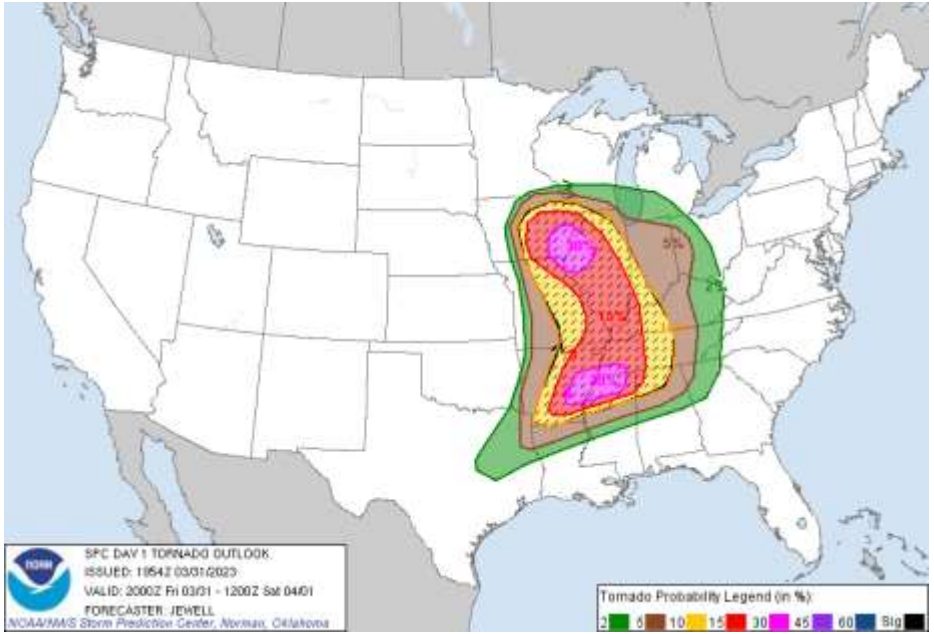
GLM and Warning Decision Making: March 31 - April 1, 2023

Geoff Heidelberger, Ashley Ravenscraft,
Kris White, and Katie Magee
NWS Huntsville, AL

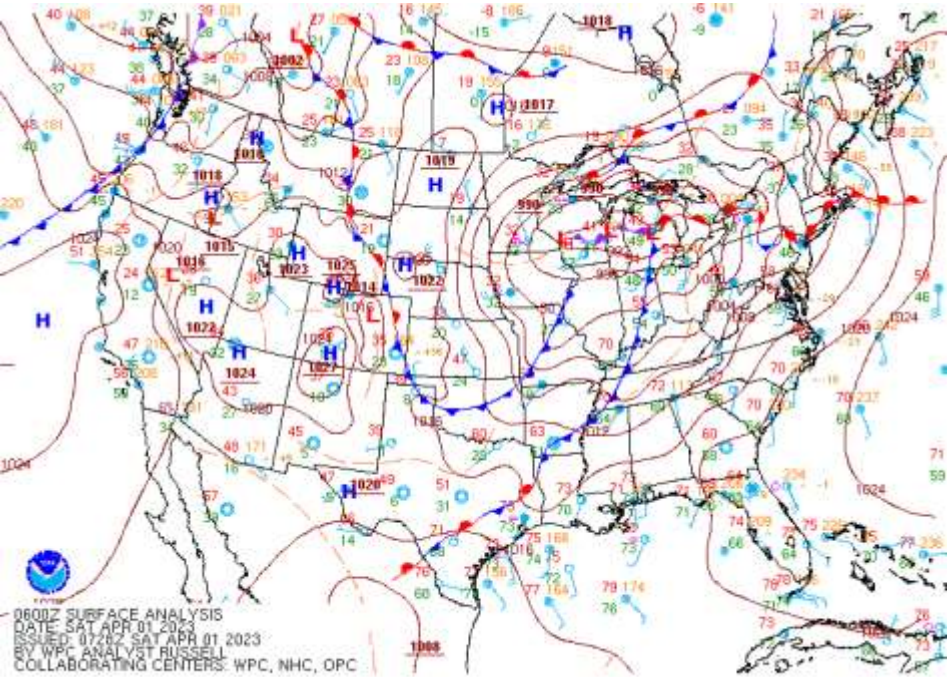
Environment Overview of Mar 31 - Apr 1

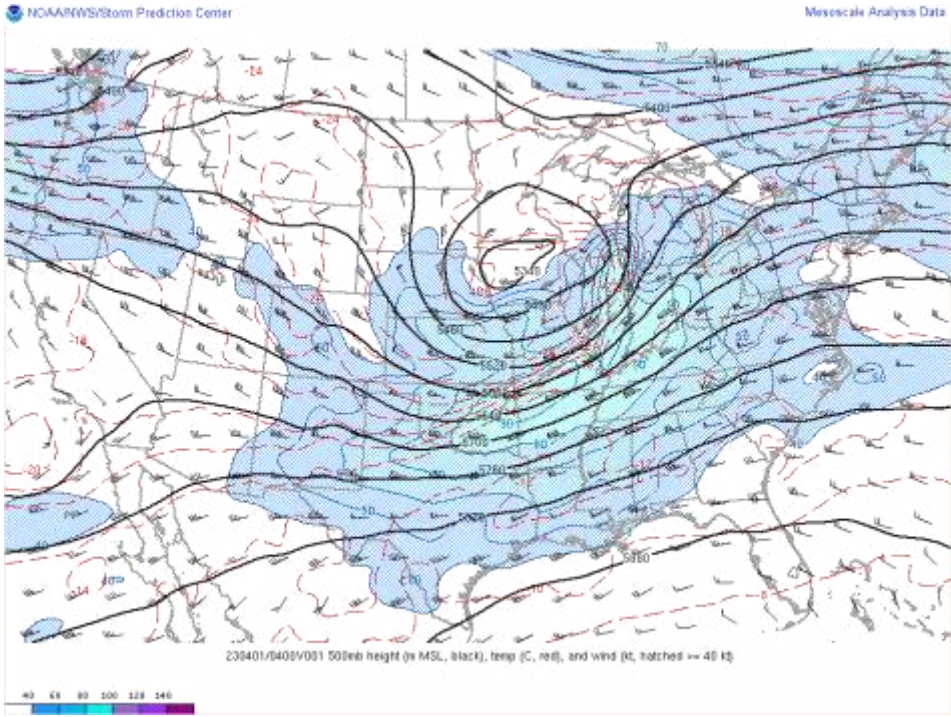
20z Day 1 SPC outlook



20z Day 1 SPC outlook - Tornado Probabilities

Environment Overview of Mar 31 - Apr 1





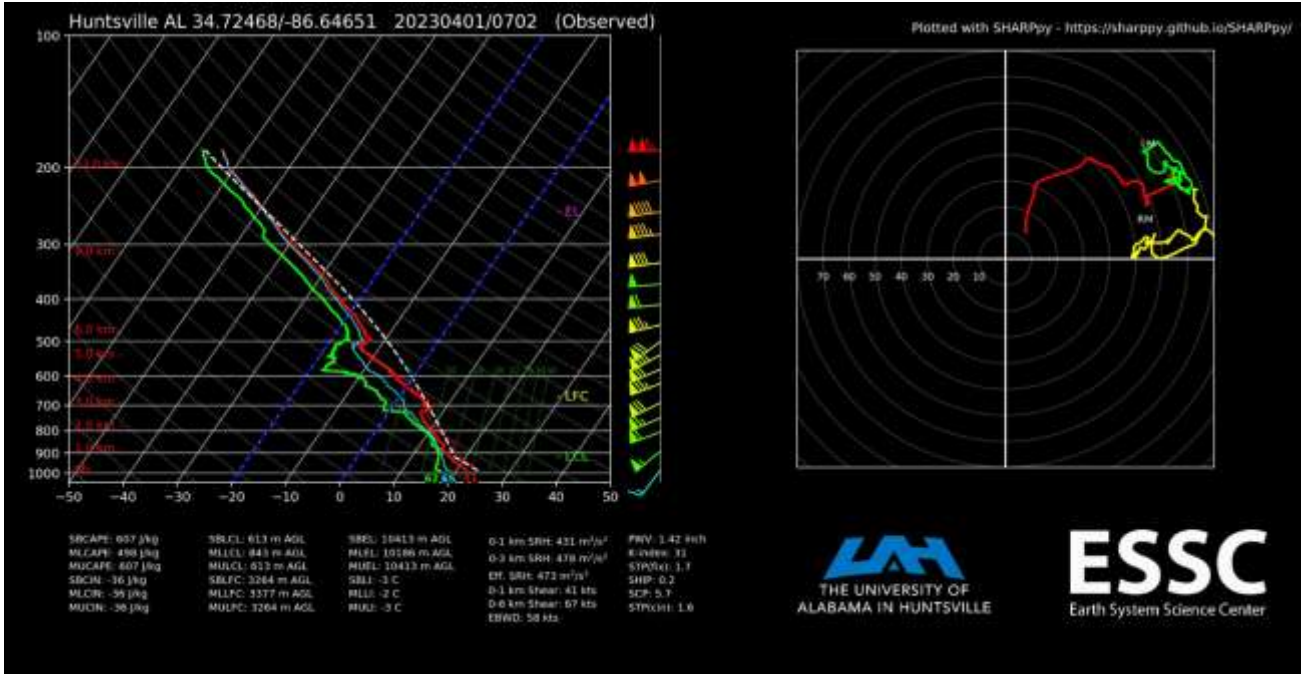
Environment Overview of Mar 31 - Apr 1

<u>April 1st - 7z UAH sounding</u>

CAPE ~700 J/kg

0-1 km shear - 41 kts

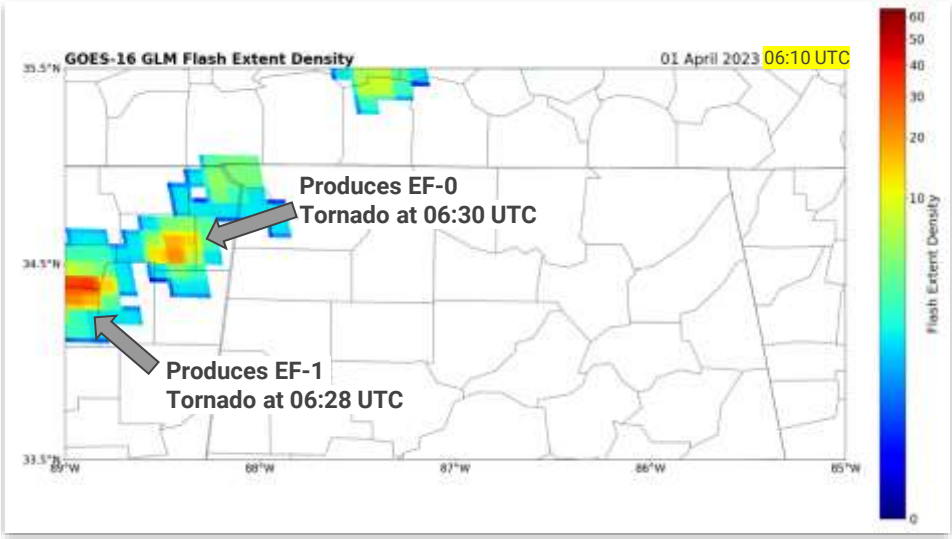
0-1 km SRH - 431 m2/s2



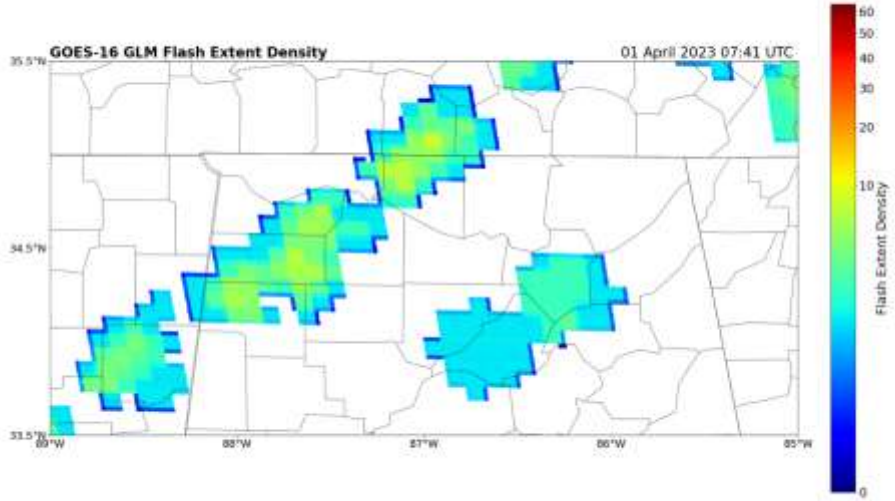
How lightning jumps upstream influenced our warning decisions over our CWA

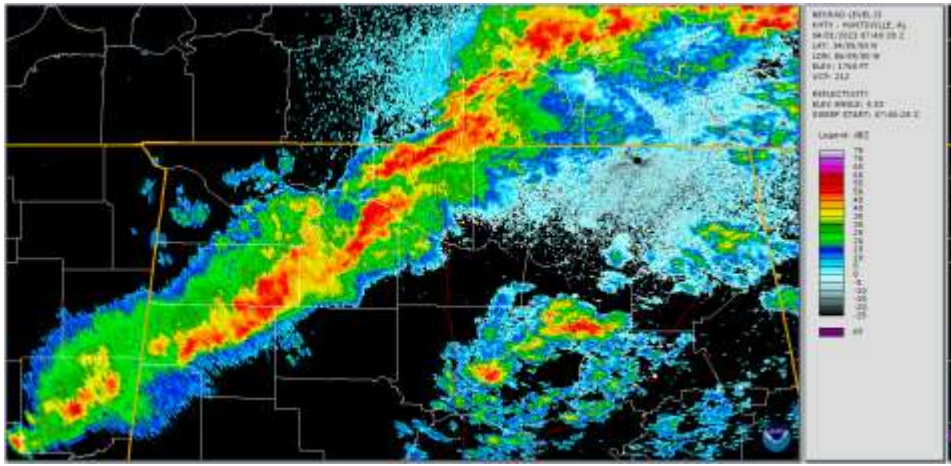
Noticed GLM spiking to 30-40 flashes per minute ahead of tornadic radar signatures over northern MS. Looking upstream helped us “calibrate” how updraft/lightning intensity may preclude tornadogenesis.

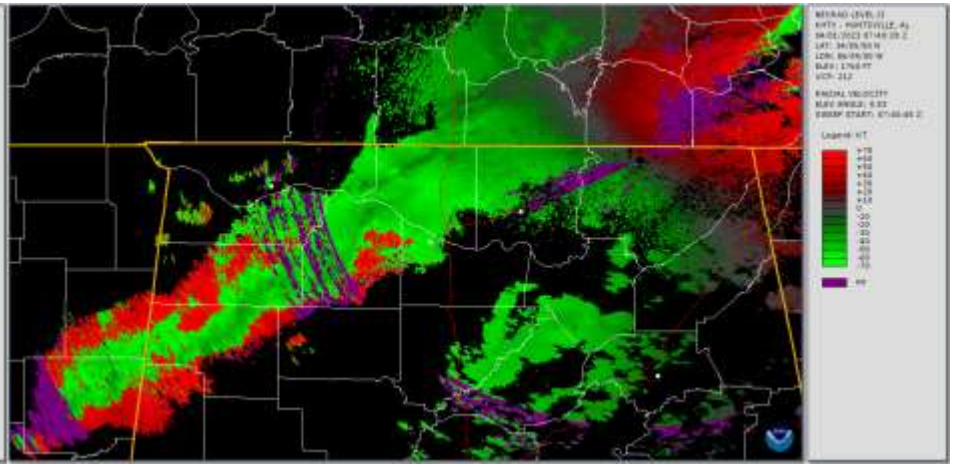
Other lightning jumps were noted with significant tornadoes, like the Rolling Fork, MS EF-4.



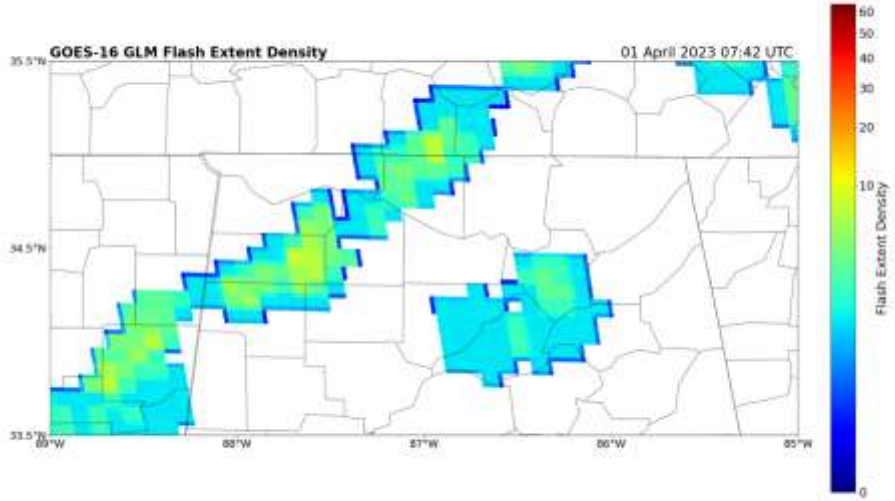
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

