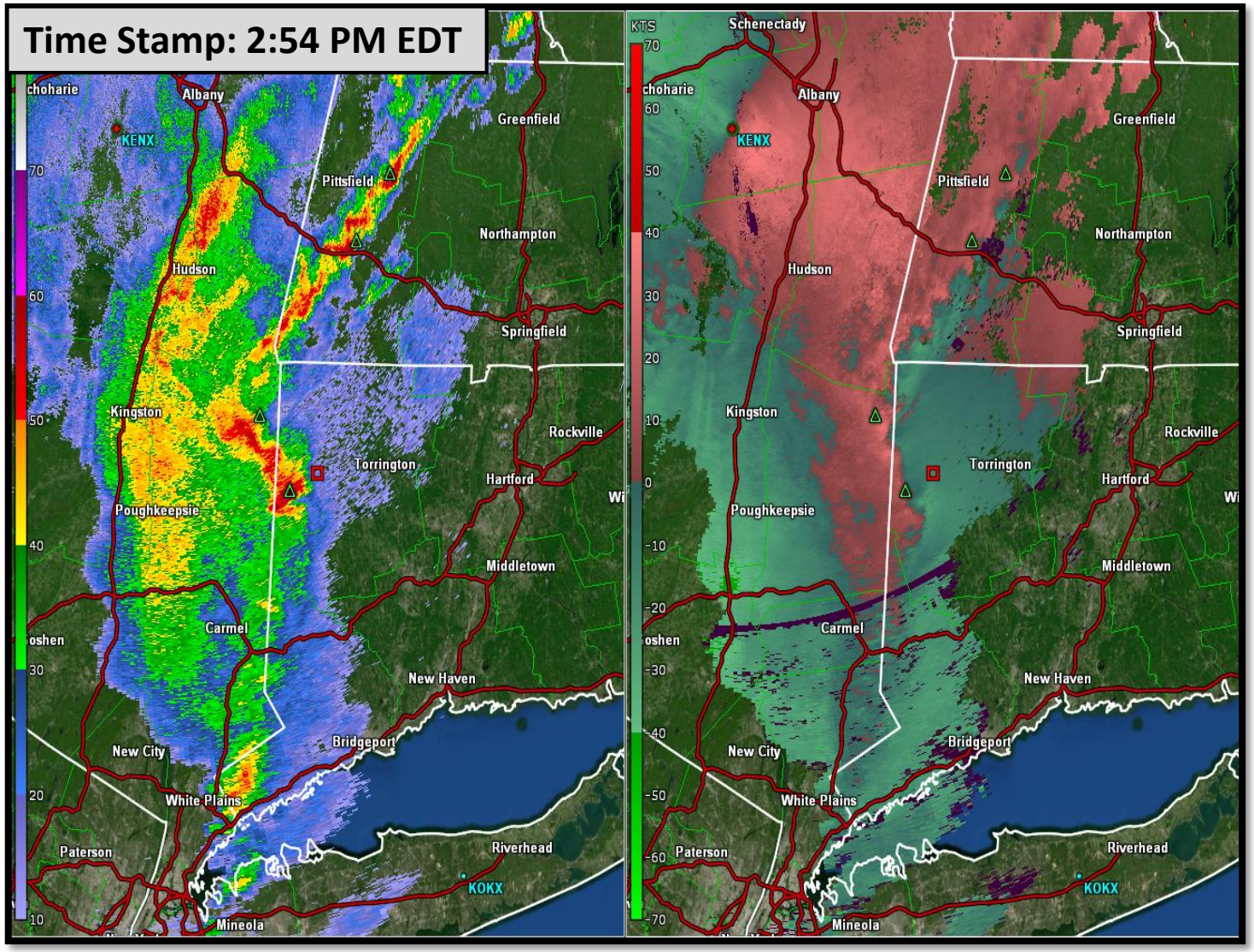


Radar Analysis



Radar Analysis



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