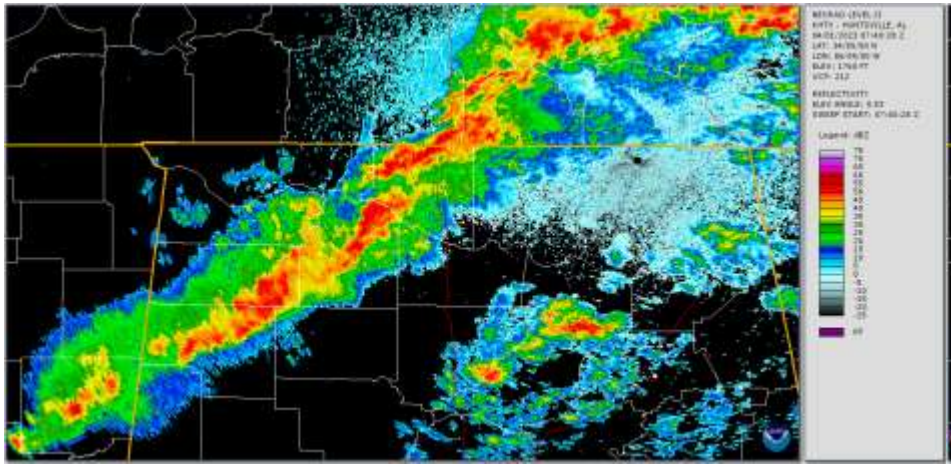


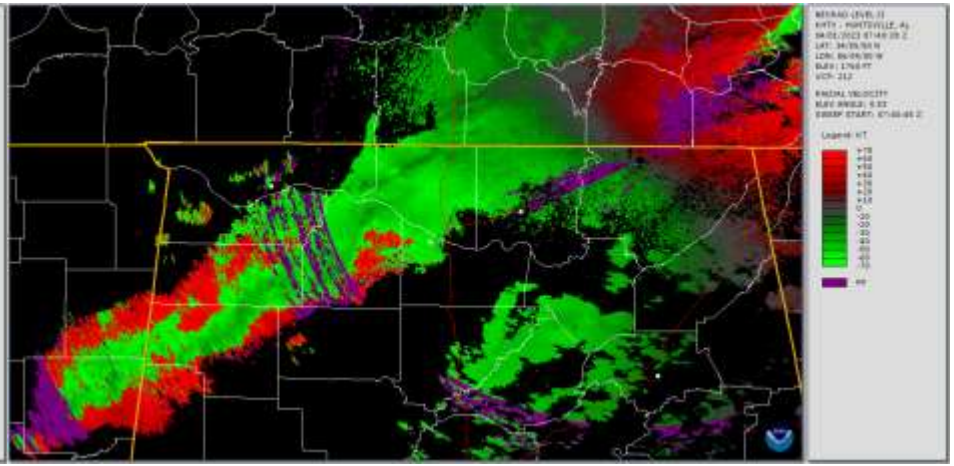




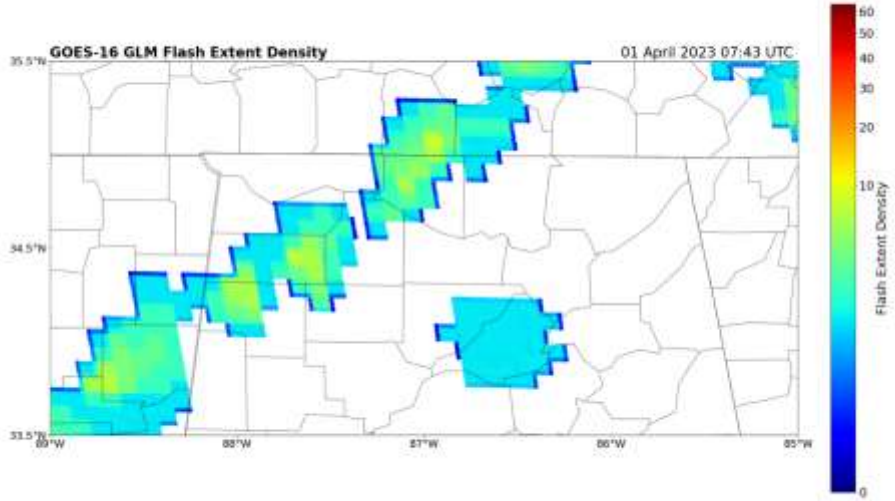
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

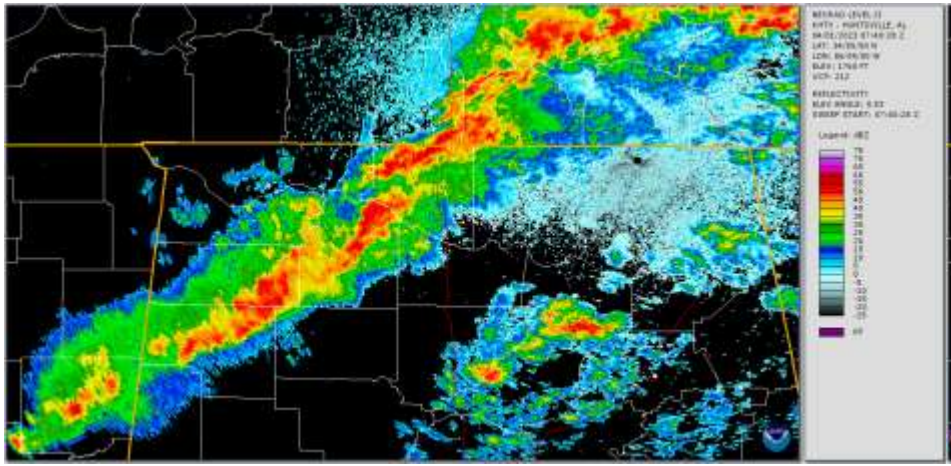


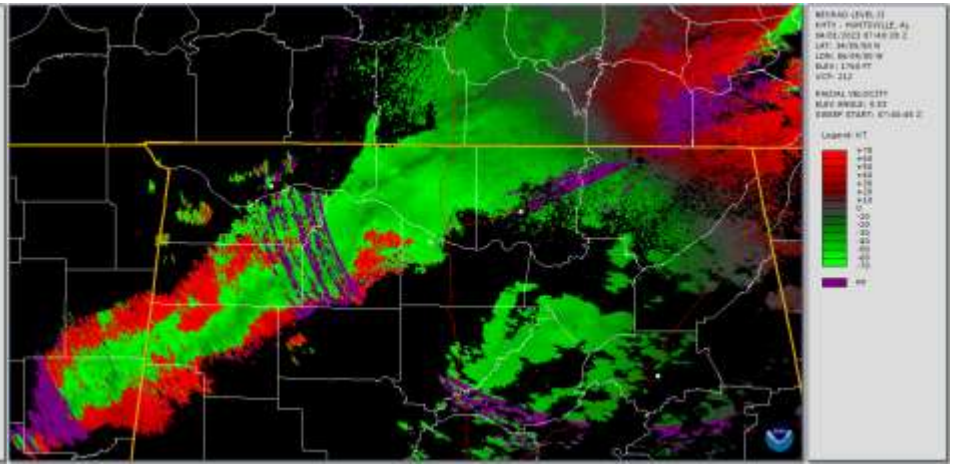




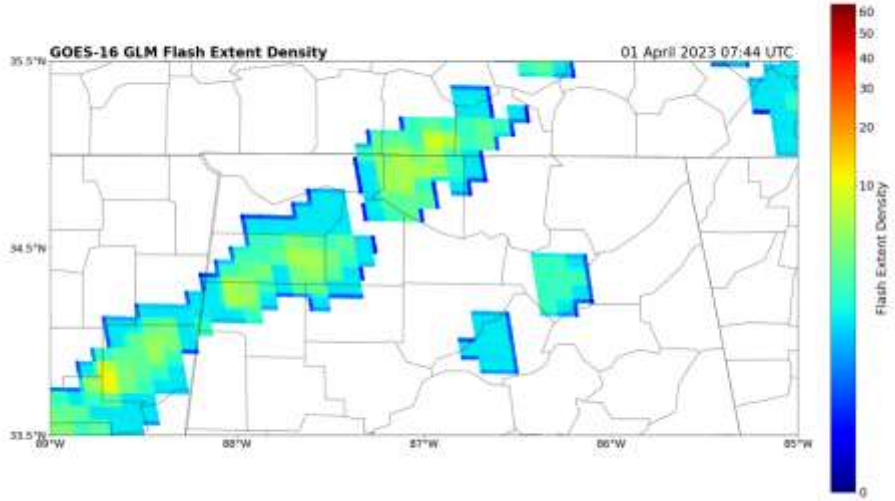
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

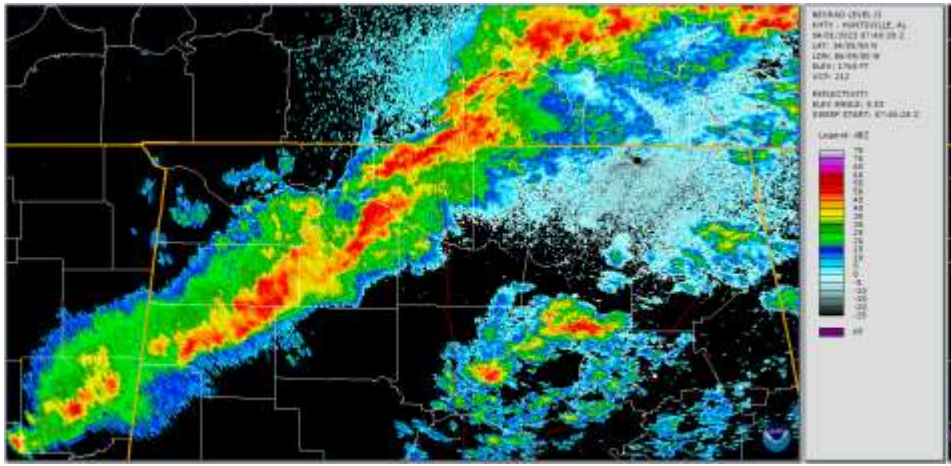


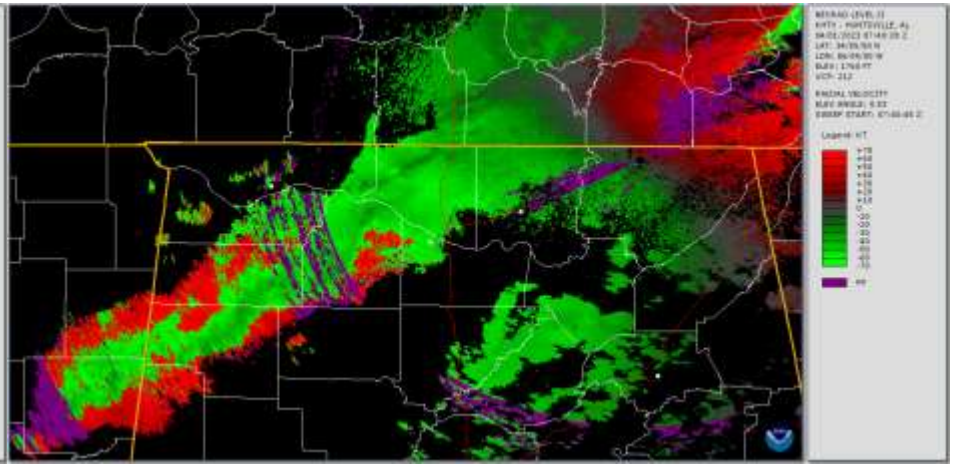




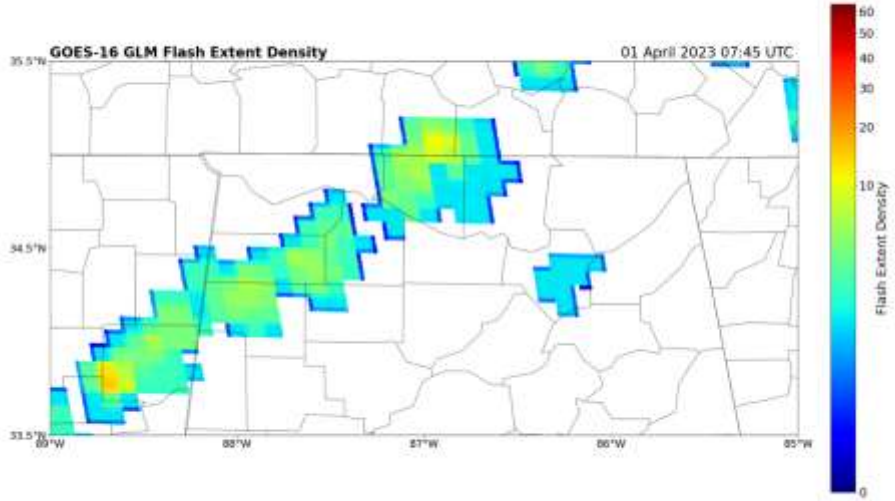
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

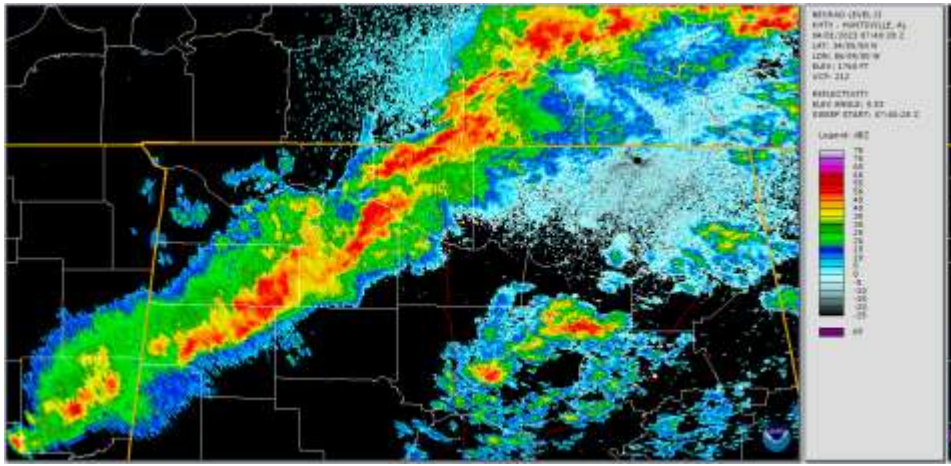


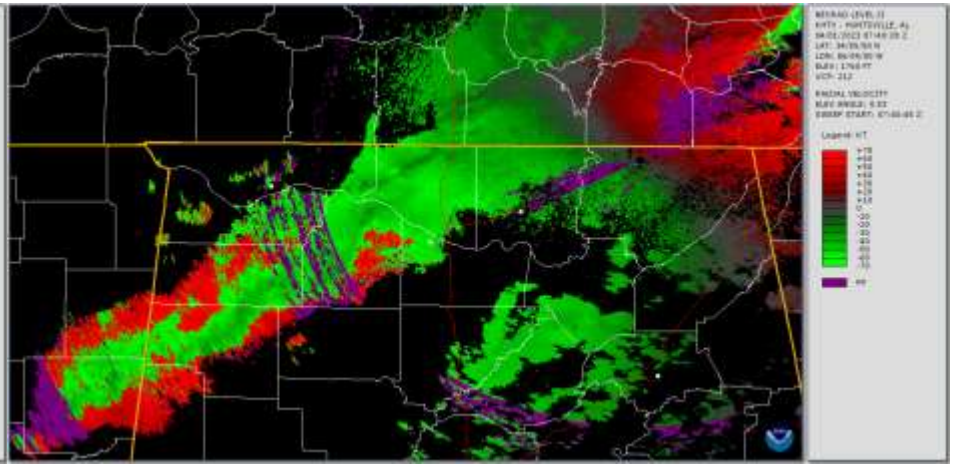




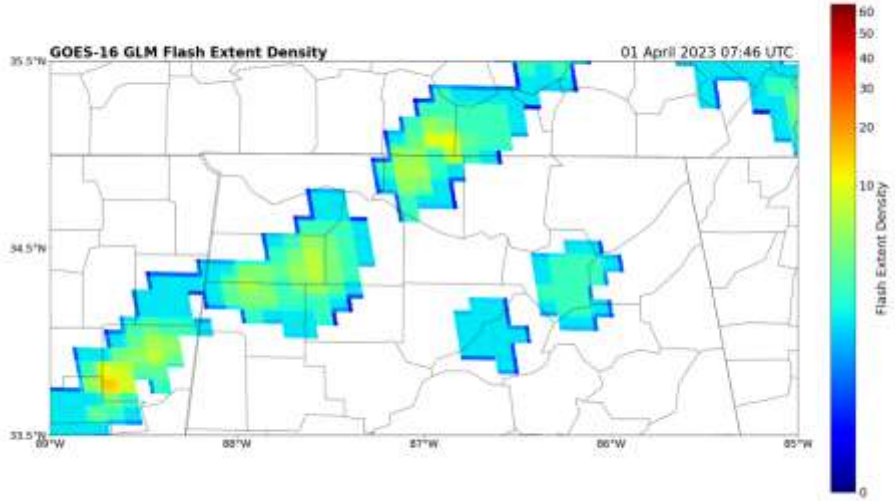
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

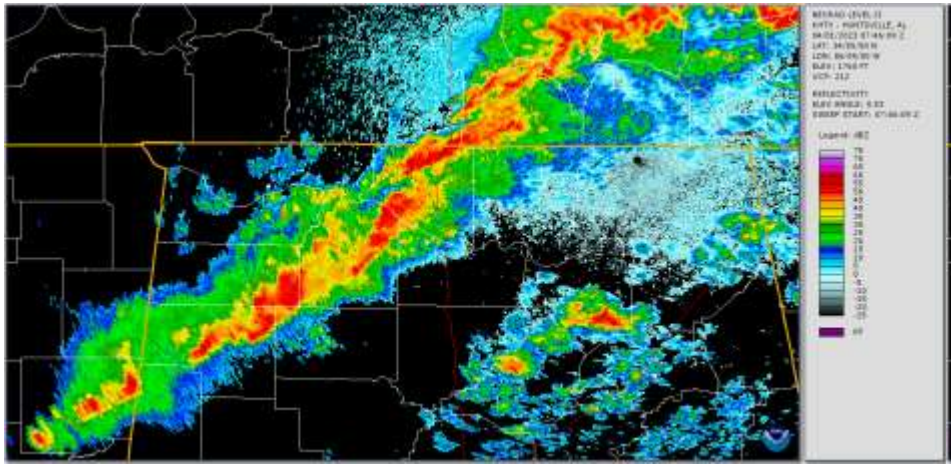


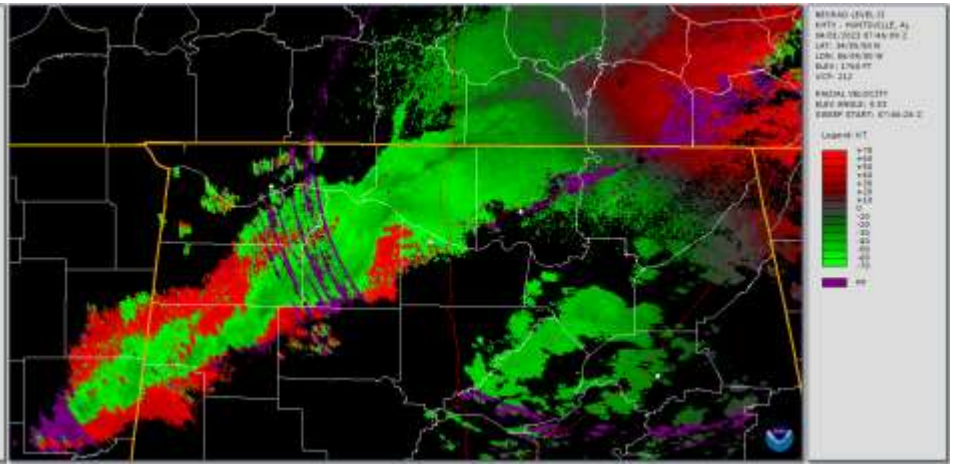




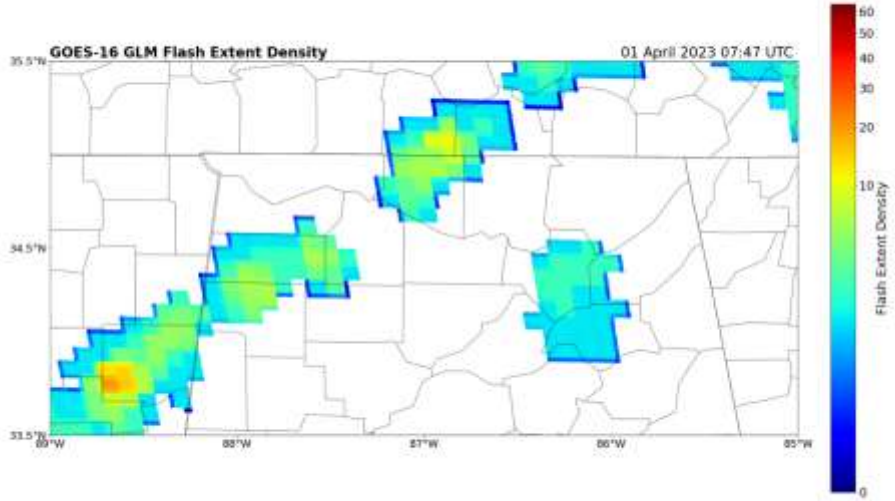
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

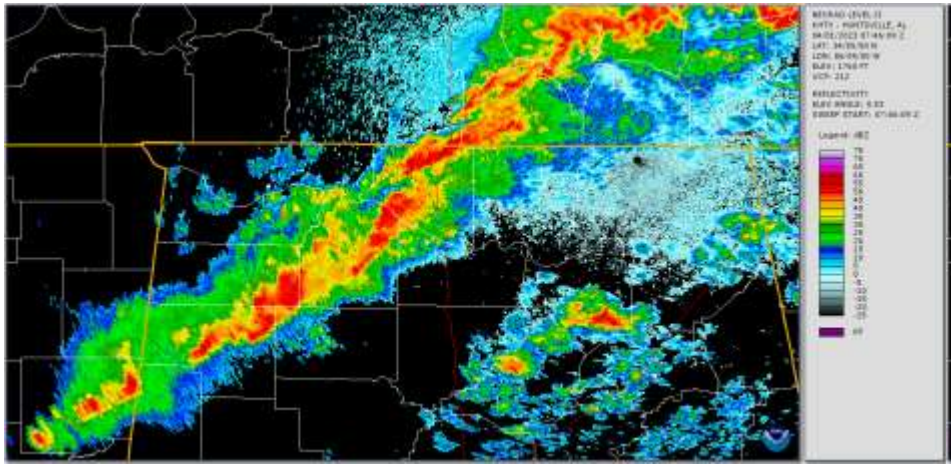


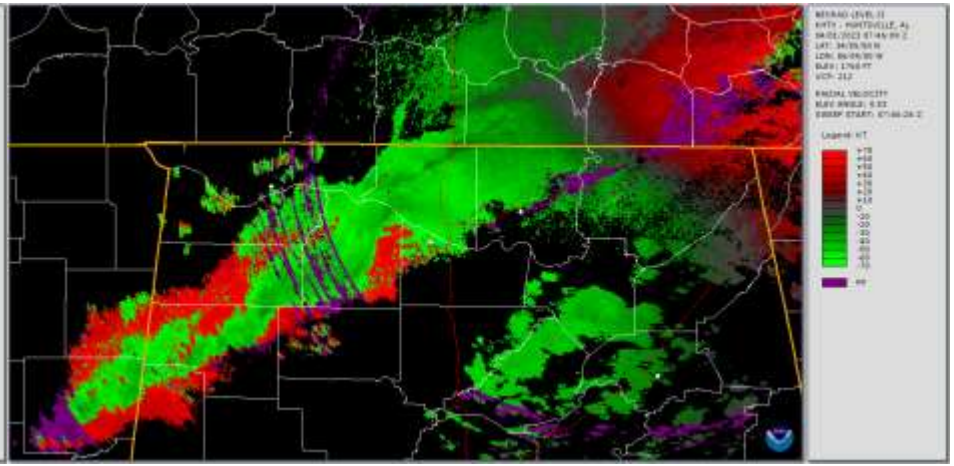




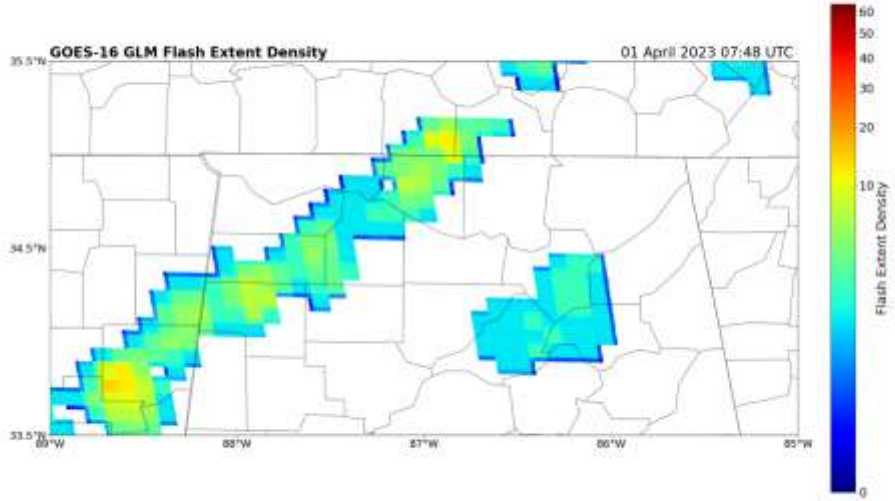
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

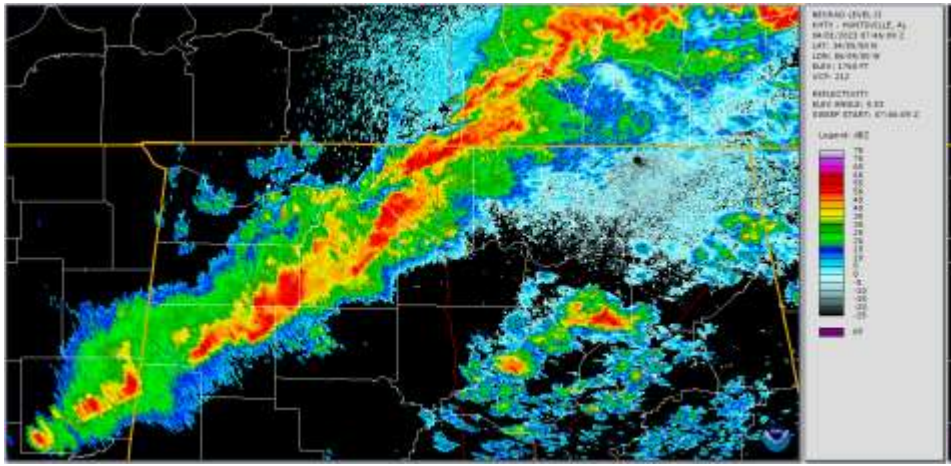


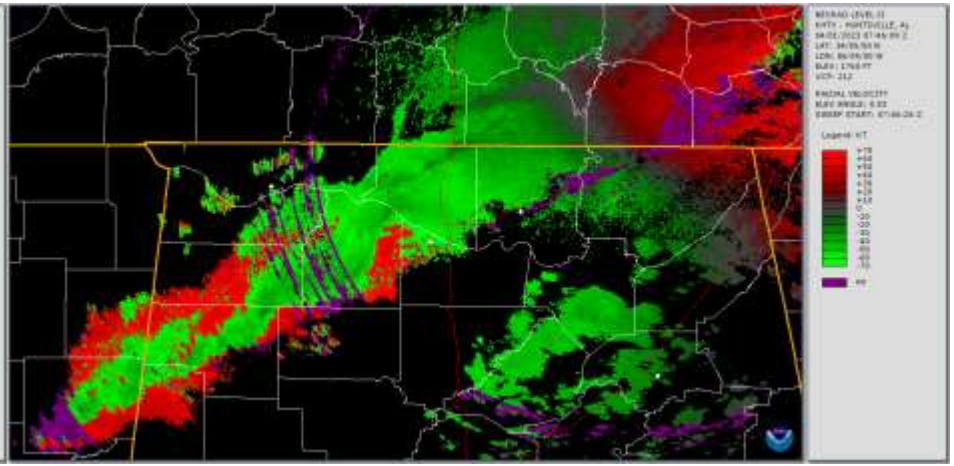




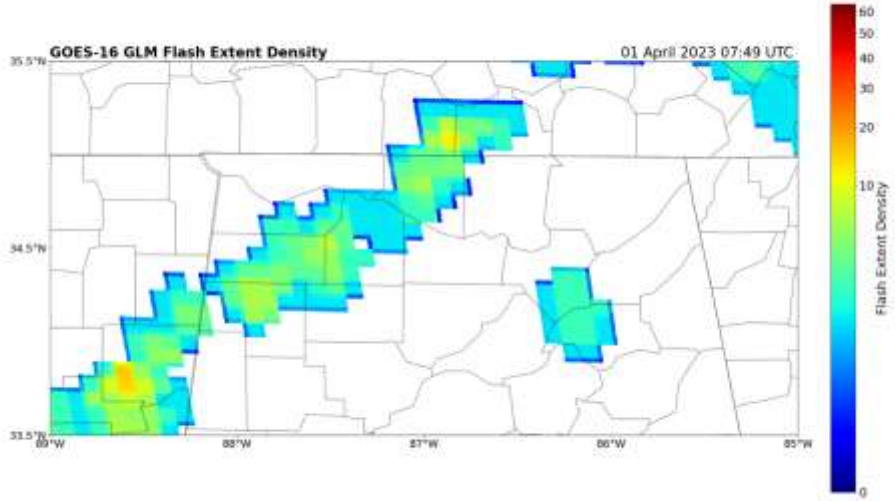
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

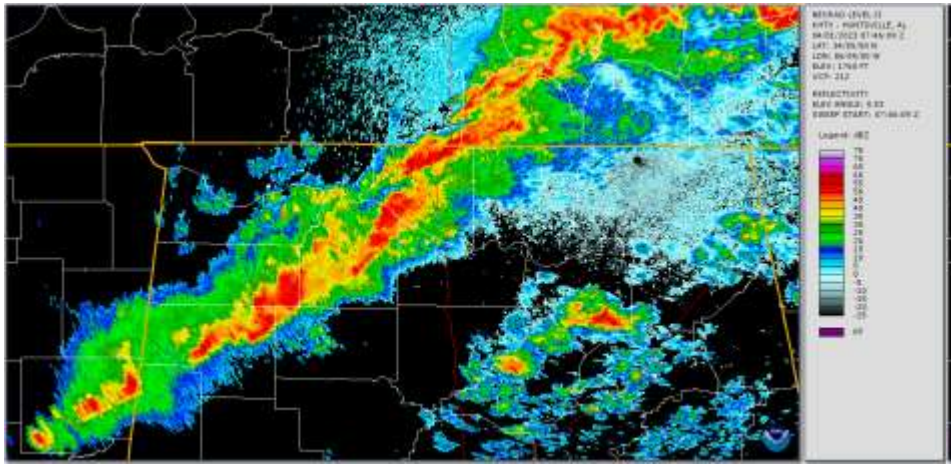


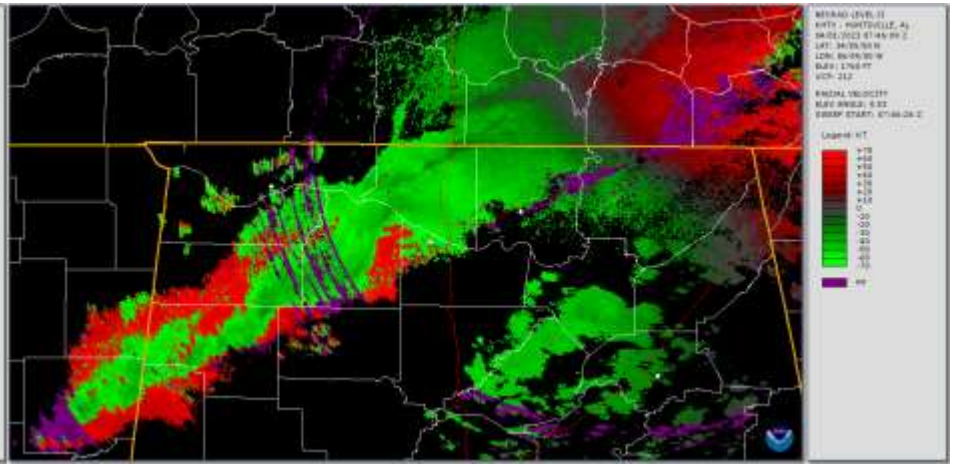




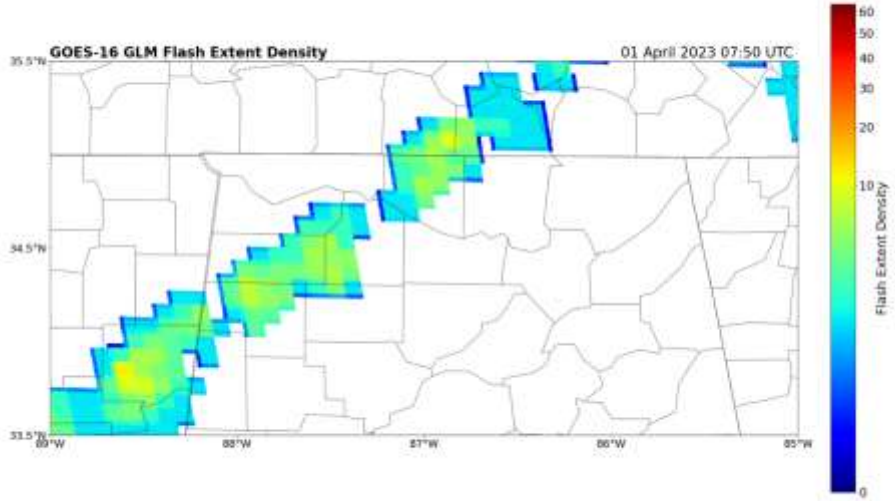
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

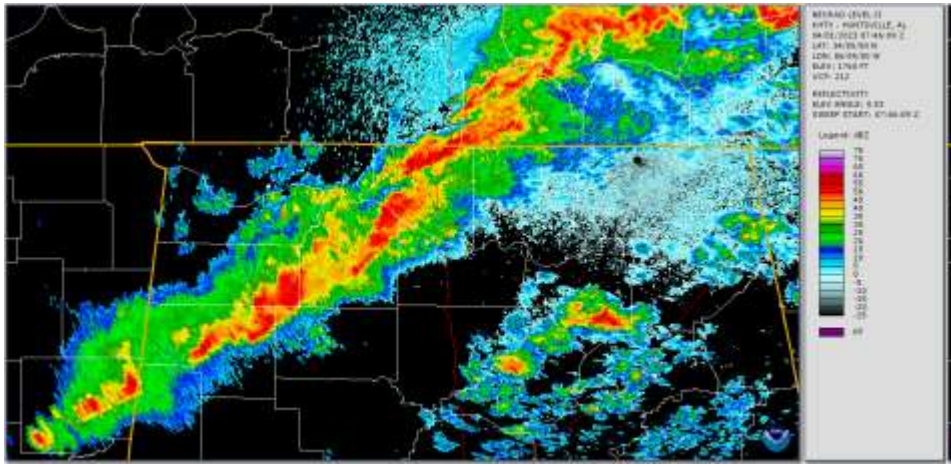


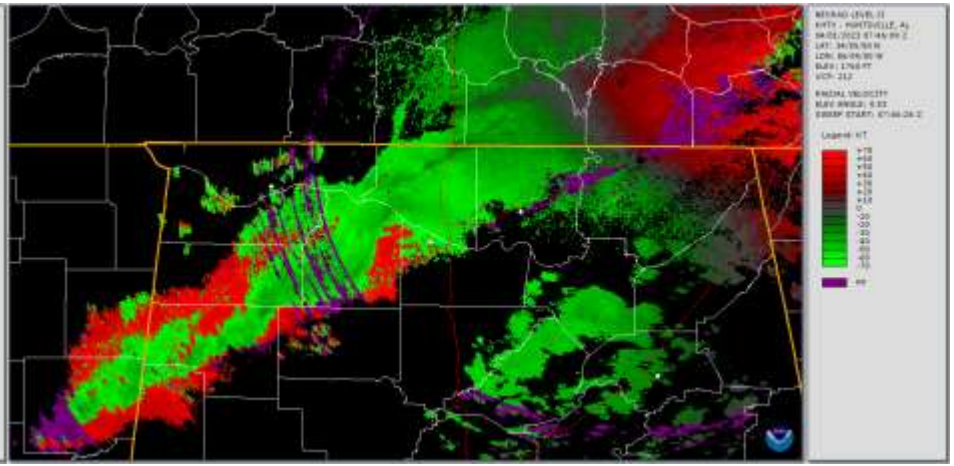




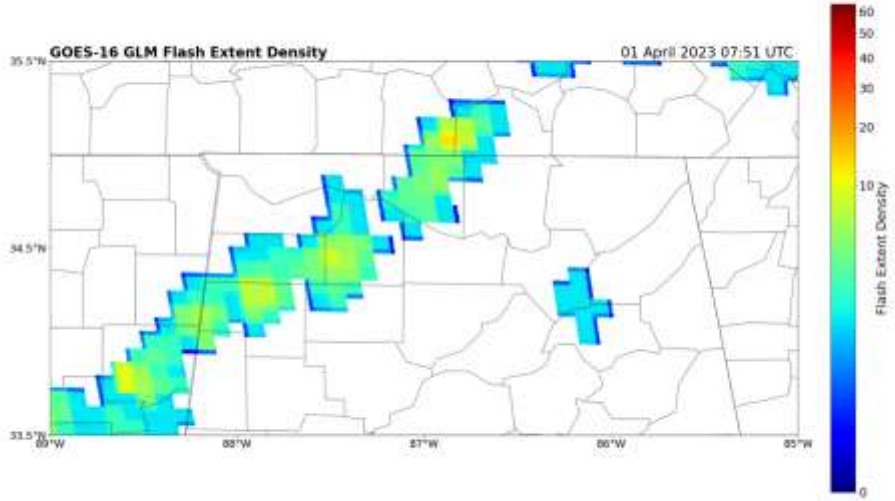
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