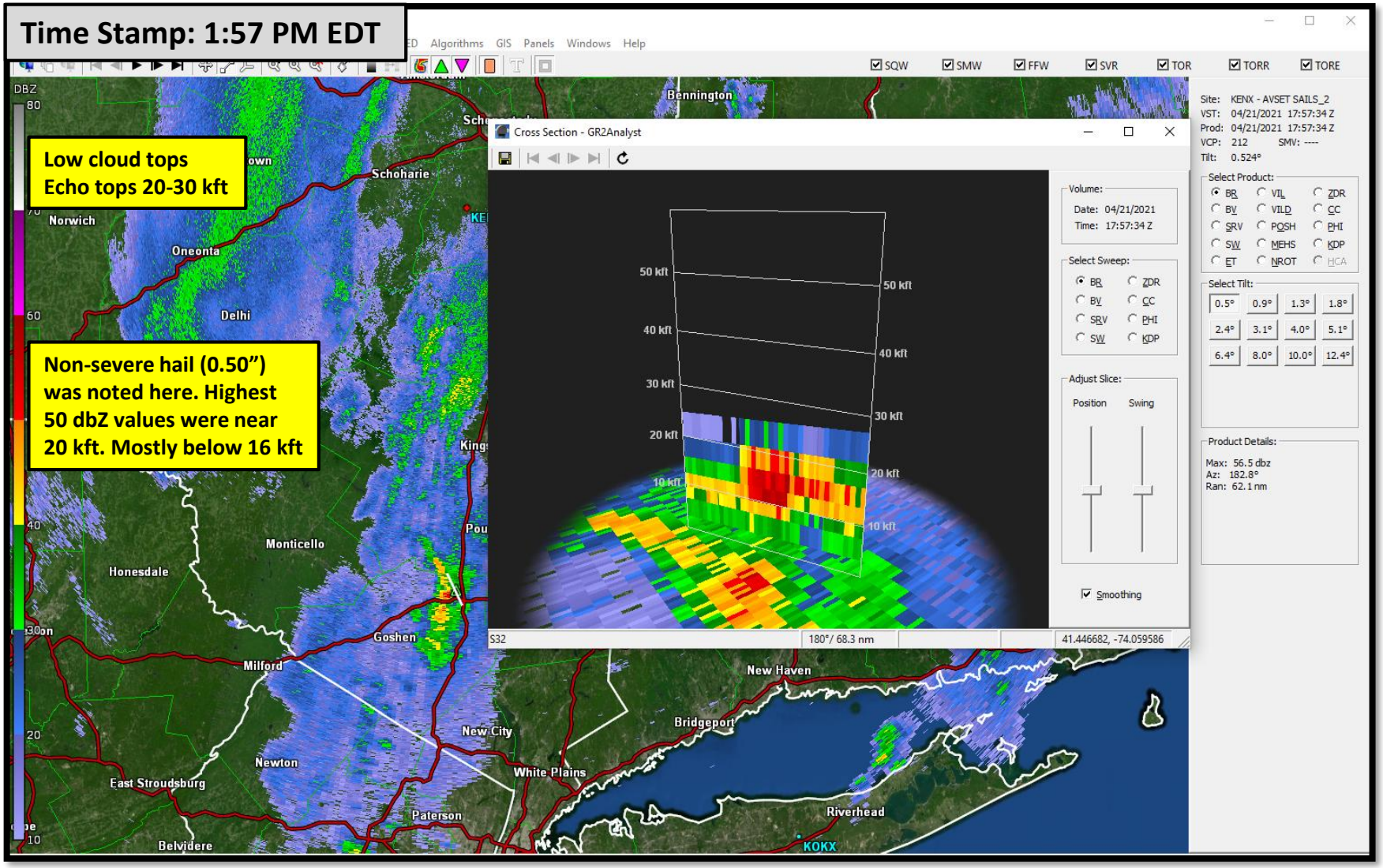
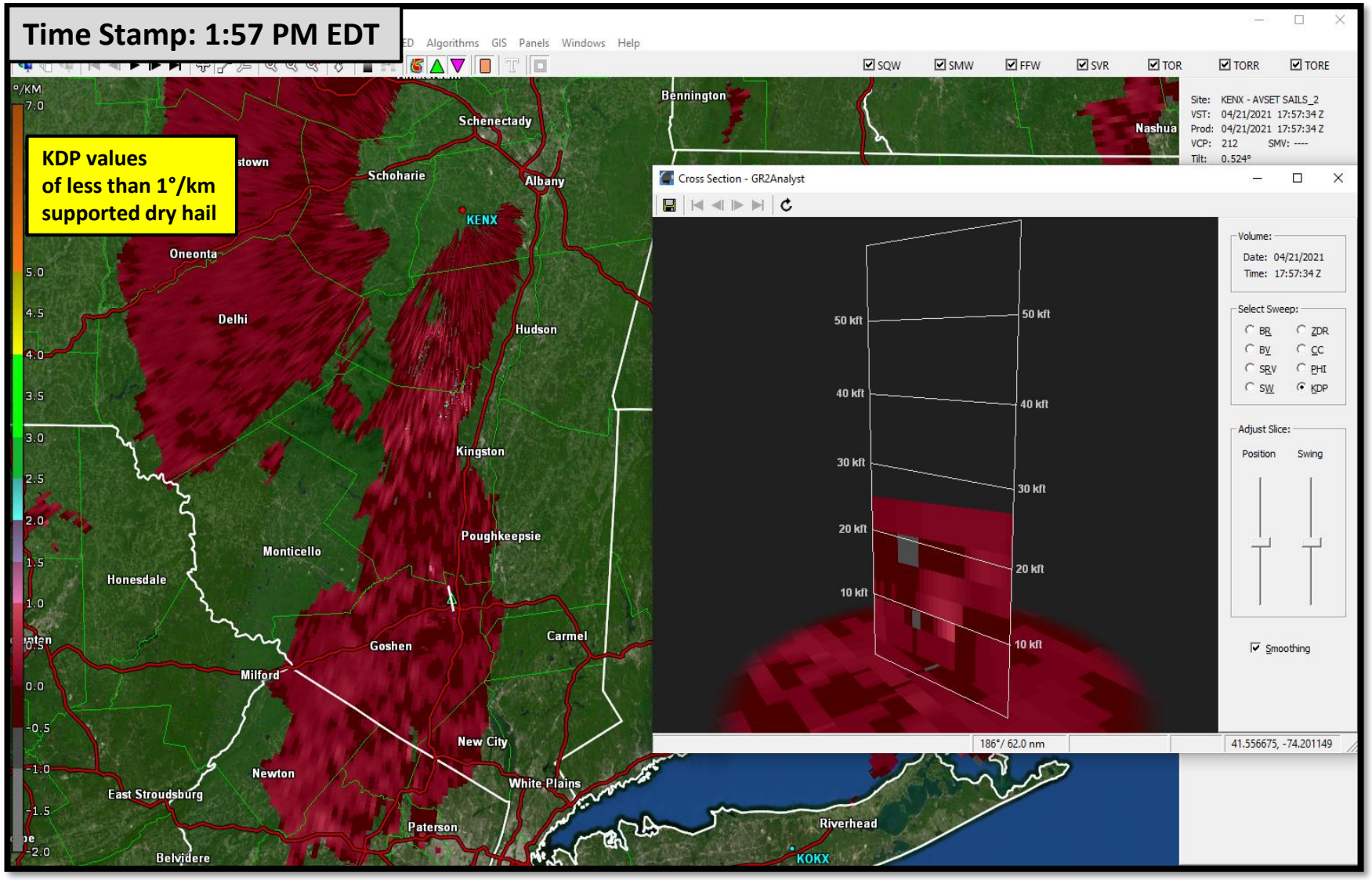
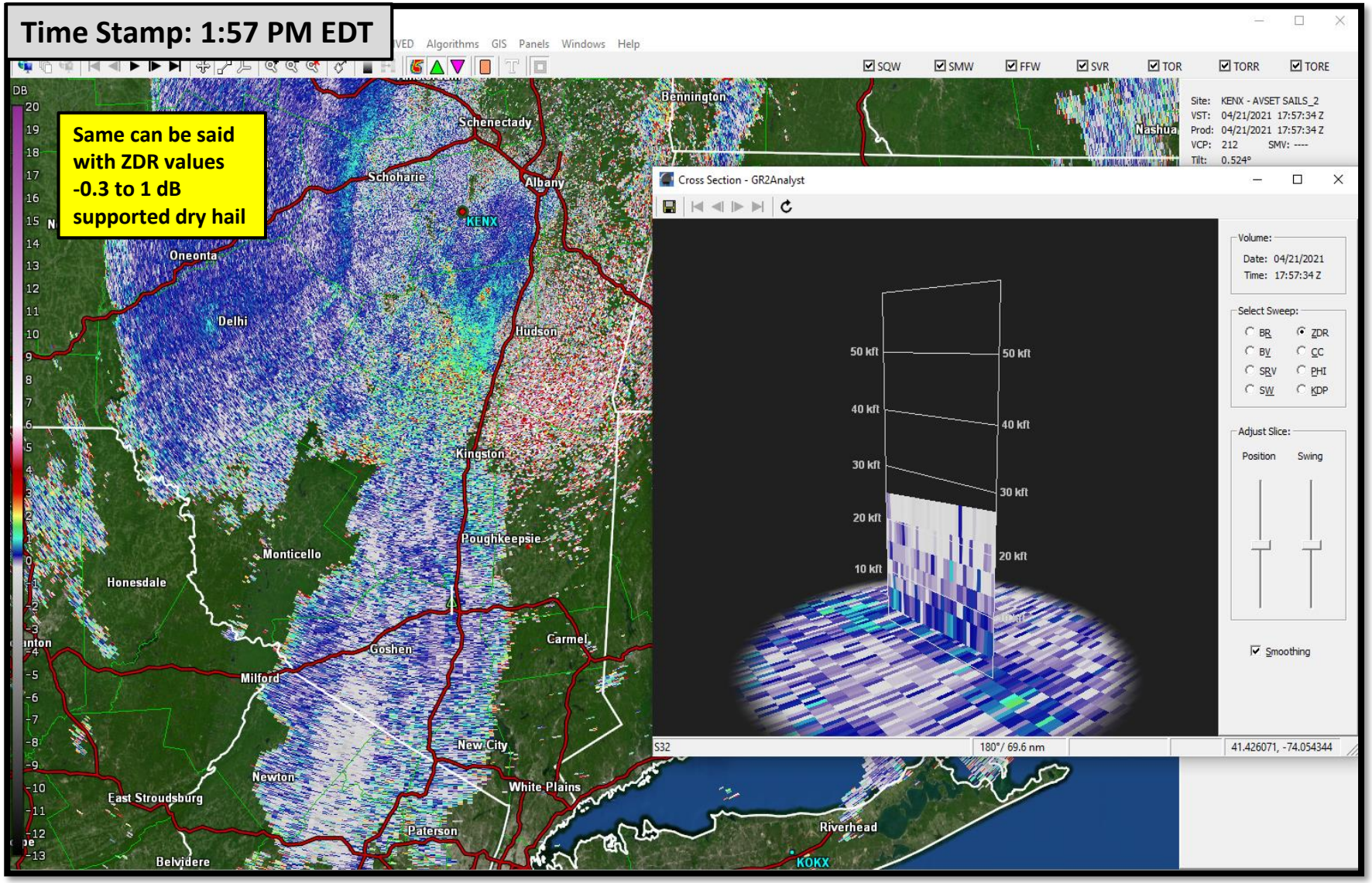