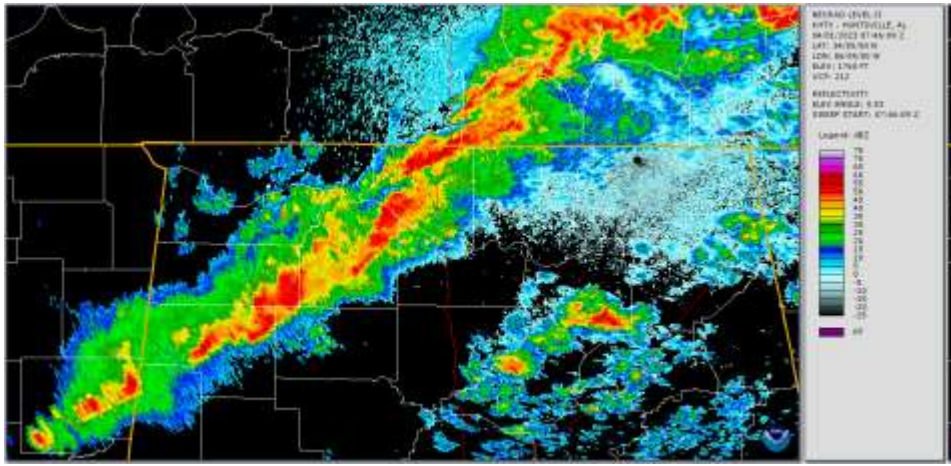


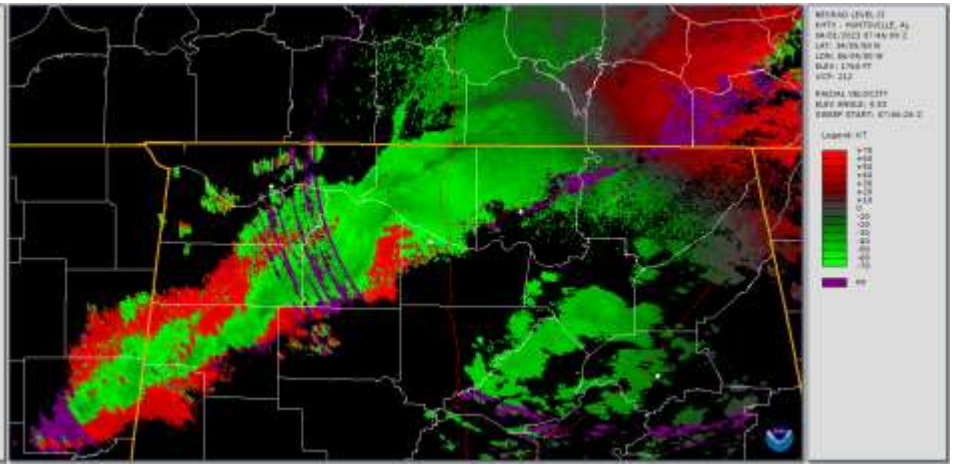




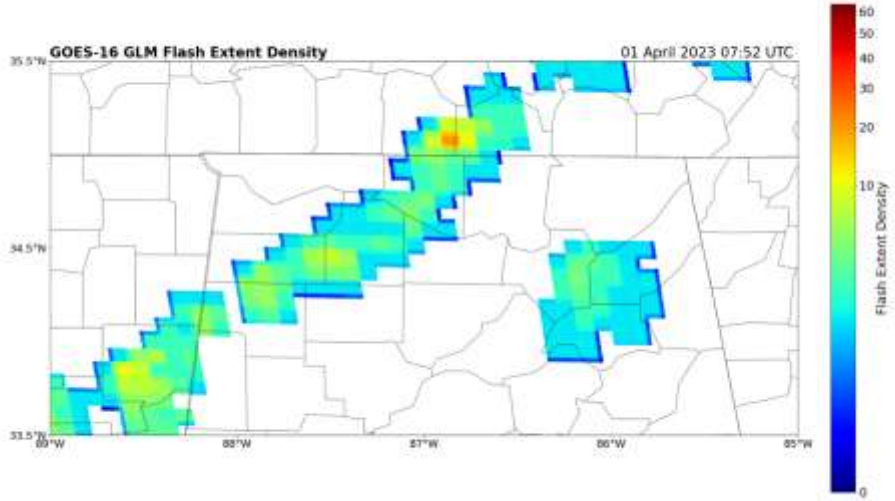
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

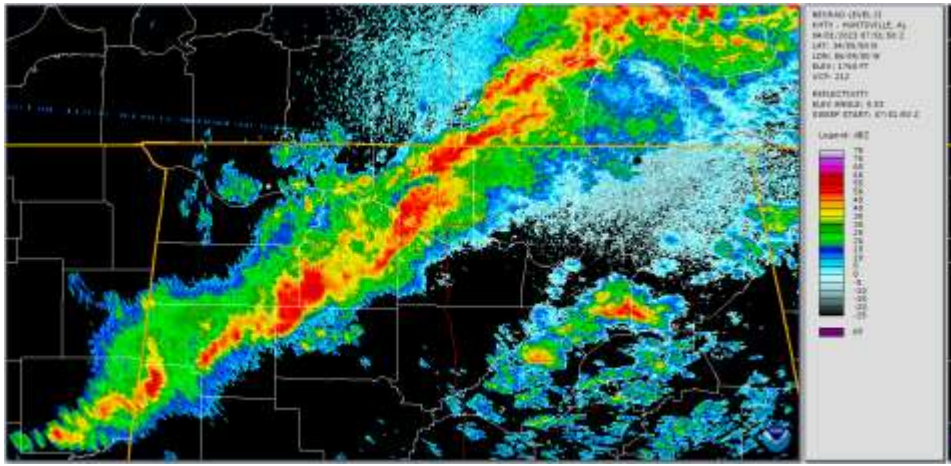


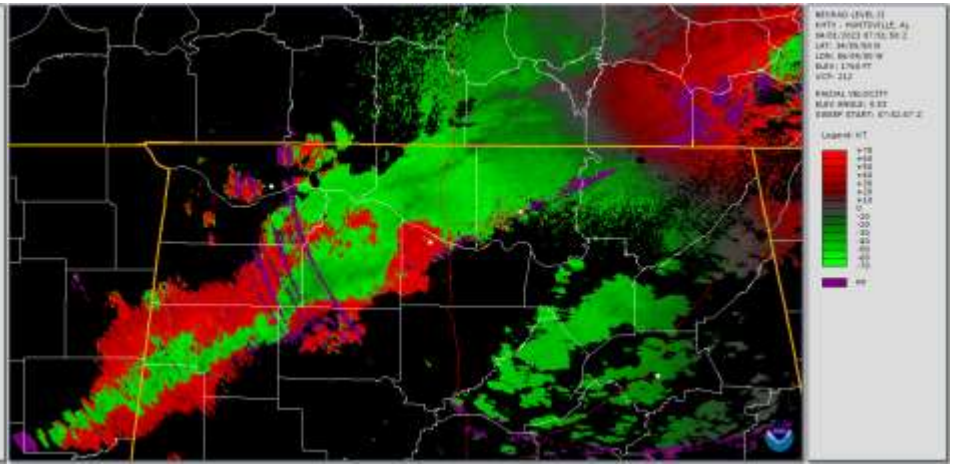




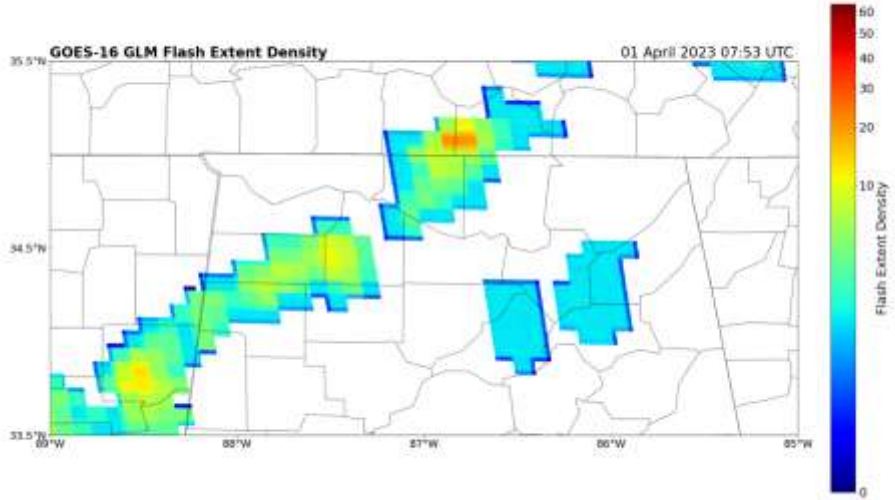
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

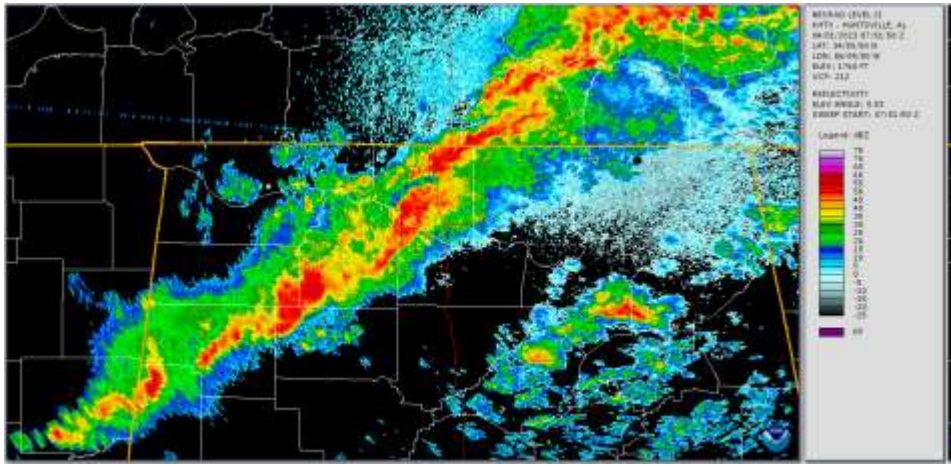


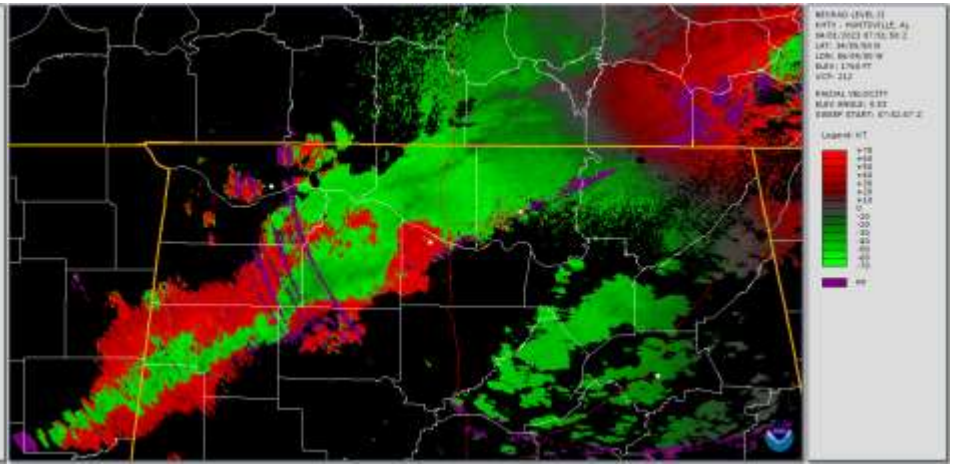




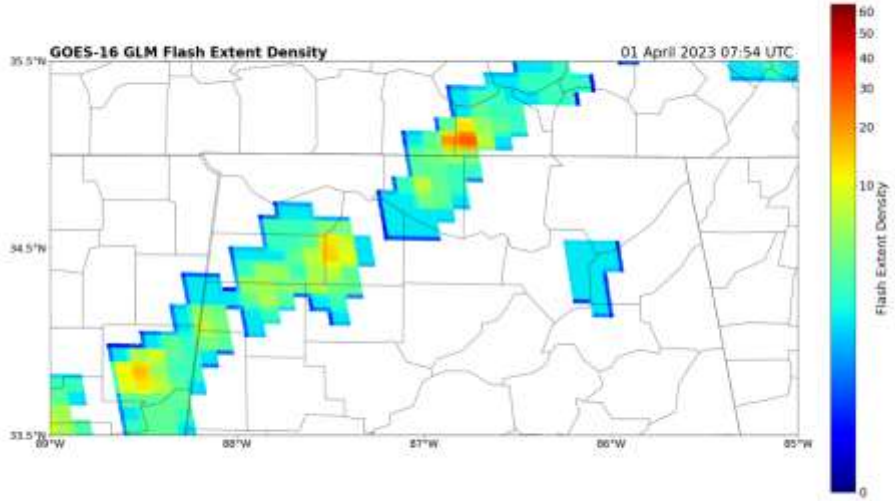
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

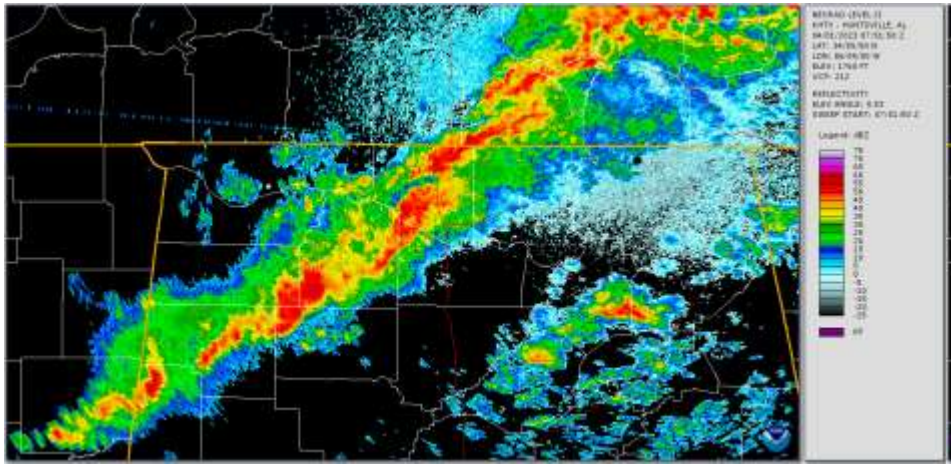


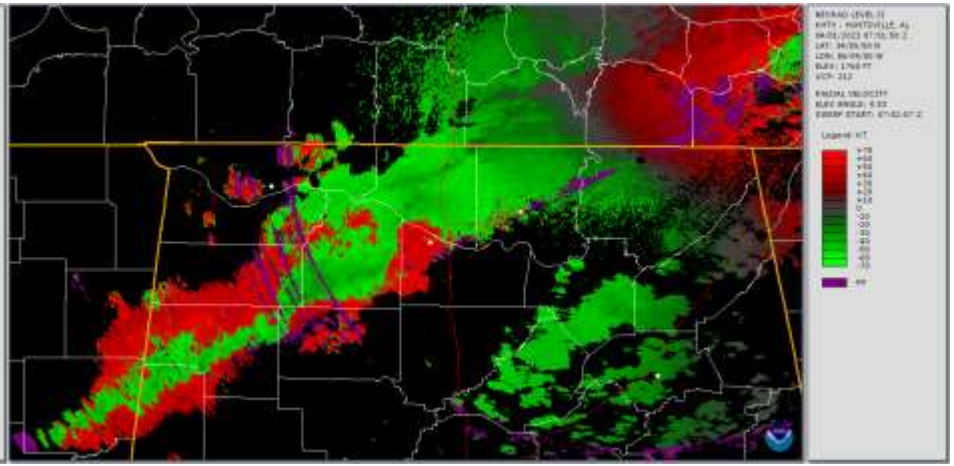




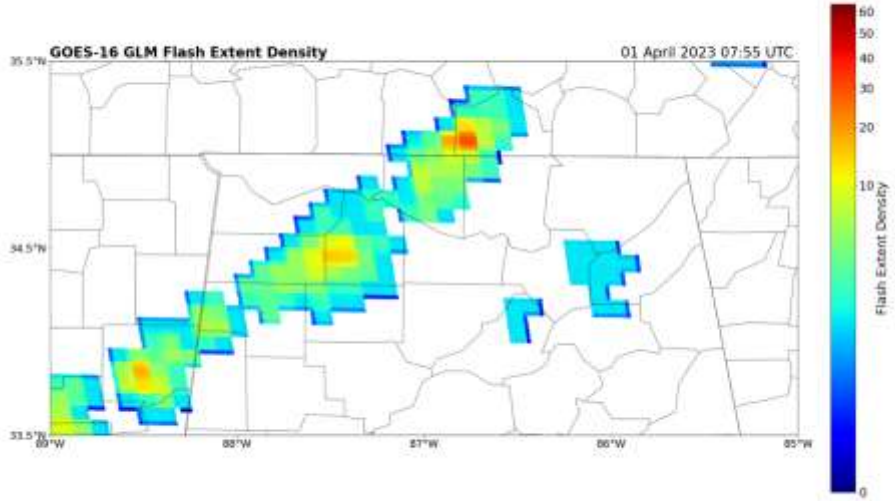
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

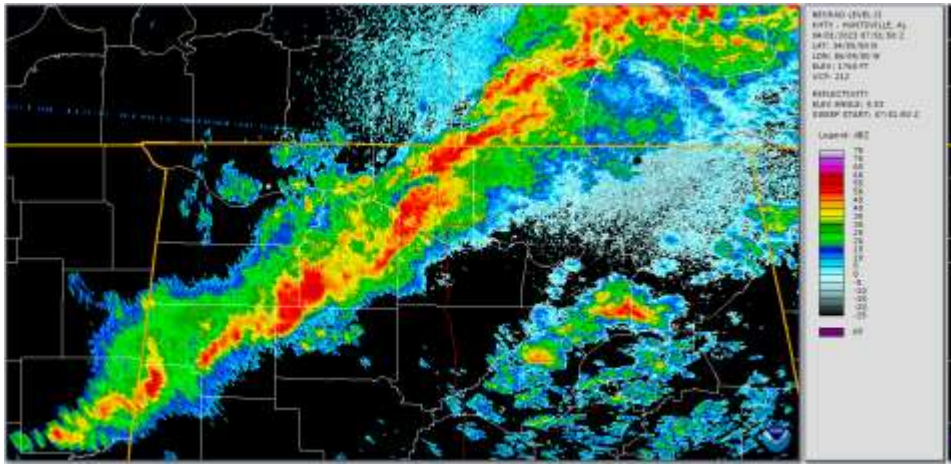


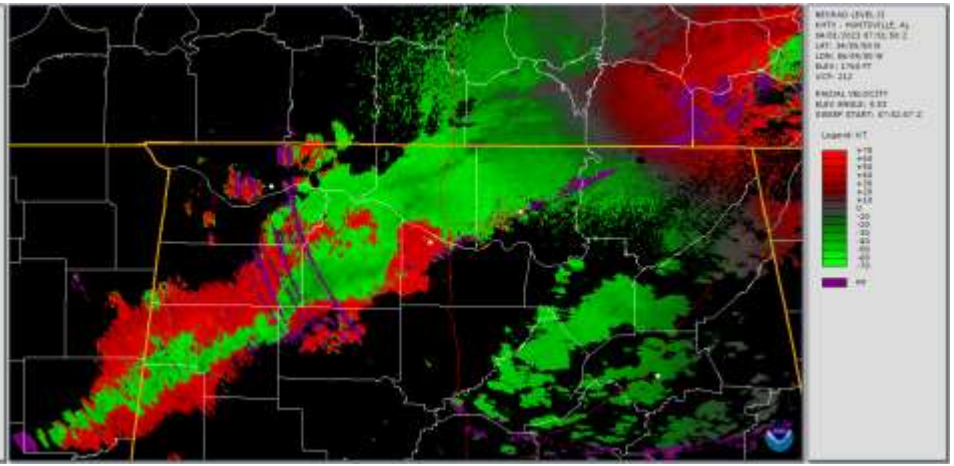




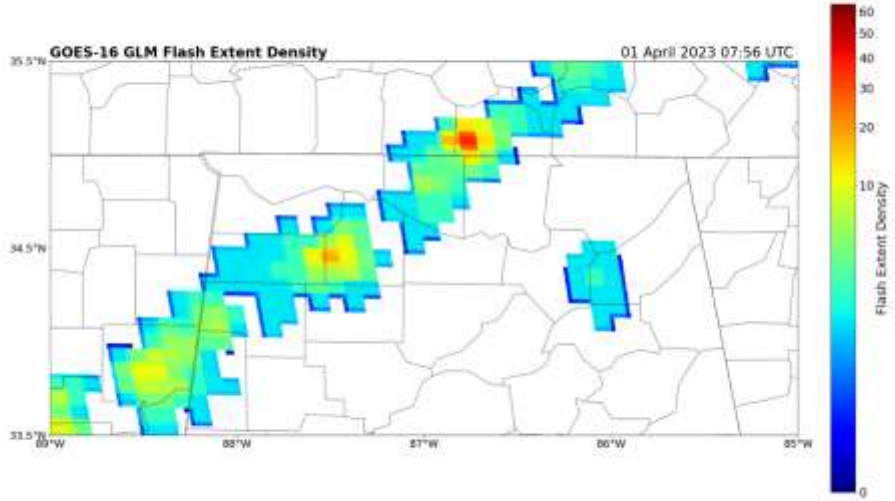
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

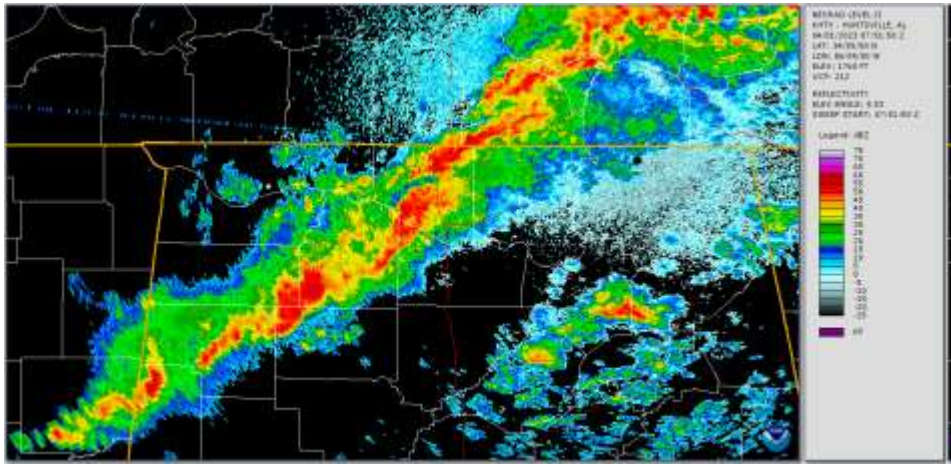


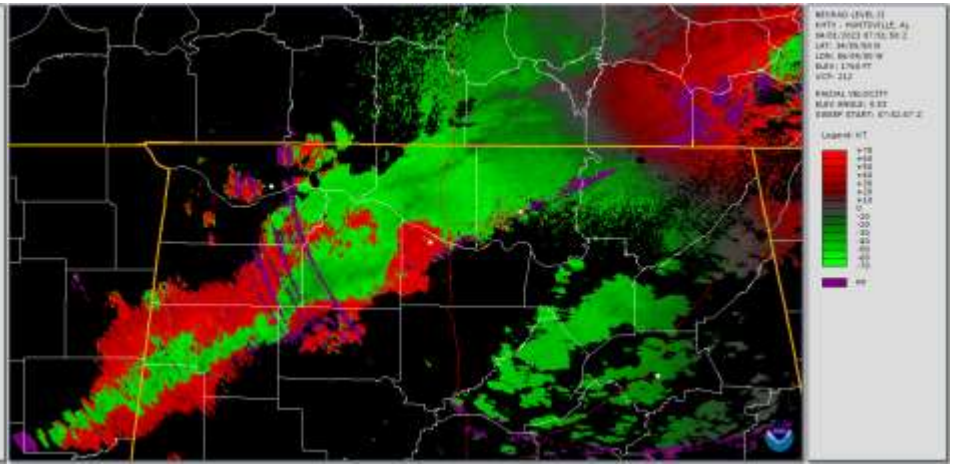




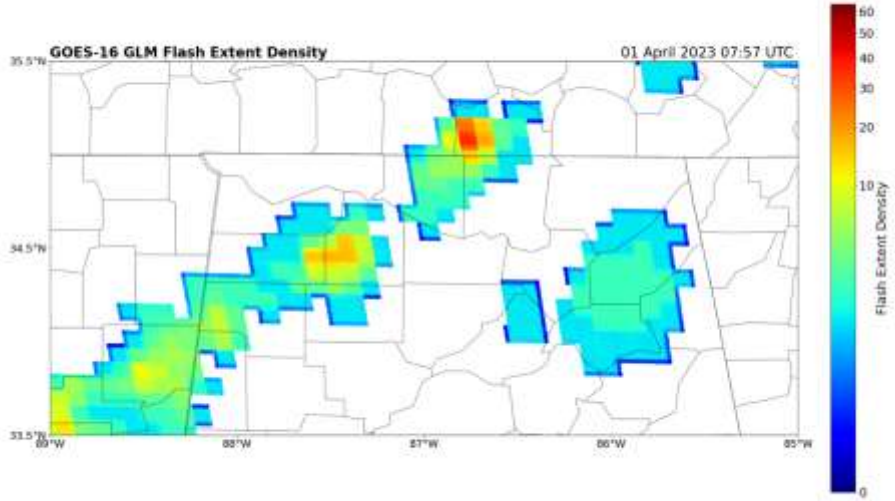
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

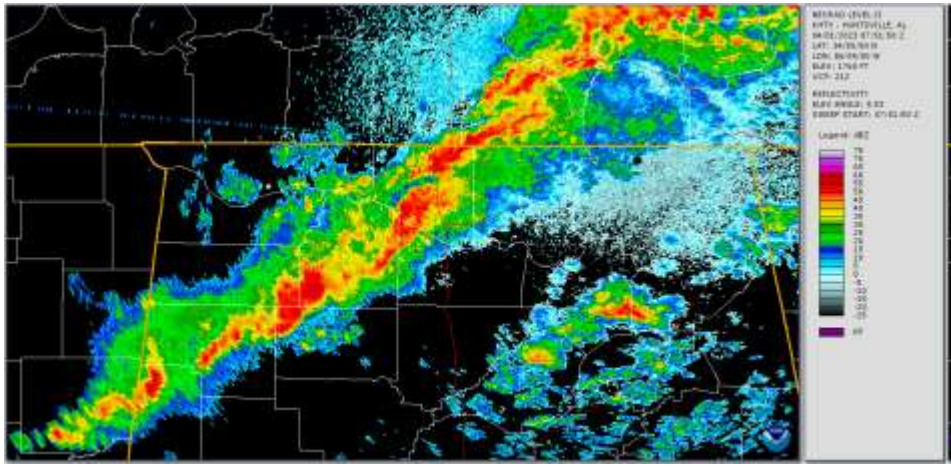


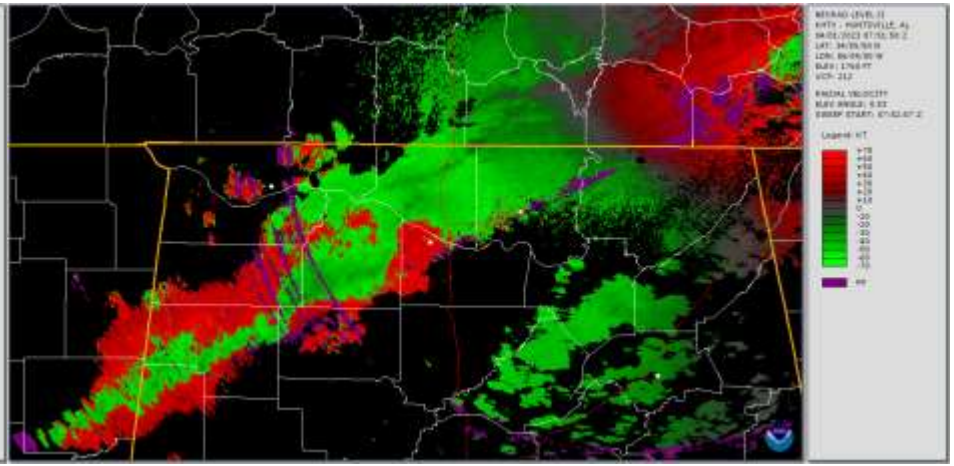




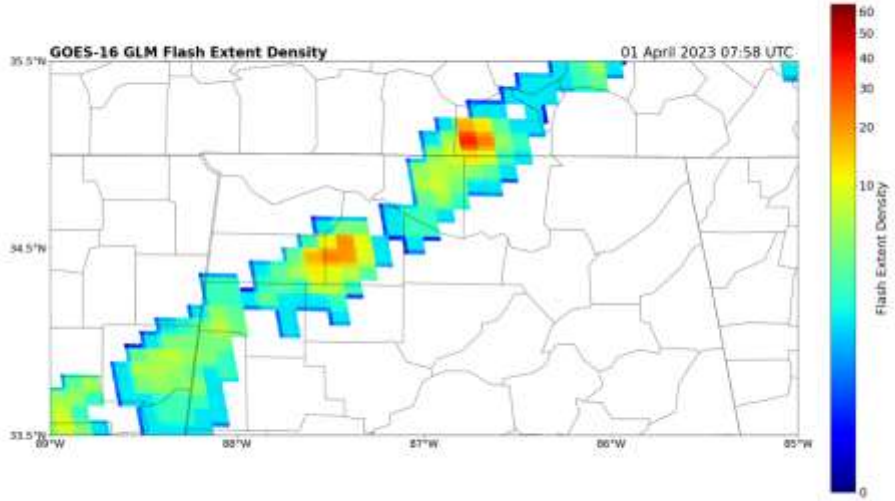
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

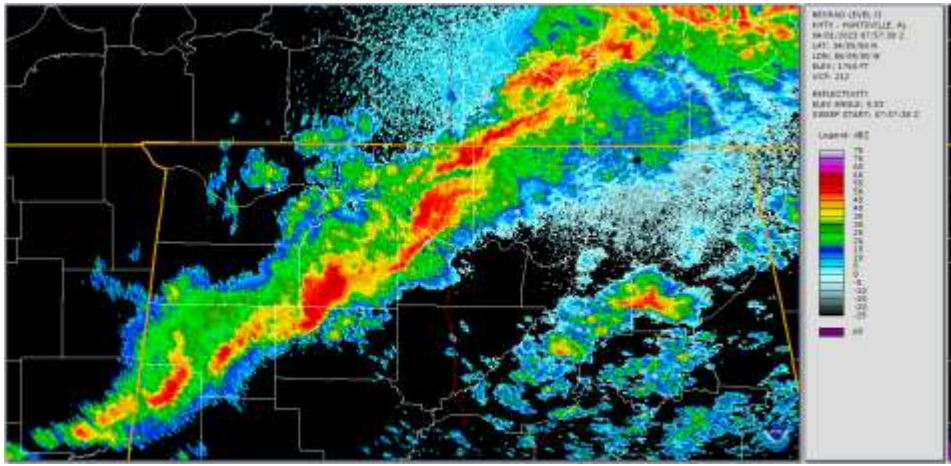


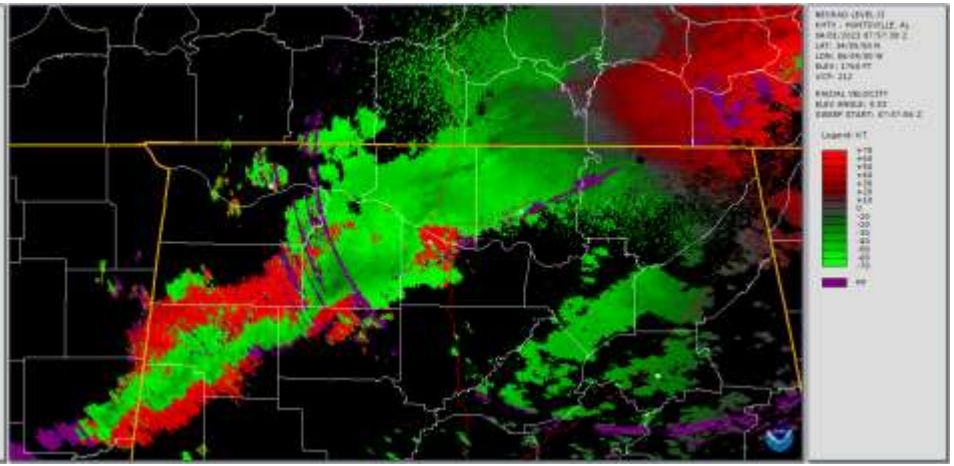




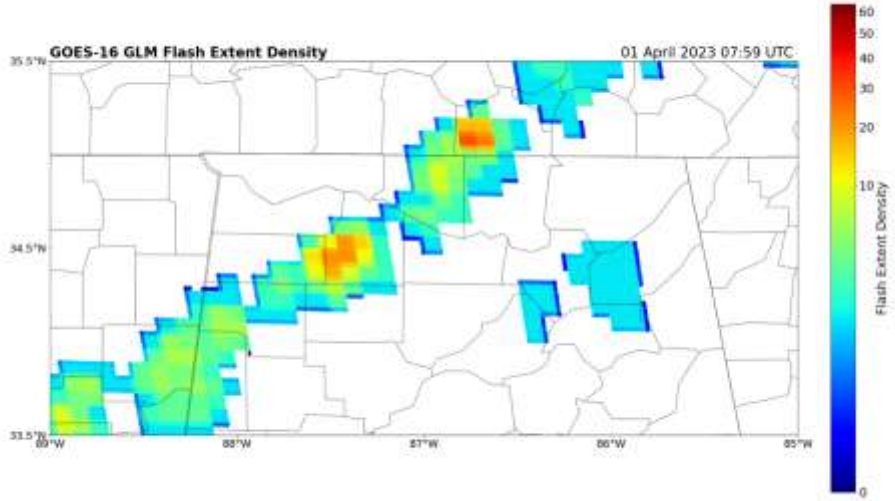
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

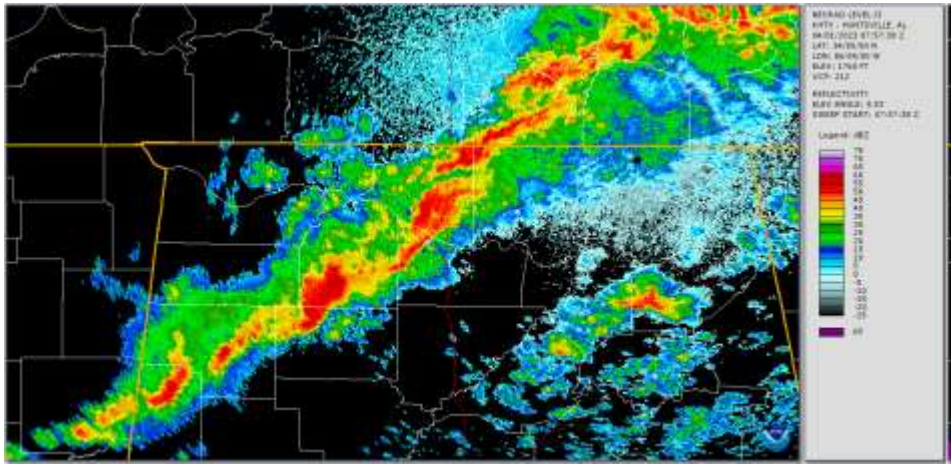


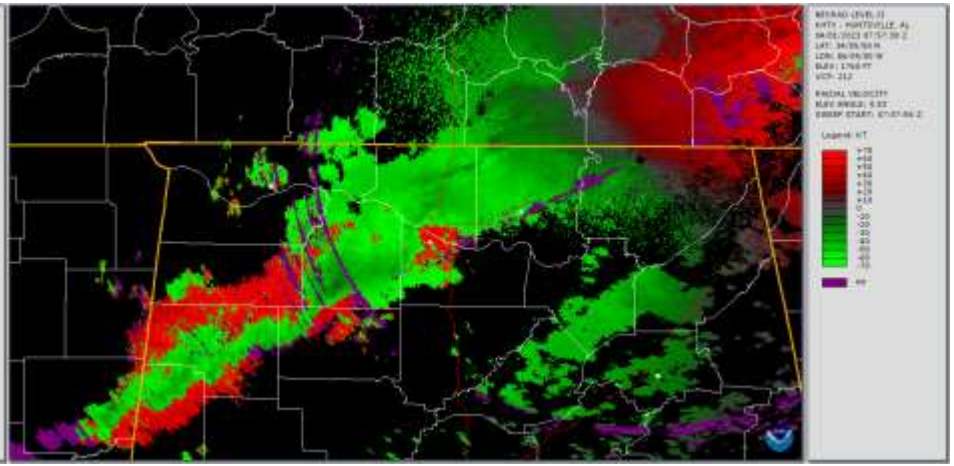




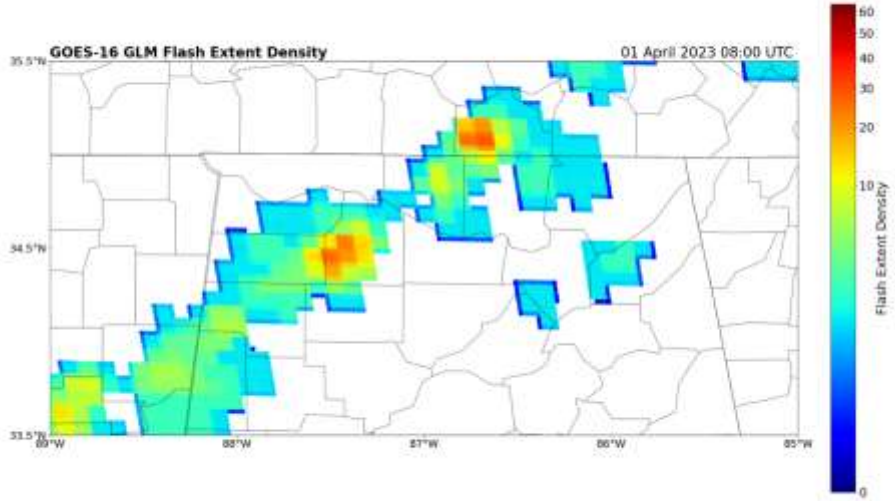
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