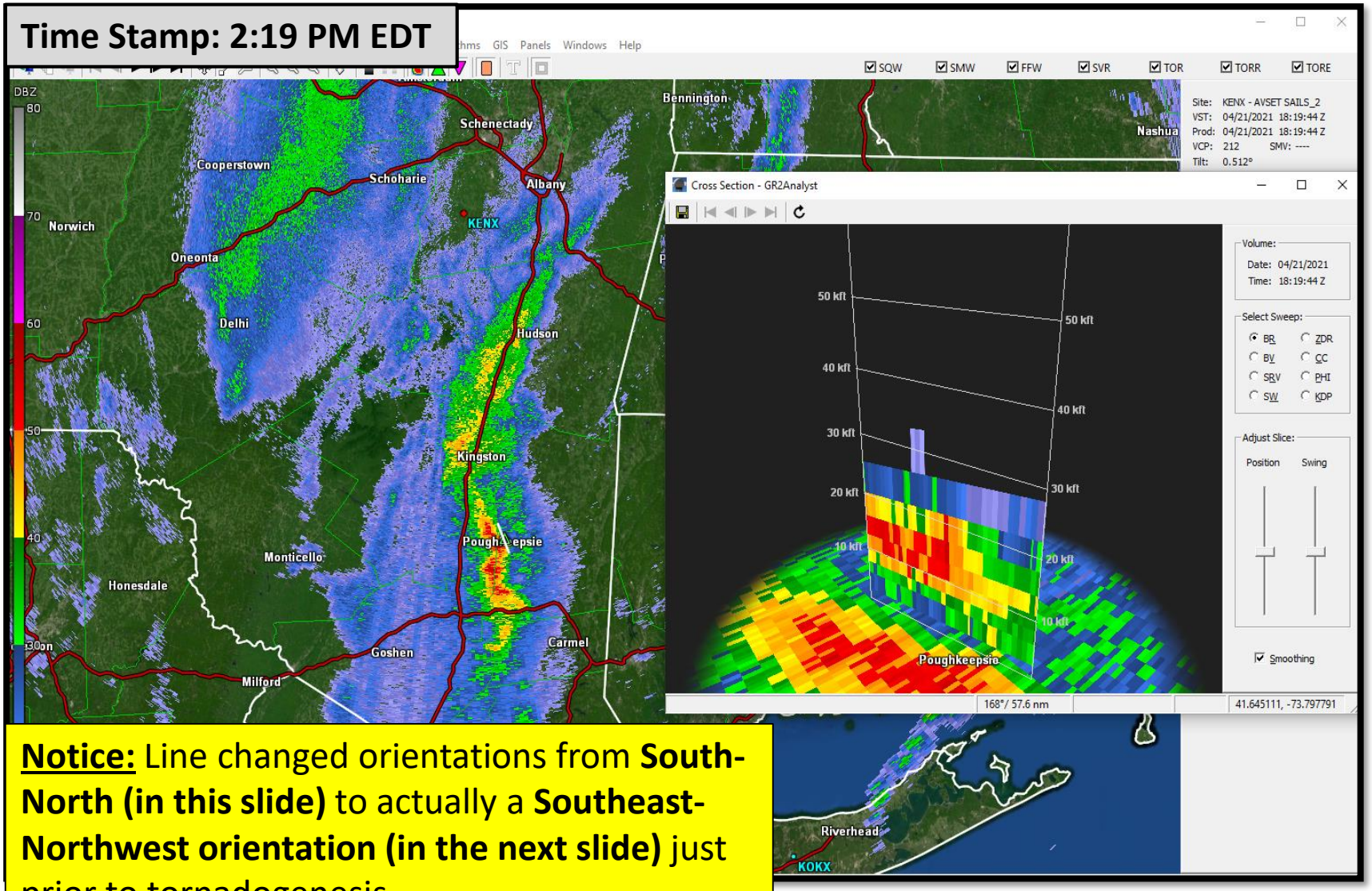
Radar Analysis



Radar Analysis



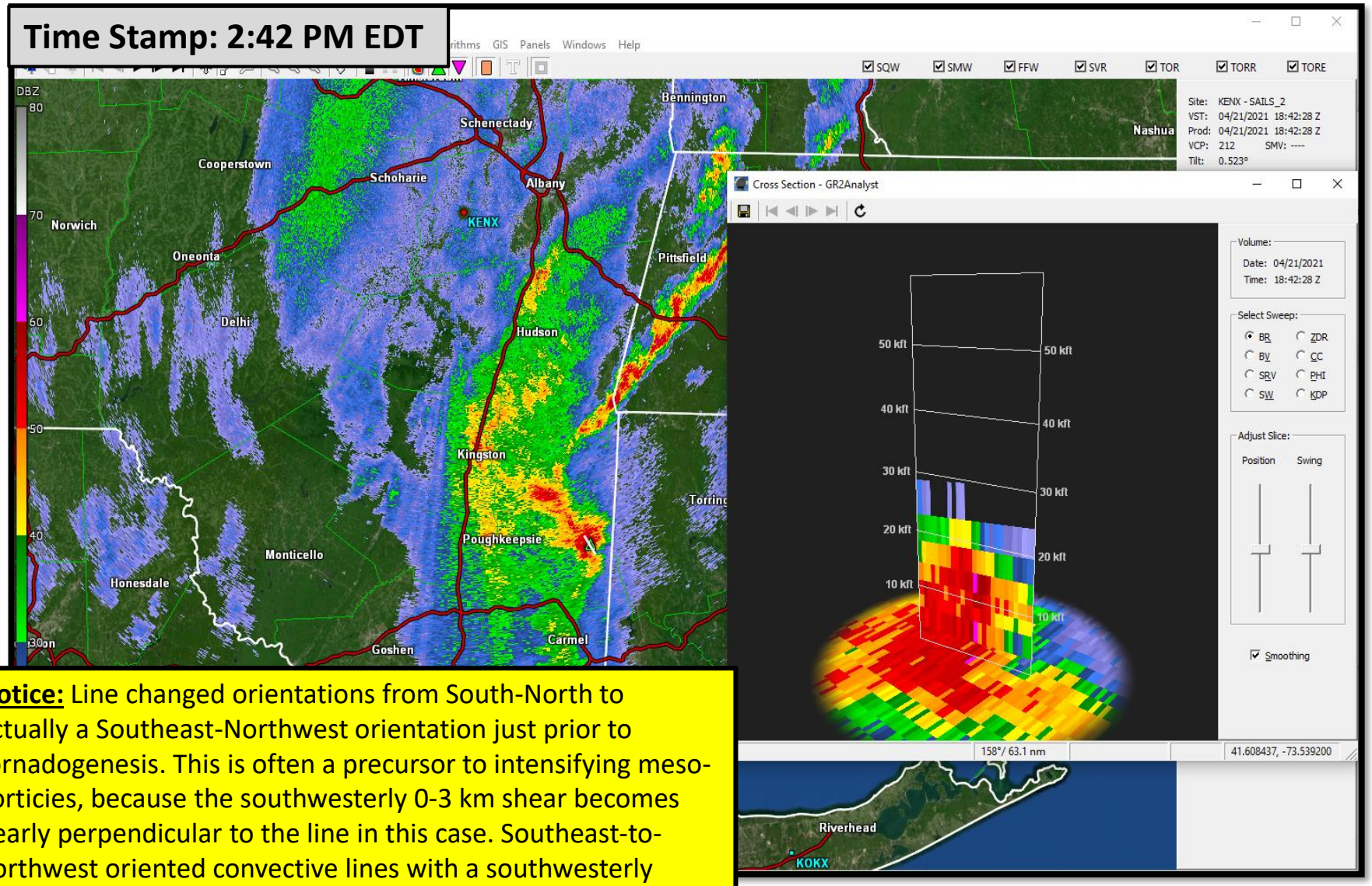
Radar Analysis



<u>Notice:</u> Line changed orientations from **South-North (in this slide)** to actually a **Southeast-Northwest orientation (in the next slide)** just prior to tornadogenesis.