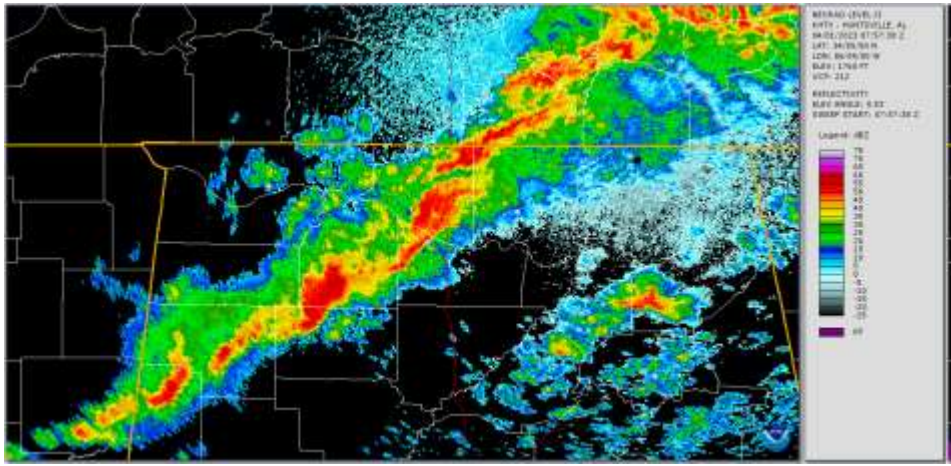


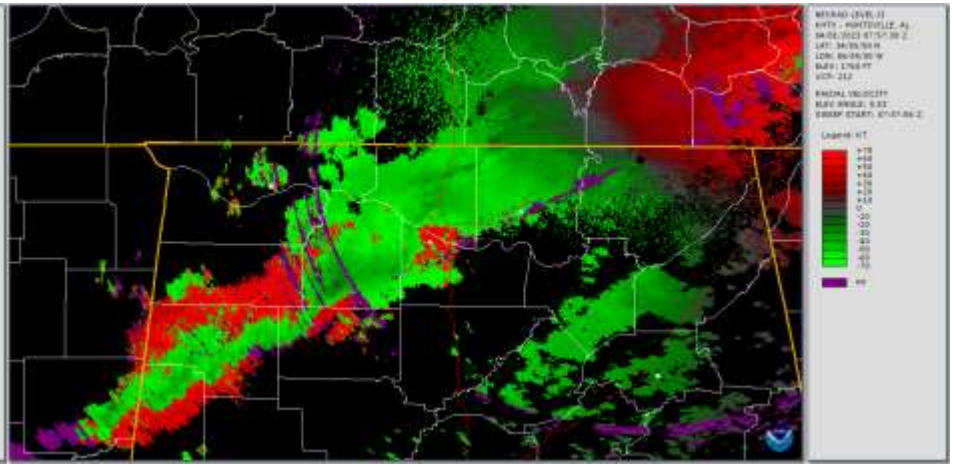




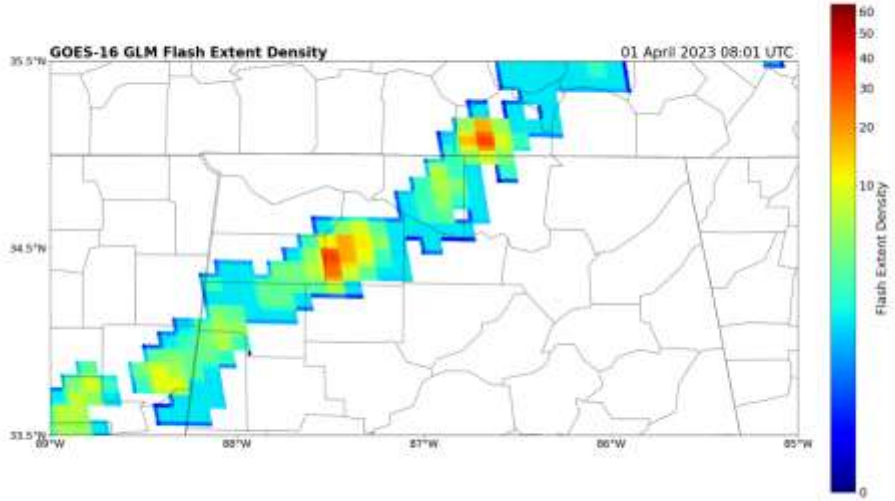
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

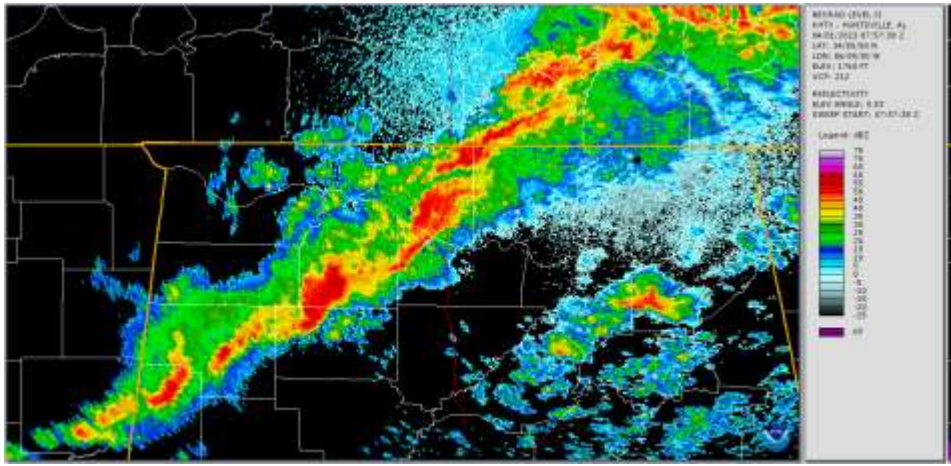


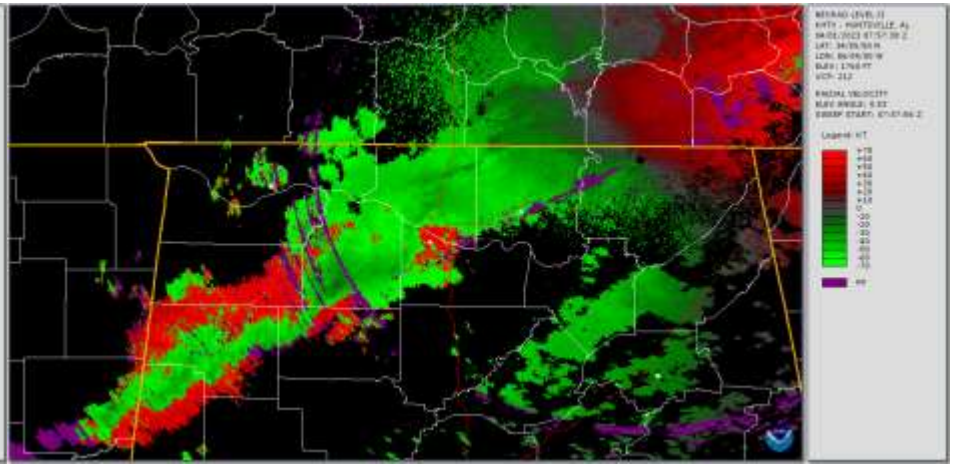




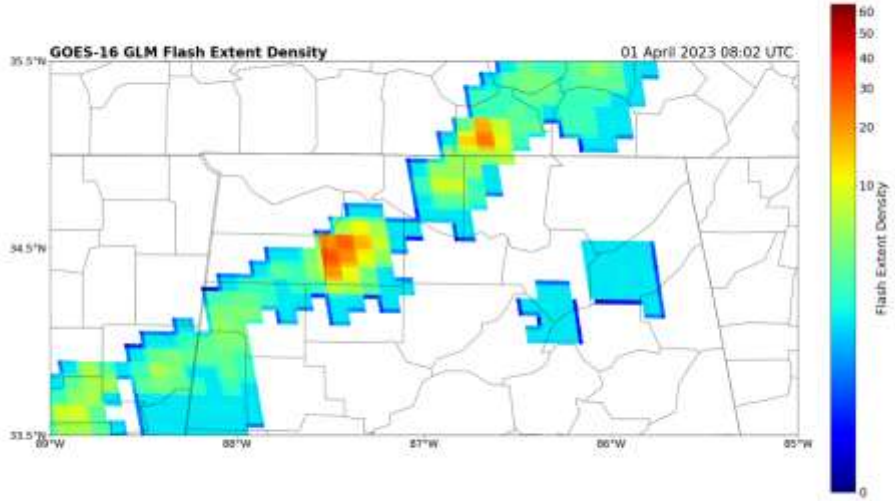
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

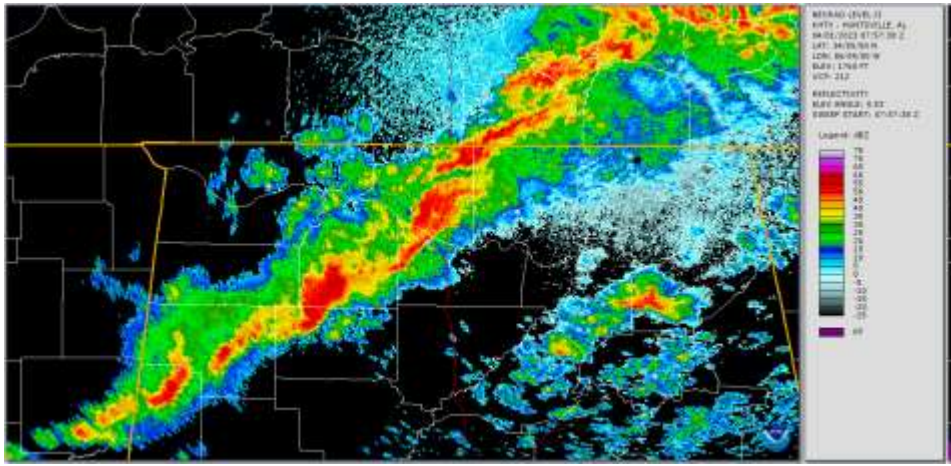


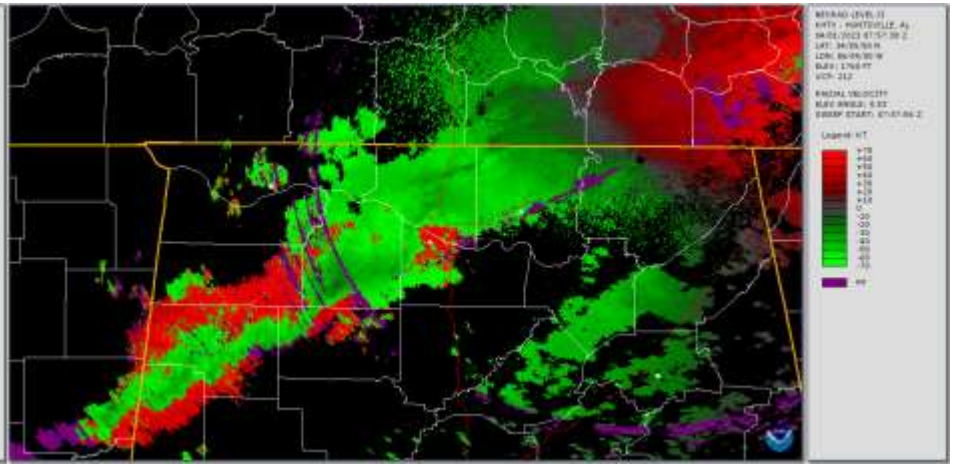




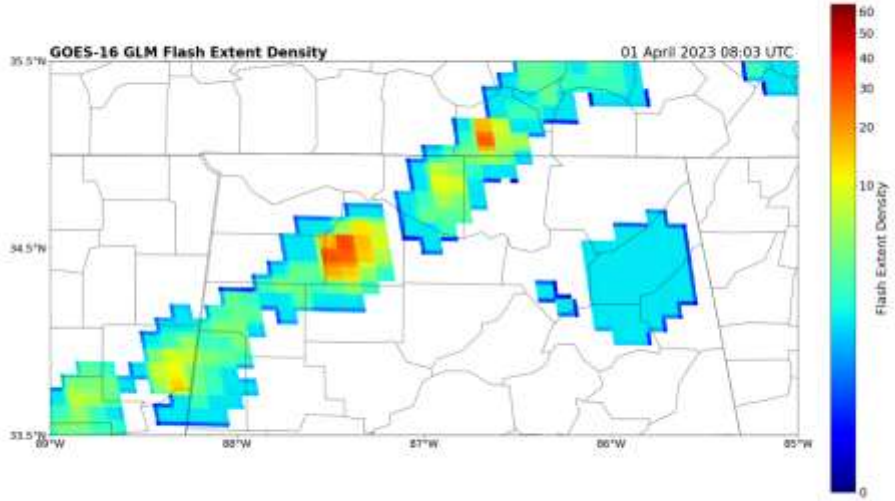
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

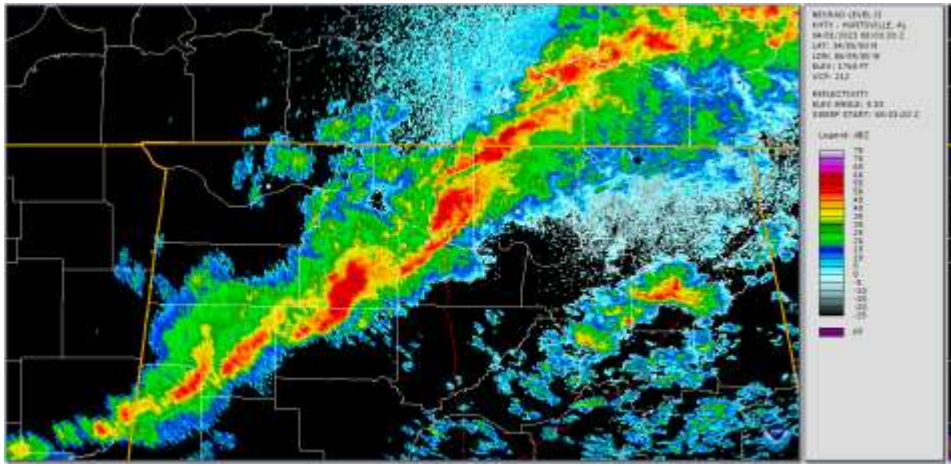


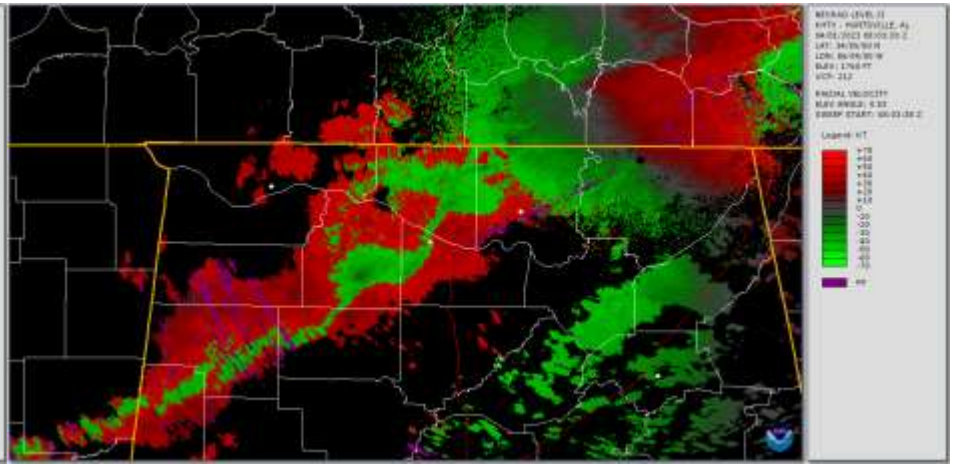




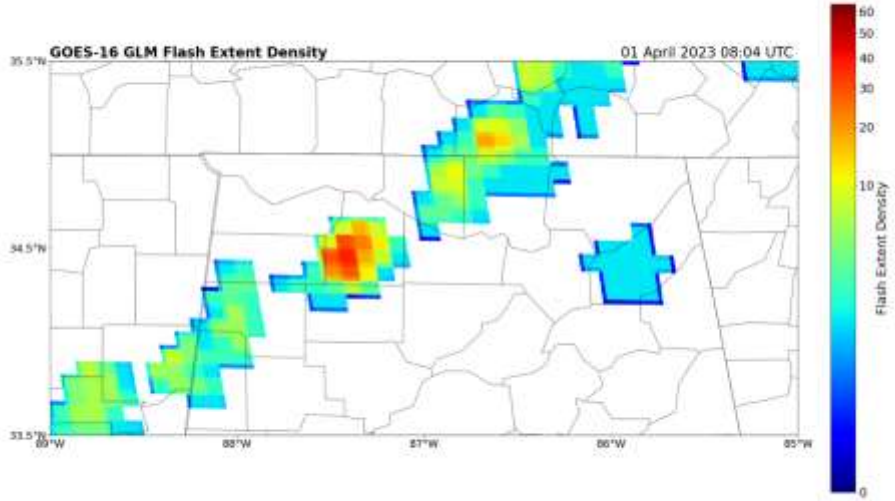
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

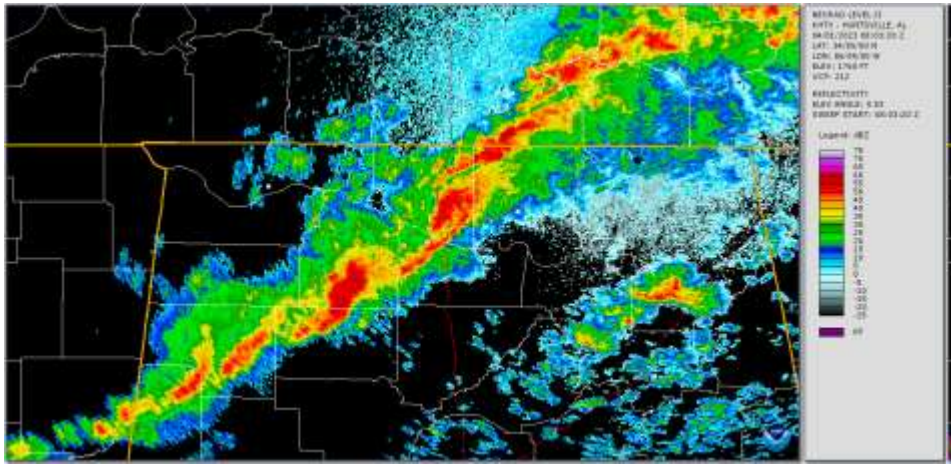


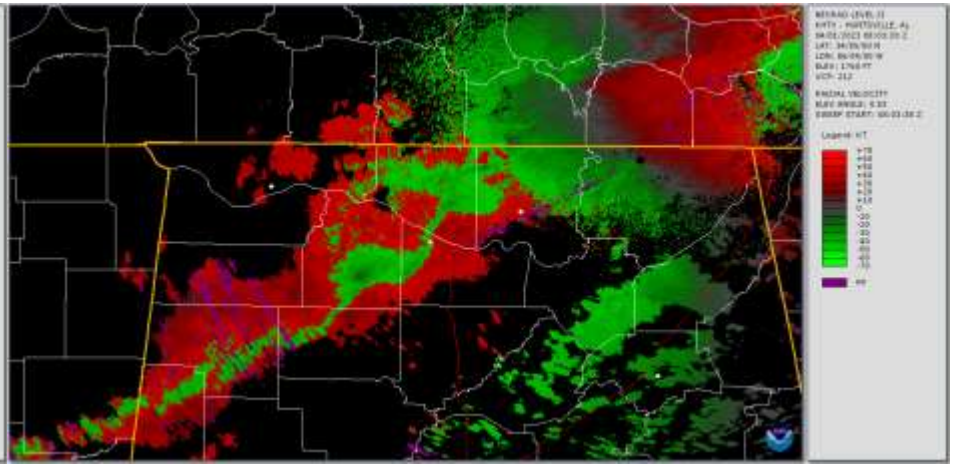




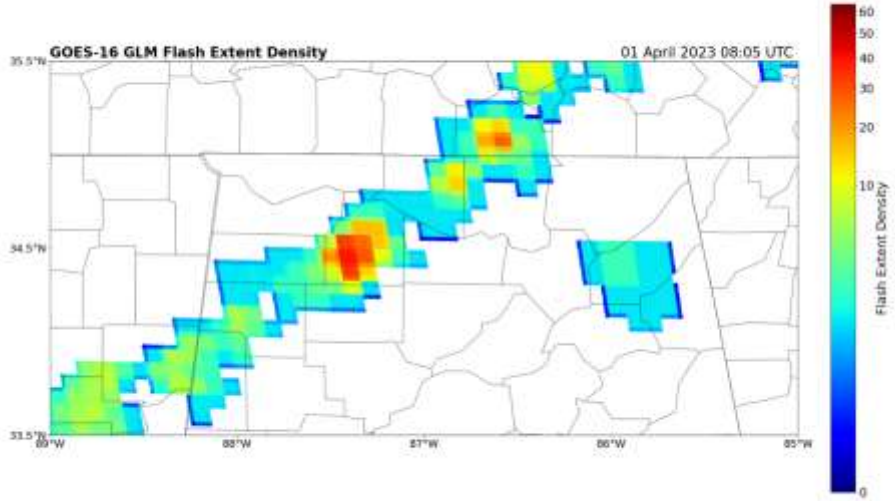
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

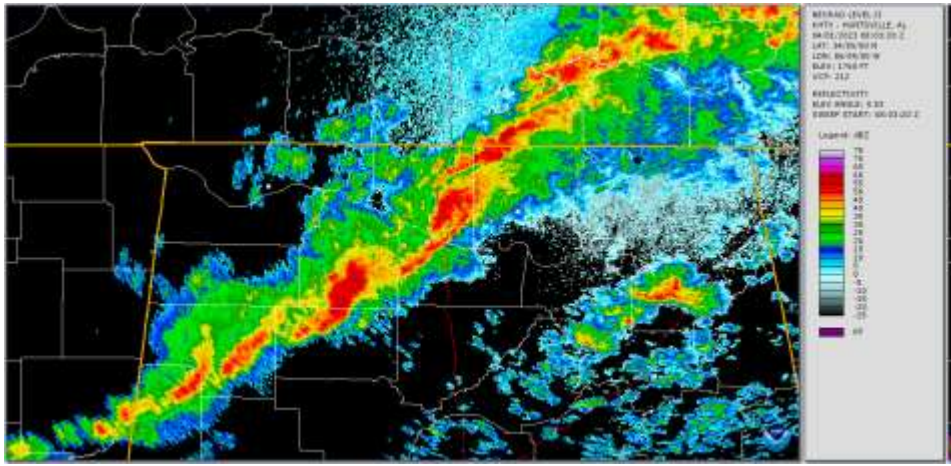


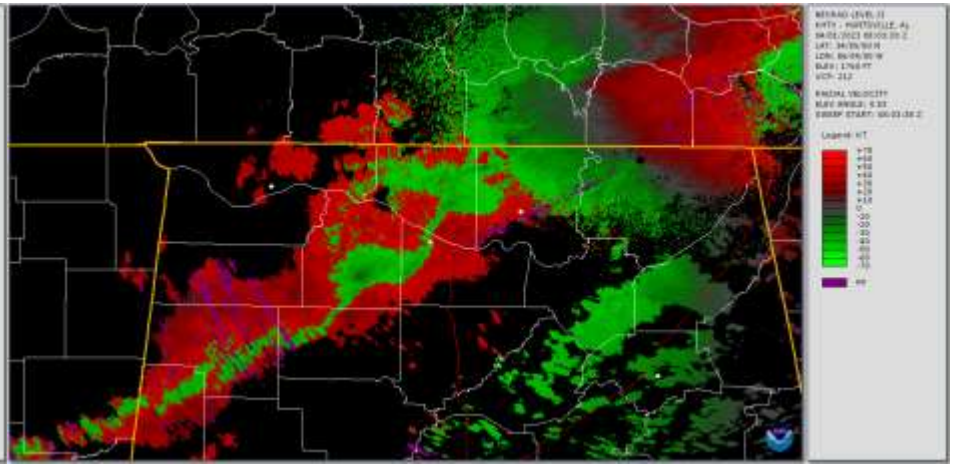




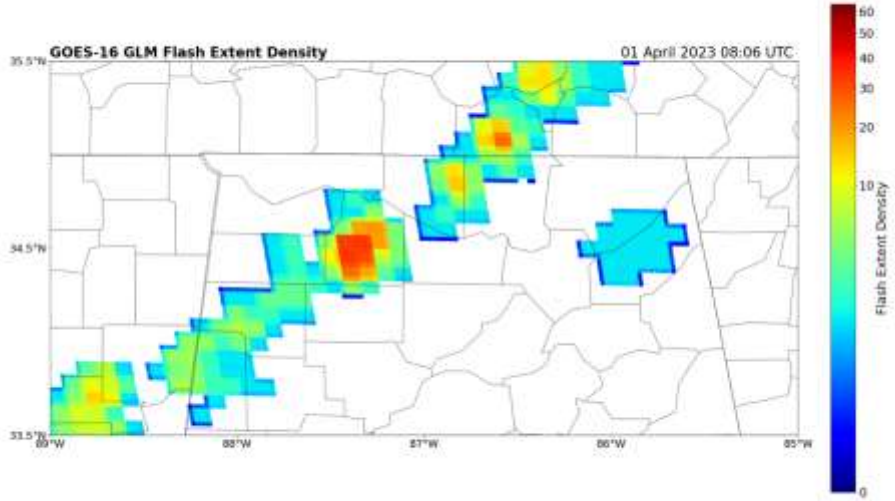
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

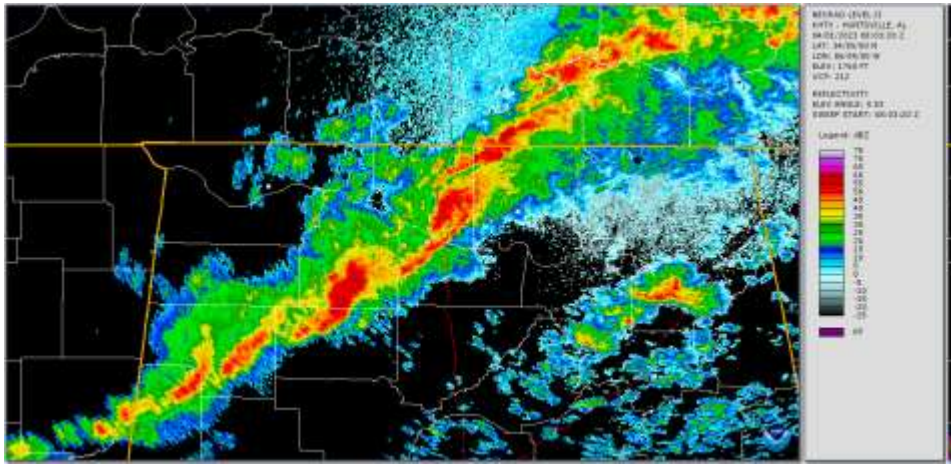


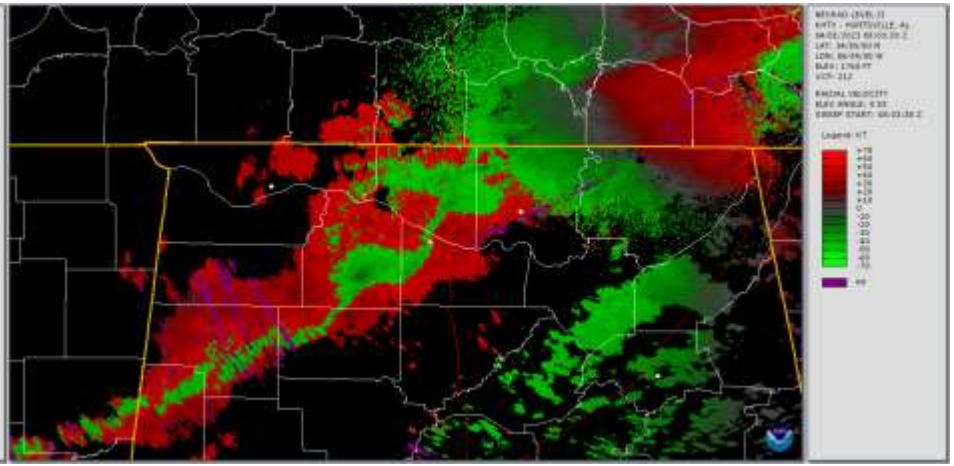




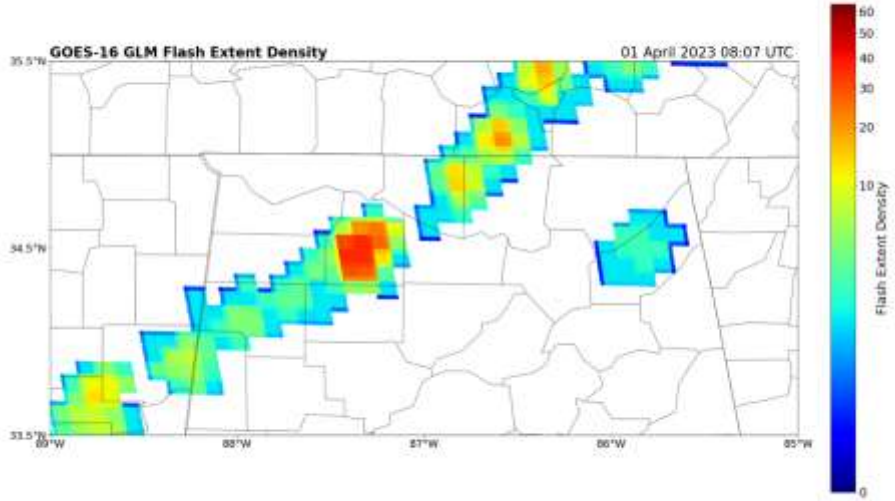
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

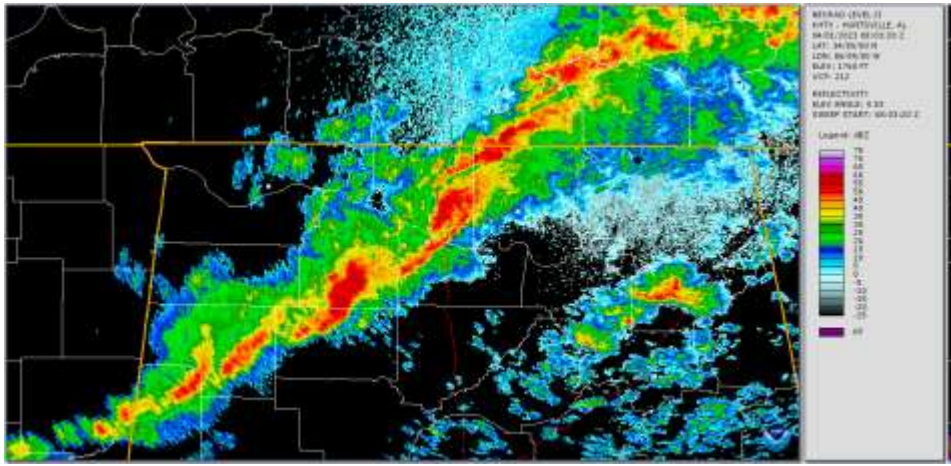


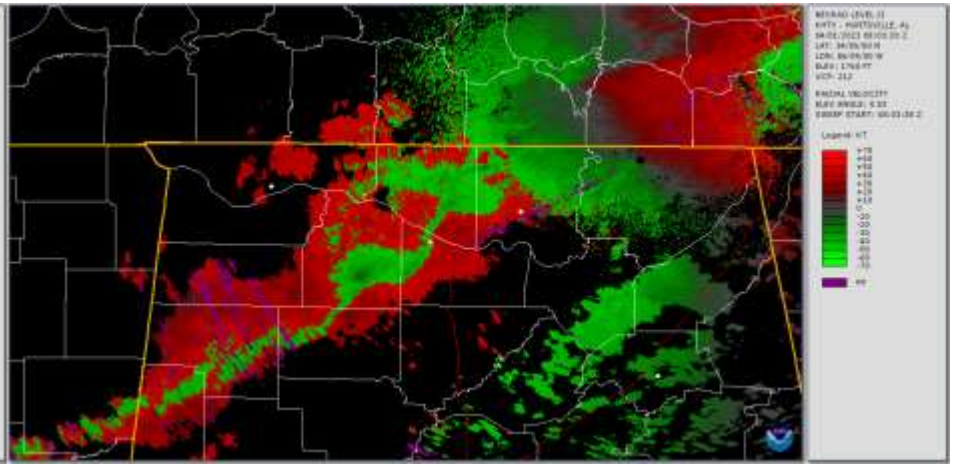




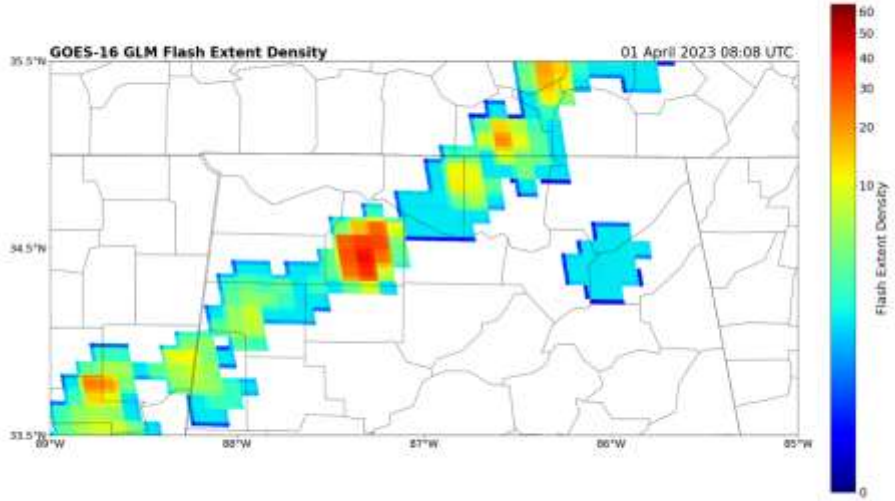
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

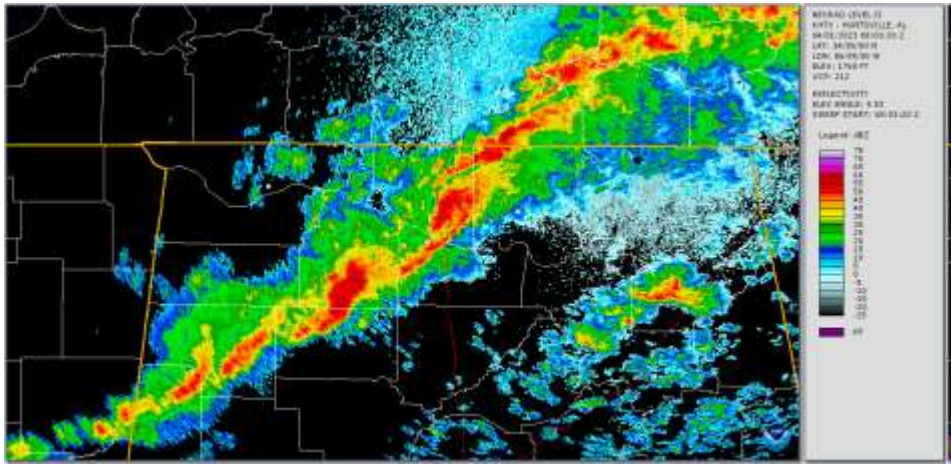


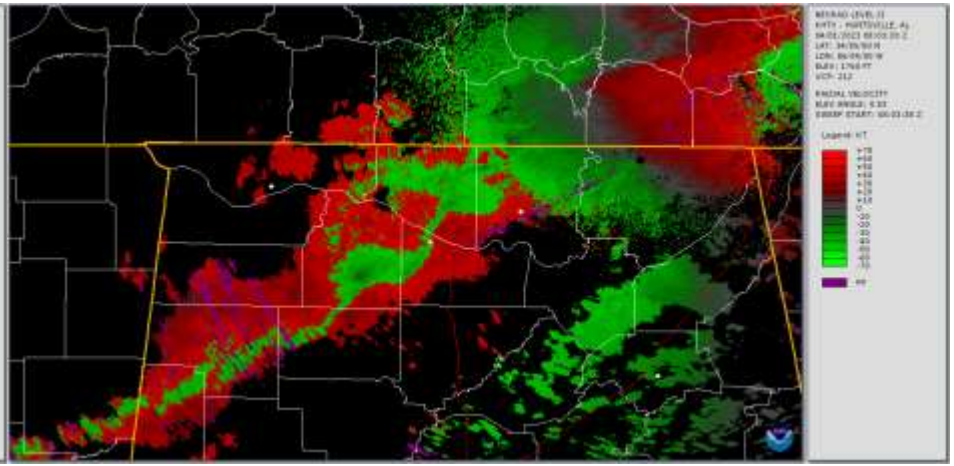




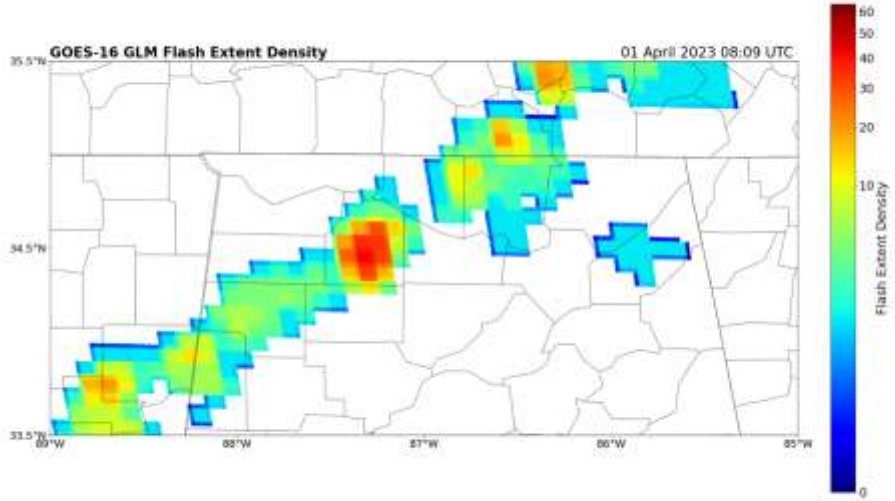
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