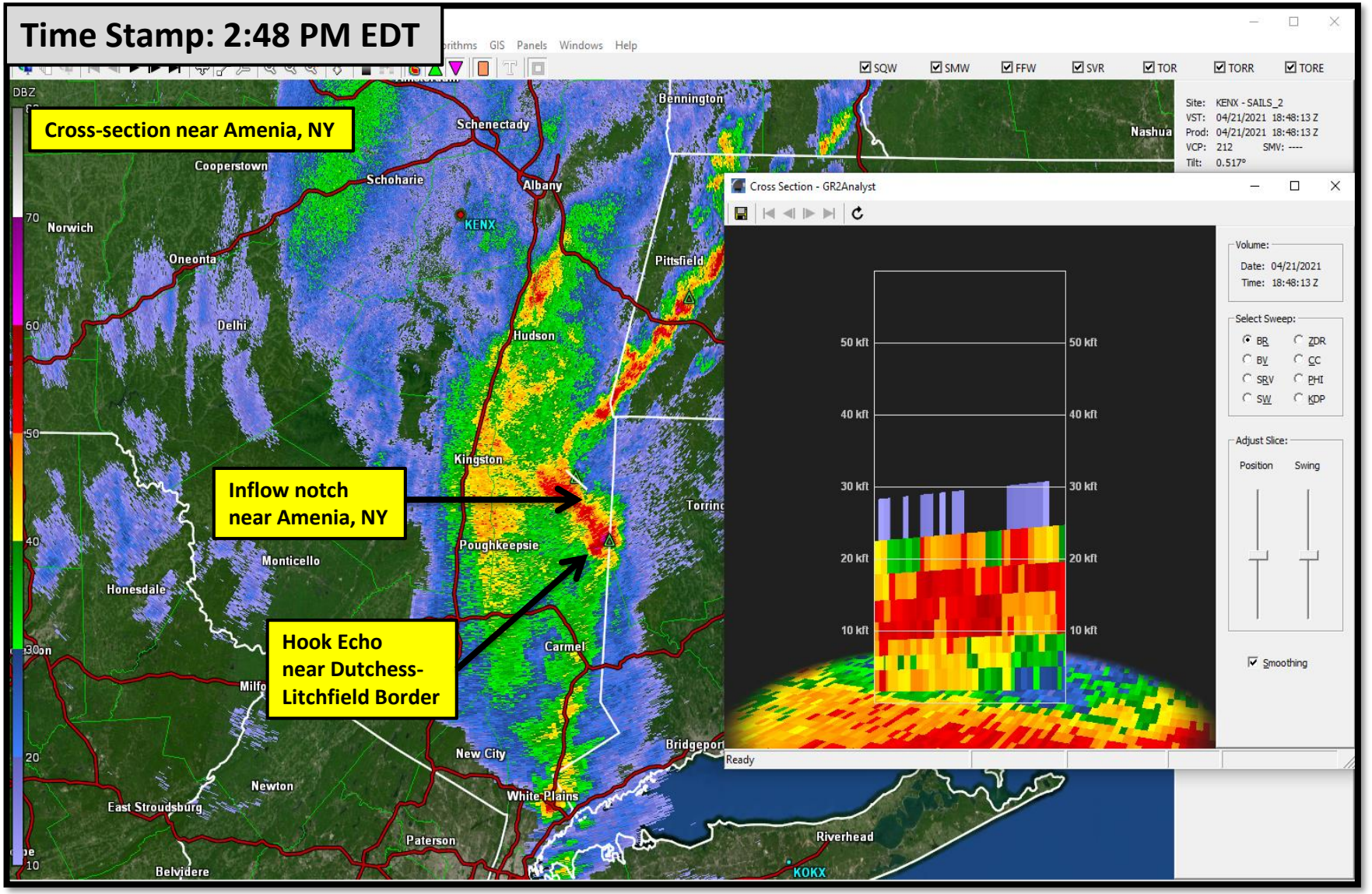
Radar Analysis

Time Stamp: 2:42 PM EDT

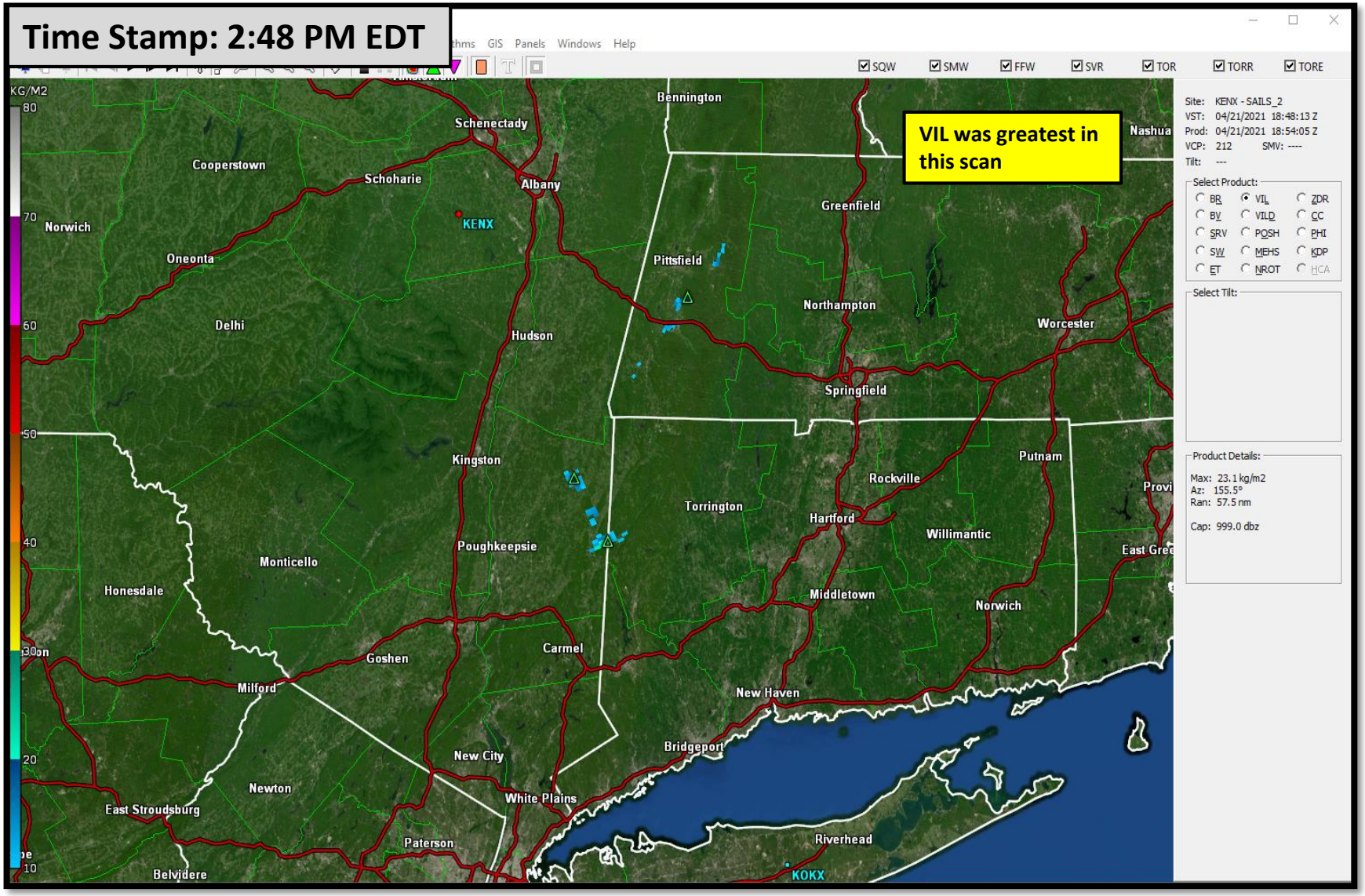


Notice: Line changed orientations from South-North to actually a Southeast-Northwest orientation just prior to tornadogenesis. This is often a precursor to intensifying meso-vorticies, because the southwesterly 0-3 km shear becomes nearly perpendicular to the line in this case. Southeast-to-northwest oriented convective lines with a southwesterly shear vector are dangerous!

Radar Analysis

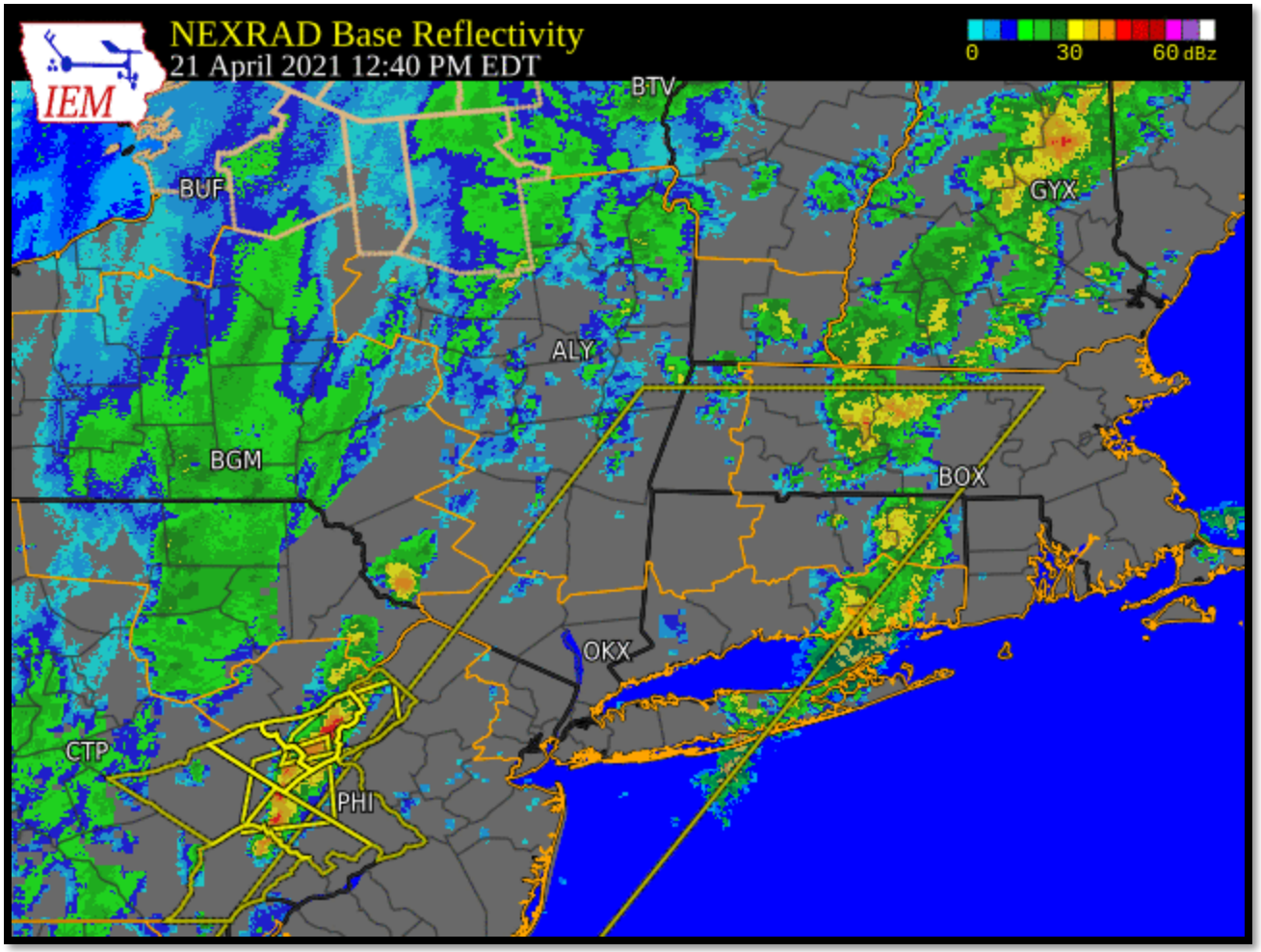


Radar Analysis



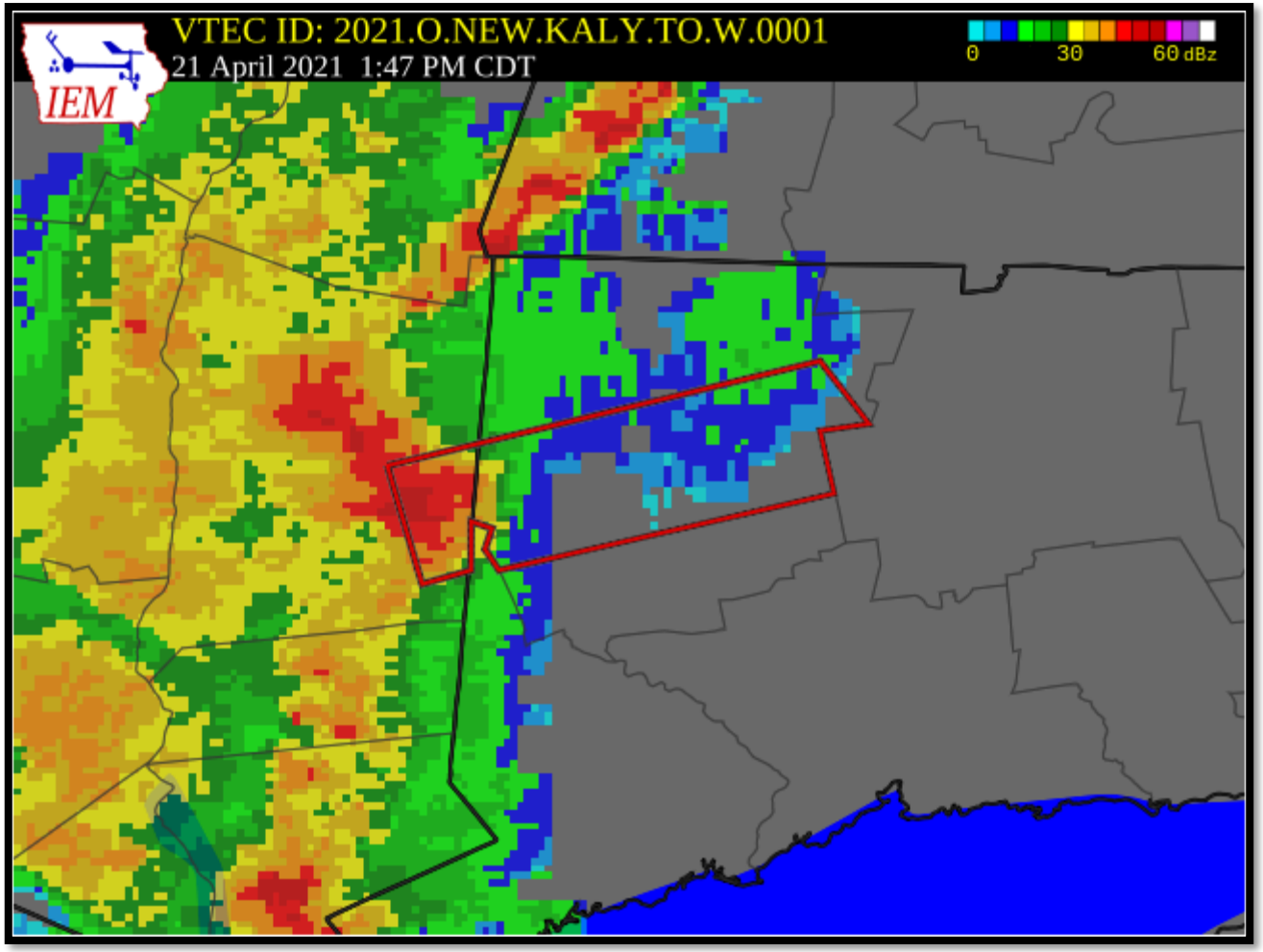
Radar Analysis

Radar loop from 12:40-3:50 PM EDT

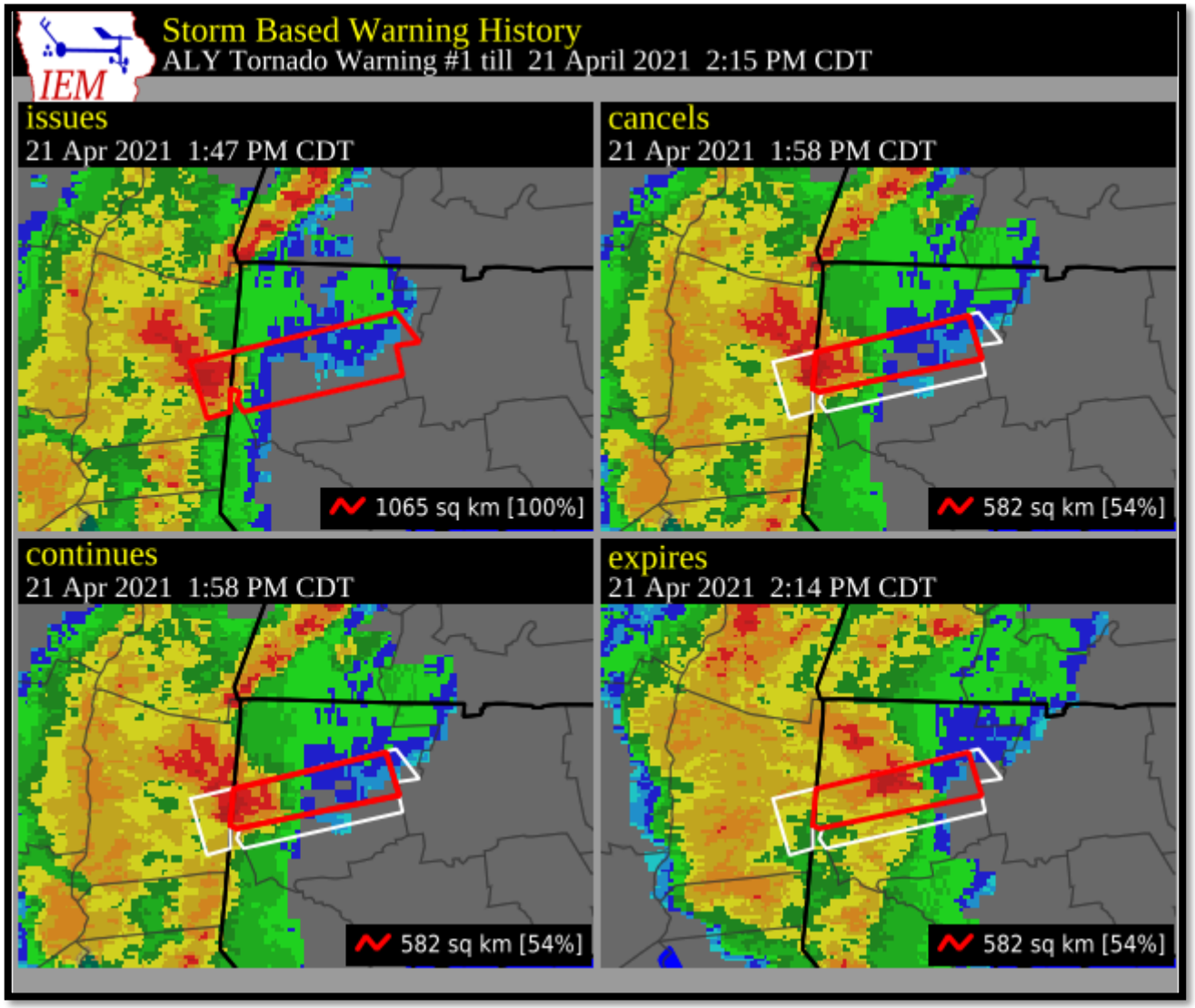


Radar Analysis

Tornado Warning Issued at 2:47 PM EDT (2 min lead time)

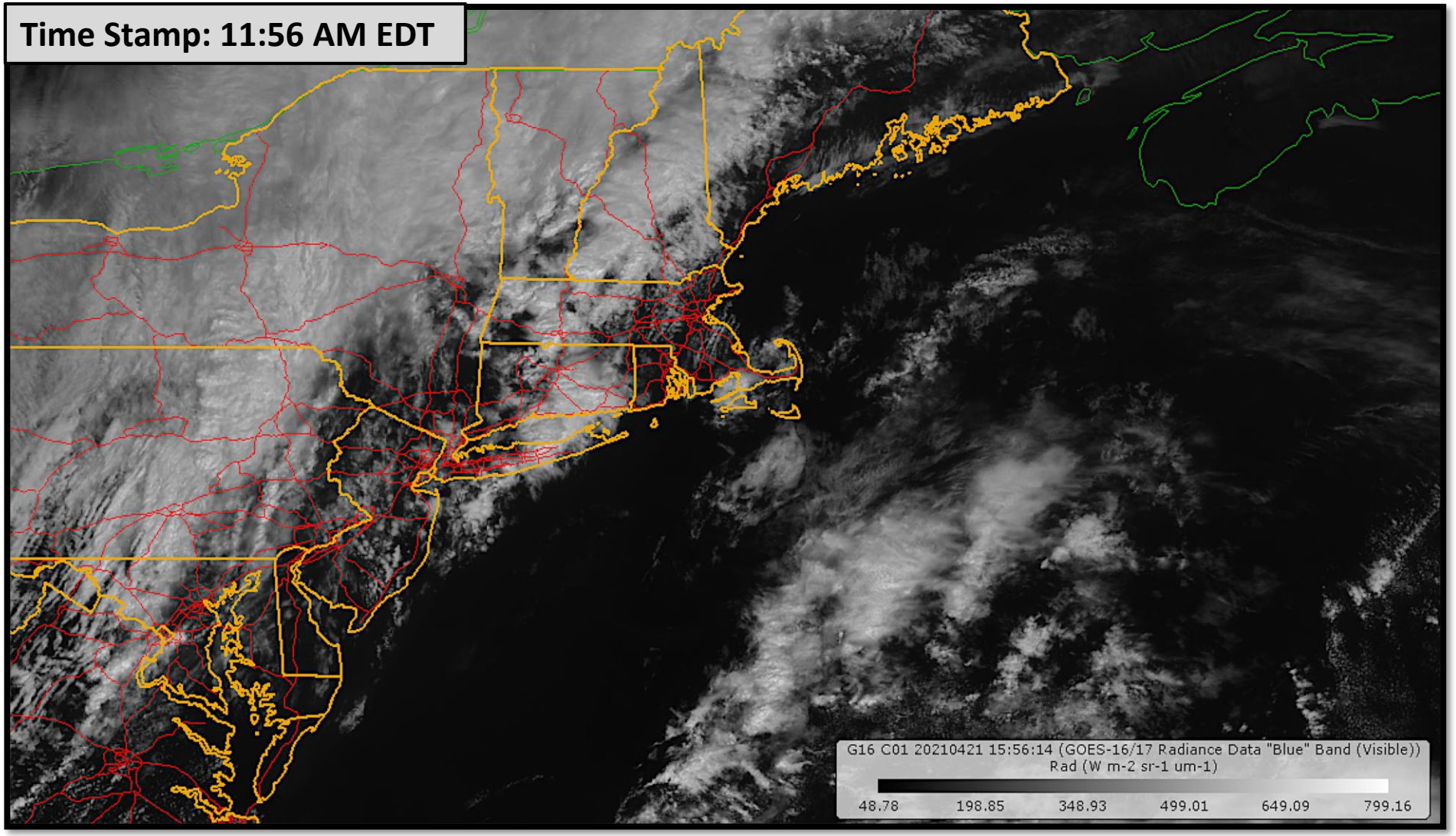


Radar Analysis



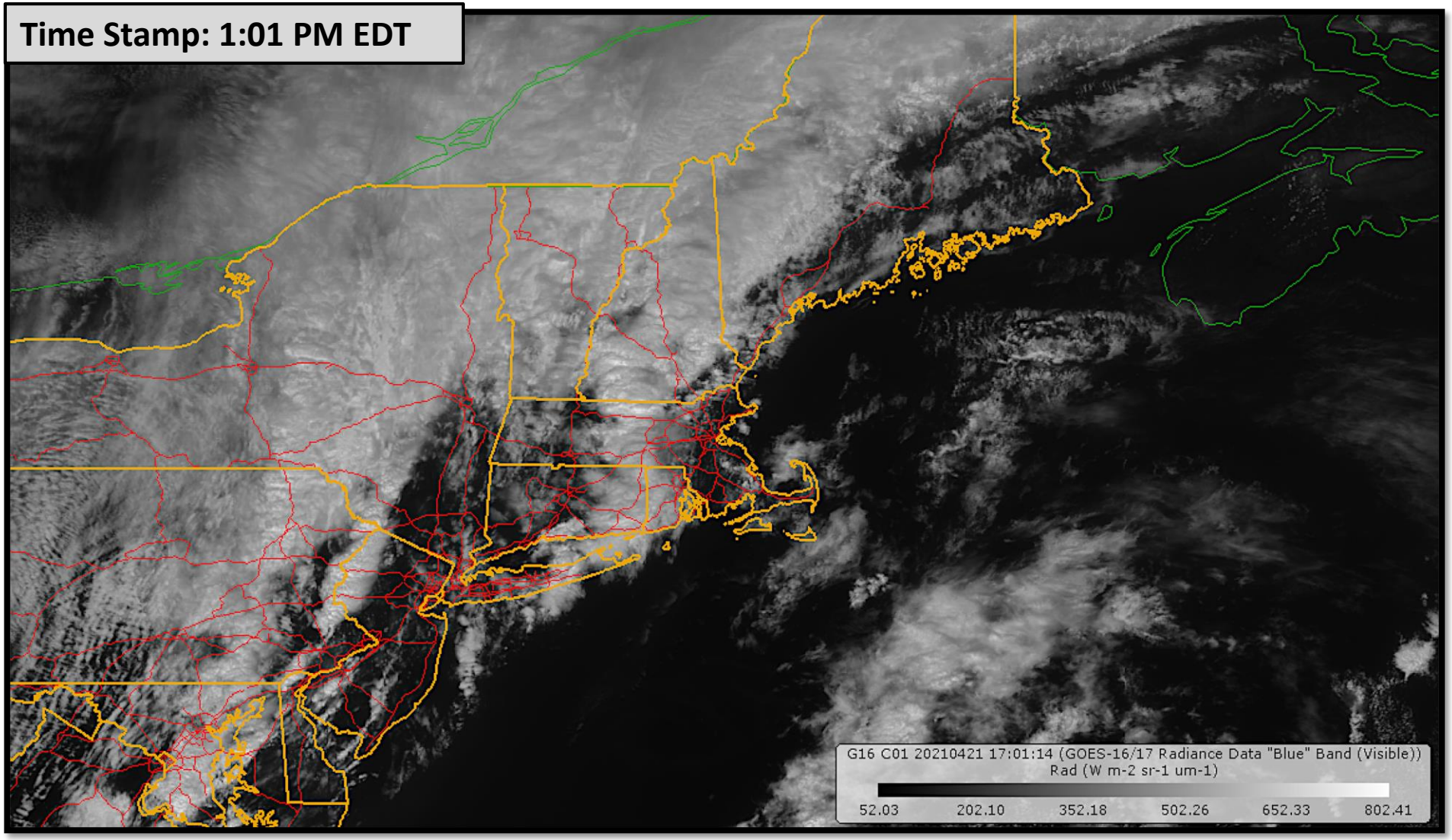
Satellite Analysis

1556 UTC April 21, 2021 – GOES-16 Visible



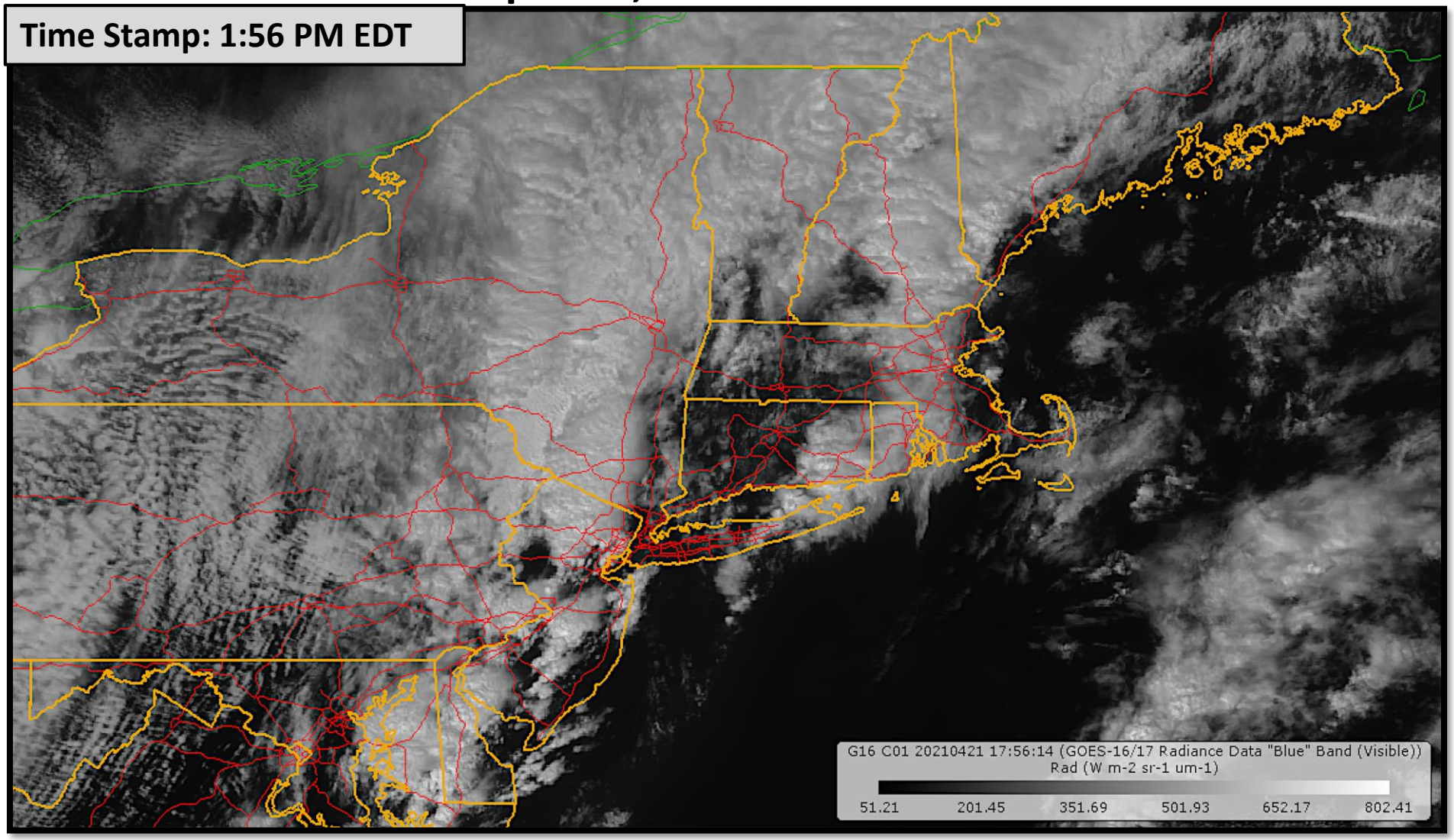
Satellite Analysis

1701 UTC April 21, 2021 – GOES-16 Visible

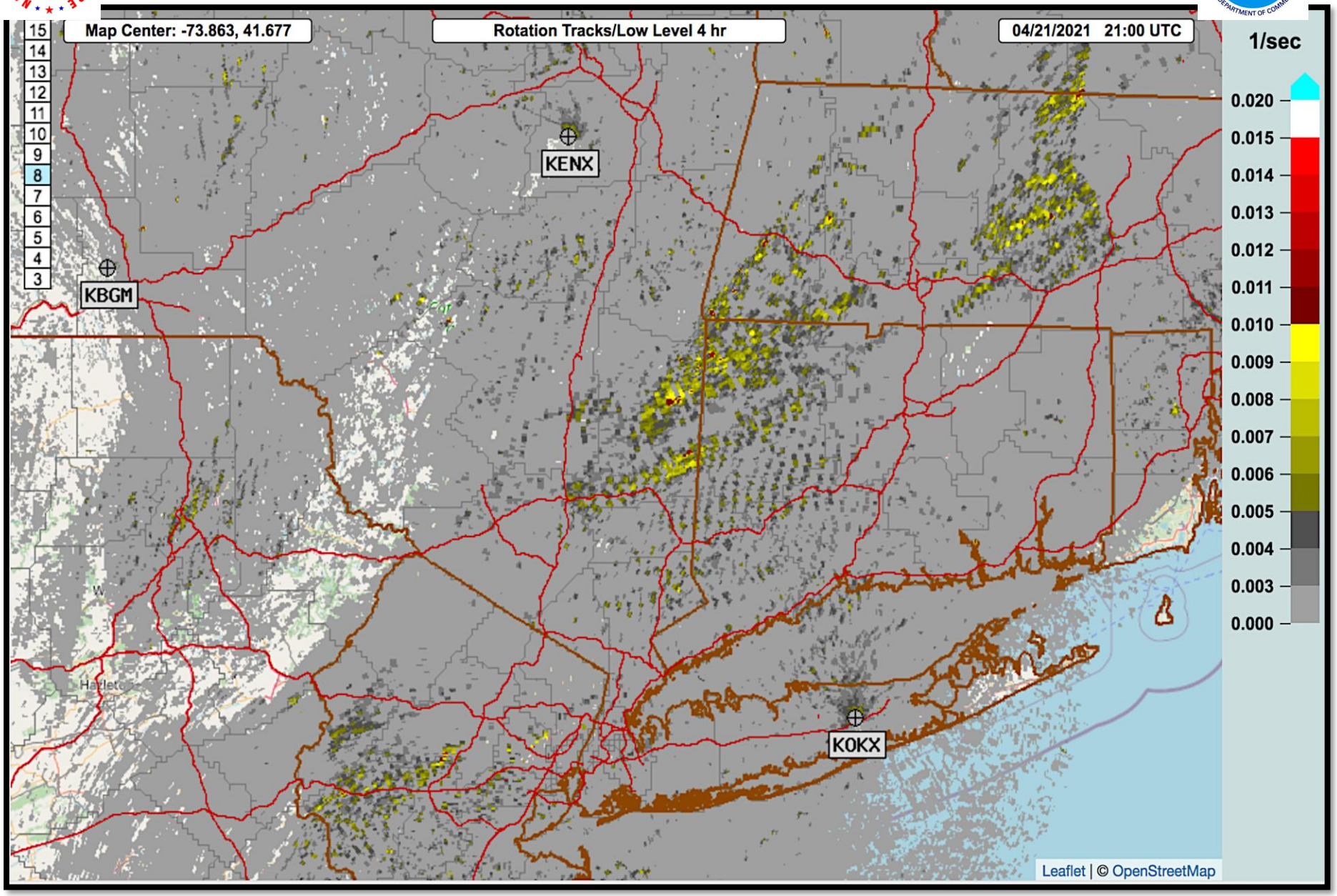


Satellite Analysis

1756 UTC April 21, 2021 – GOES-16 Visible



April 21, 2021 MRMS Rotation Tracks



Tornado Damage Photos

Tornado Damage Photos

Summary/Conclusions

- Impressive storm system with dynamic ingredients attached that brought late-season snow and early-season severe weather to the region.

- Classic Low CAPE/High Shear Environment (low tops, rotating storms)

- EF-1 Amenia, NY Tornado was earliest on record in Dutchess County. EF-0 Kent, CT Tornado was earliest on record in Connecticut.

- Weaker tornado in Kent, CT had stronger signal than the stronger tornado in Amenia, NY.

- Distance from radar and brief nature of these QLCS tornadoes provided the most challenging aspects of the warning process.

- No TDS associated with the rotation signatures. Possible reasons: 1) Radar beam was 5000-7000 ft AGL and tornadoes/updraft were probably too weak to loft debris that high. 2) Little to no leaves were on the trees so any lofted debris signature was limited.

Summary/Conclusions Cont'd

- Several reports of thundersnow (particularly over the Berkshires and southern VT).

Thundersnow occurred on the backside of the boundary over an area where Strati-form precip was rapidly changing over to snow. The nearby sfc low and tight isallobaric pressure gradient (with cold air at the sfc and aloft behind the boundary and thunderstorms east of the boundary) likely enhanced upward ascent triggering the thundersnow.

Special Thanks

- NWS Albany Survey Team and those who worked this event
- Our media partners
- EMs and Local storm spotters

Questions???