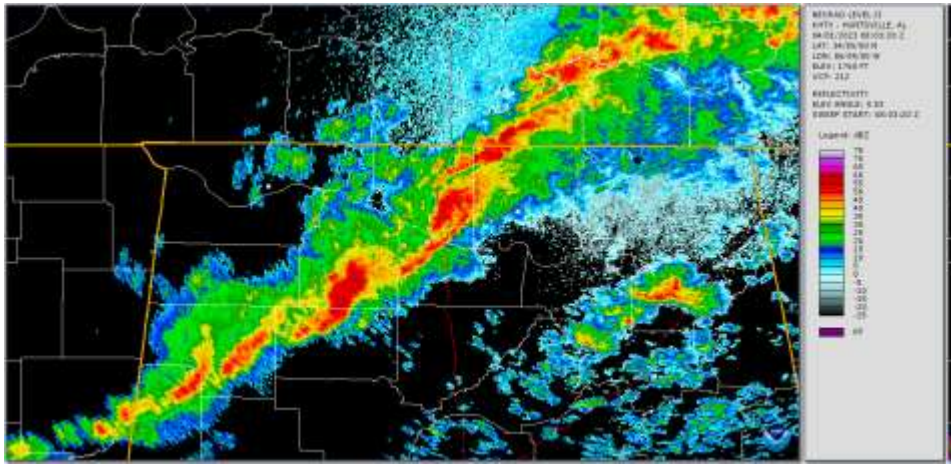


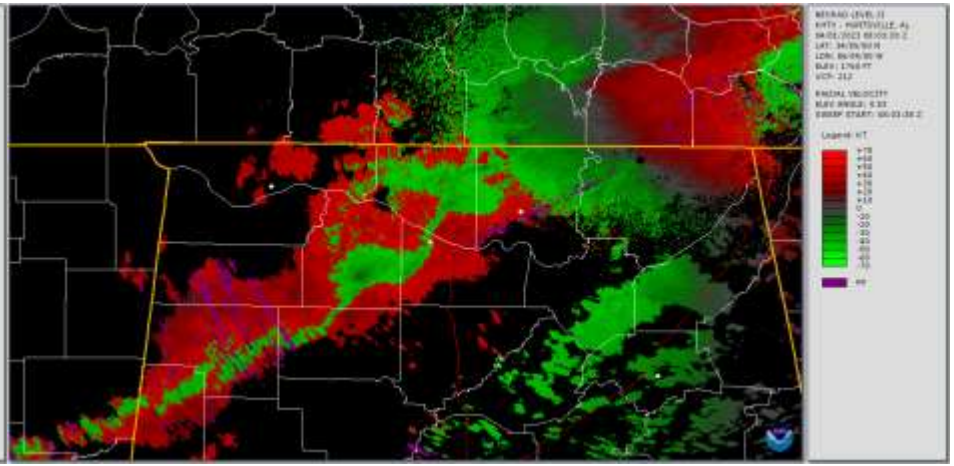




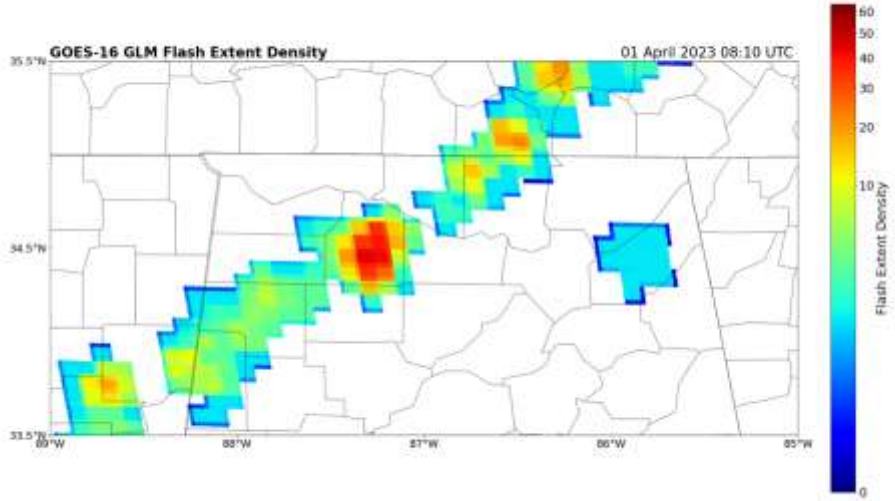
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

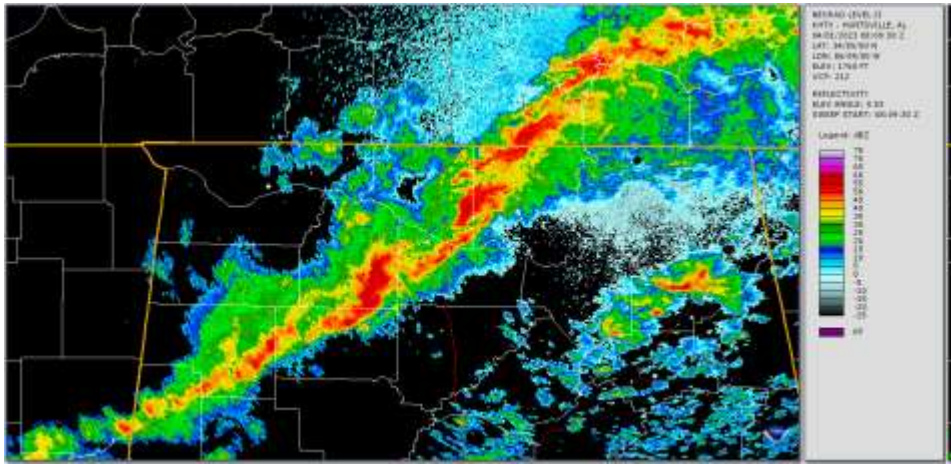


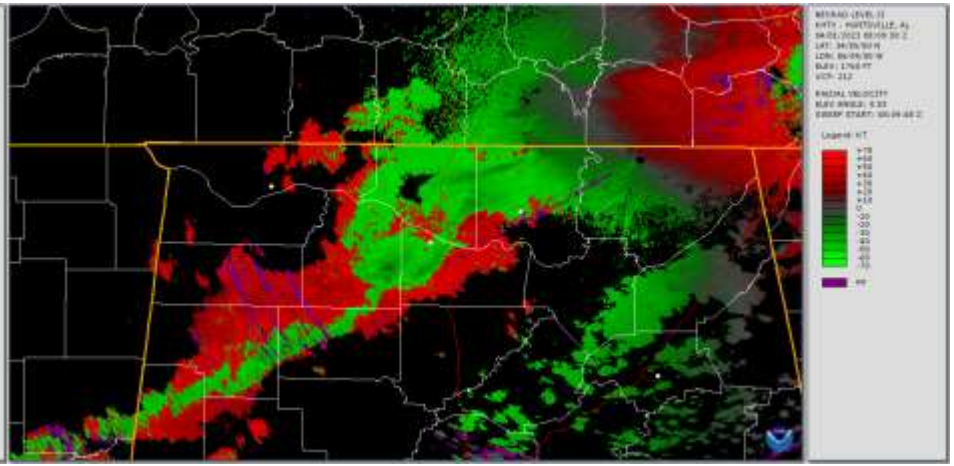




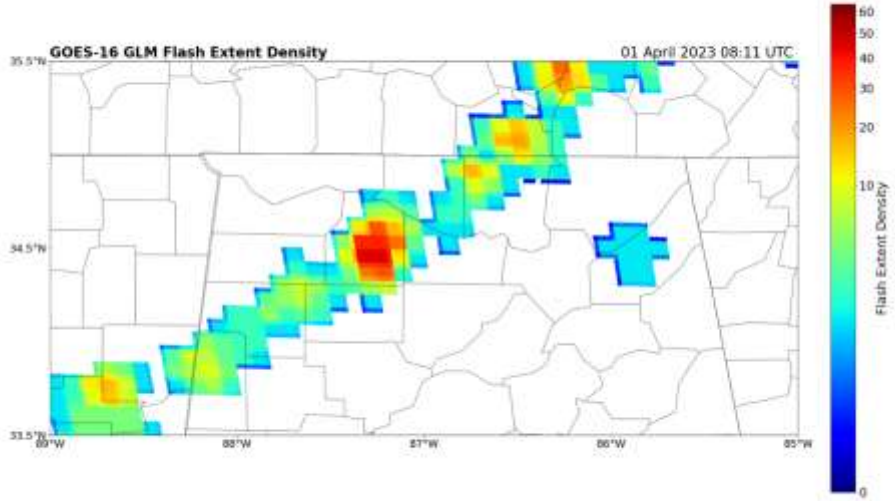
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

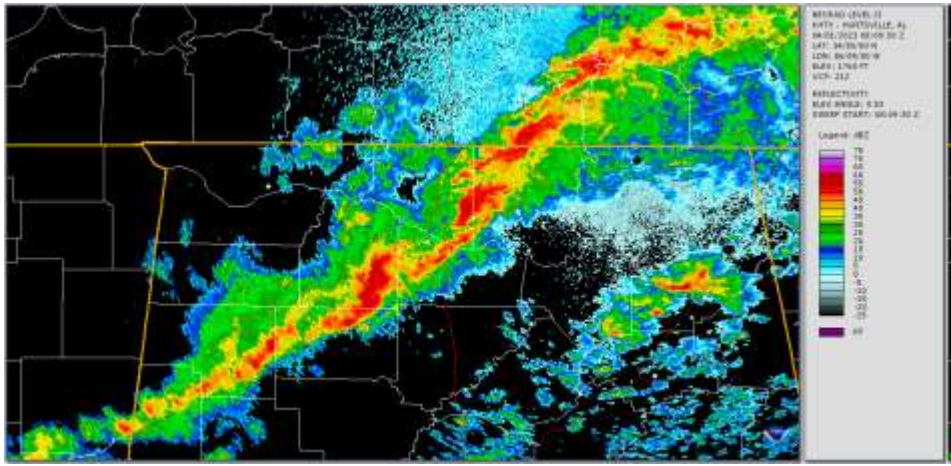


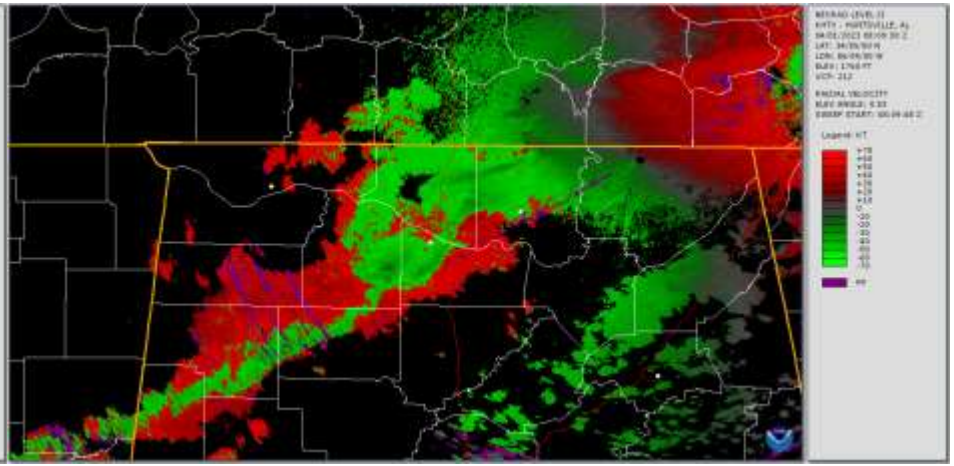




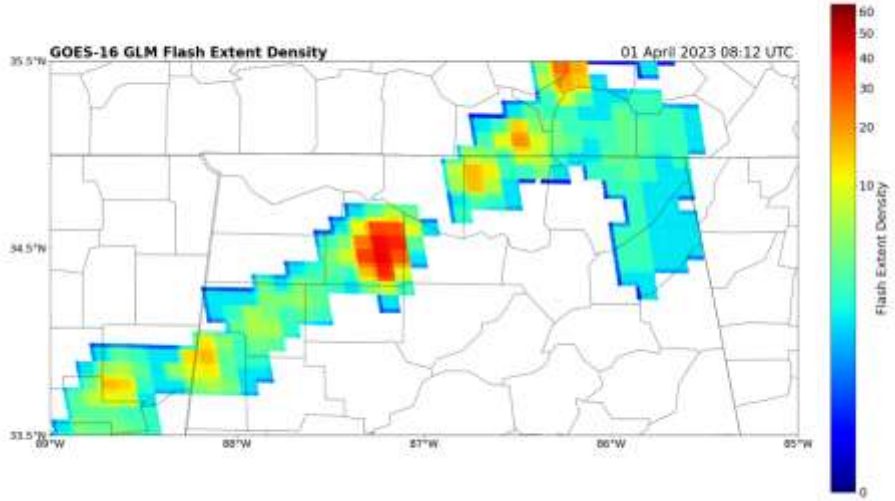
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

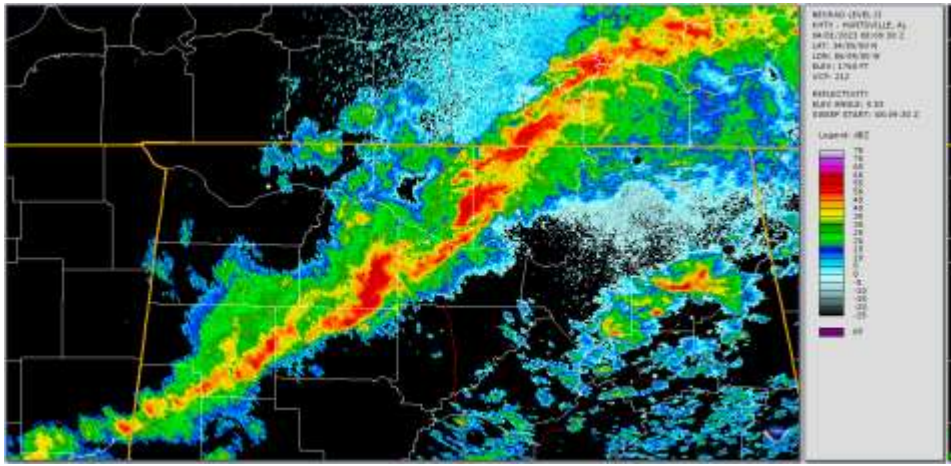


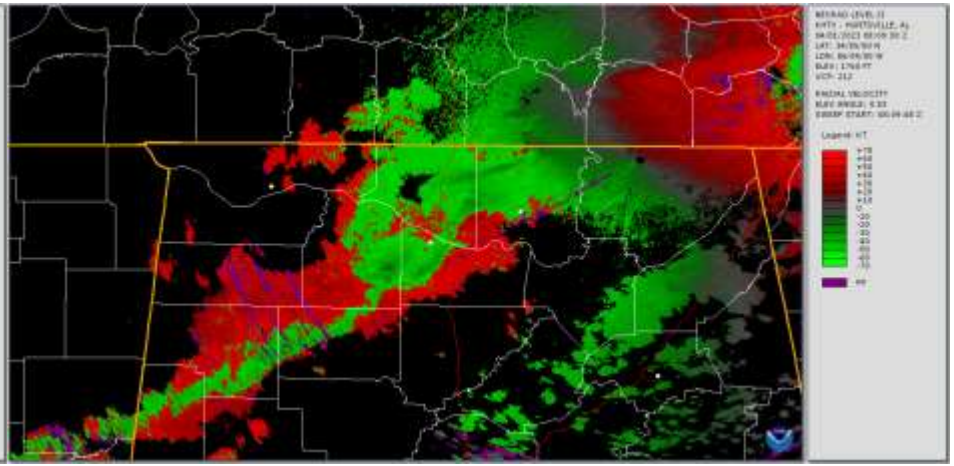




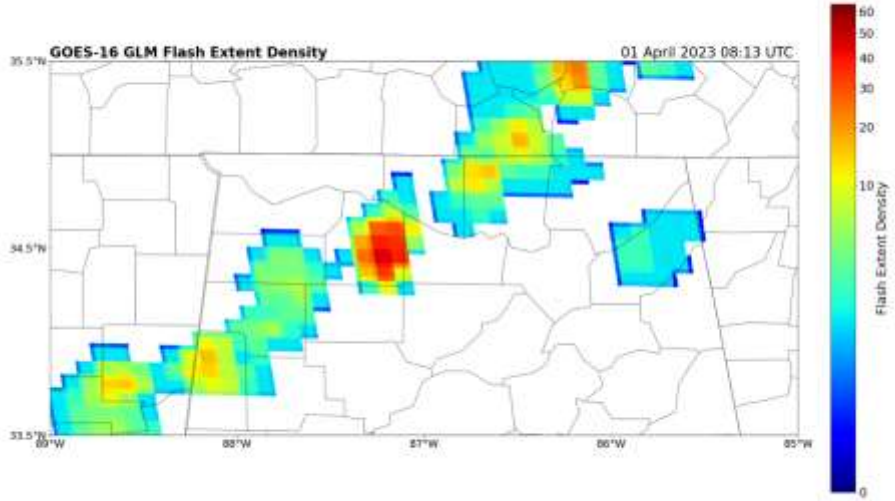
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

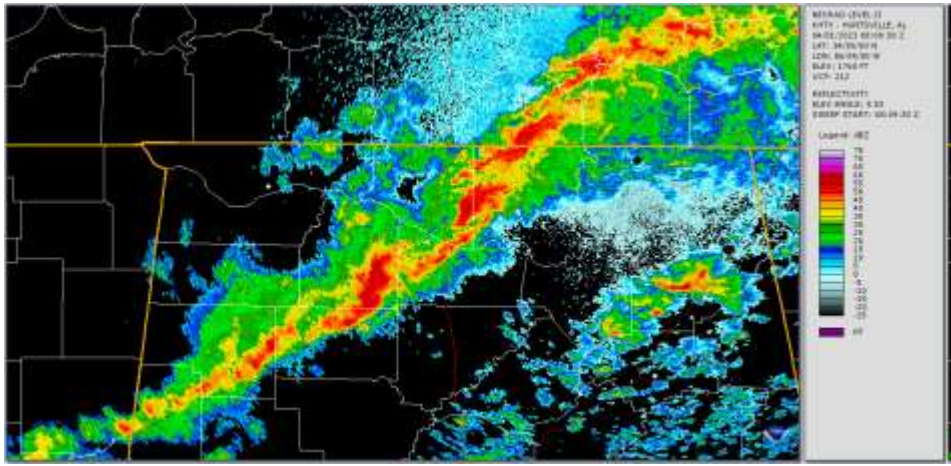


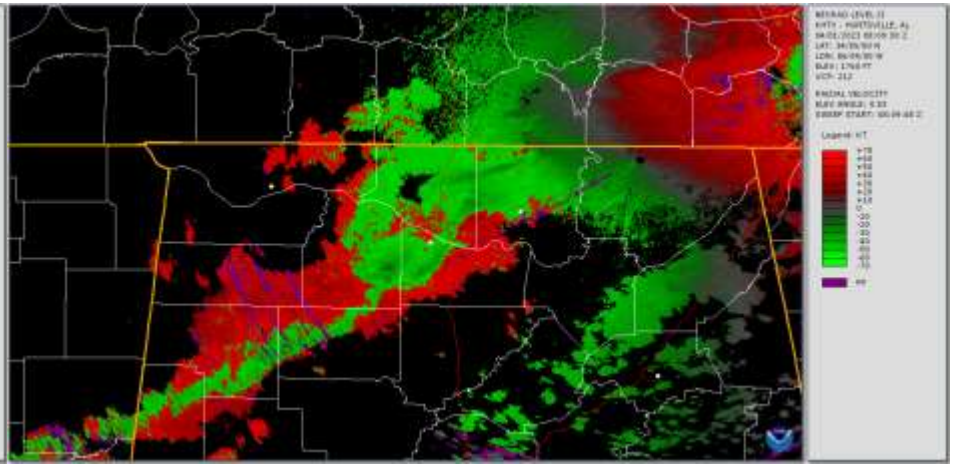




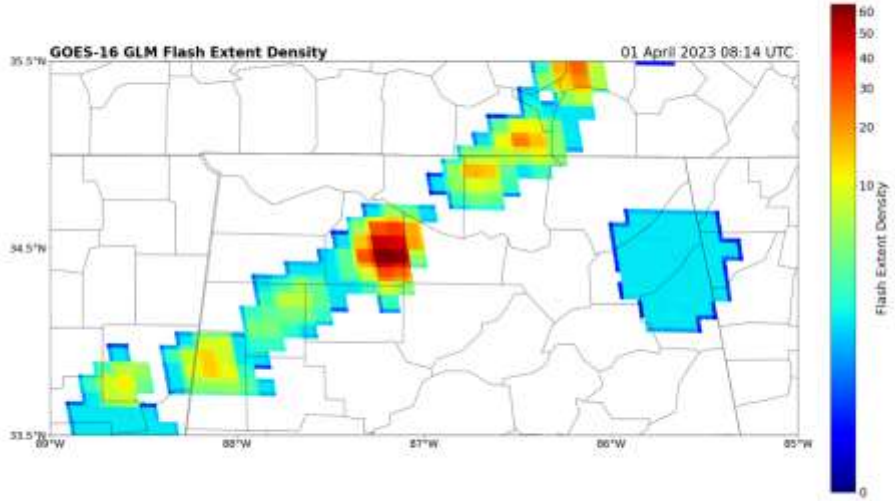
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

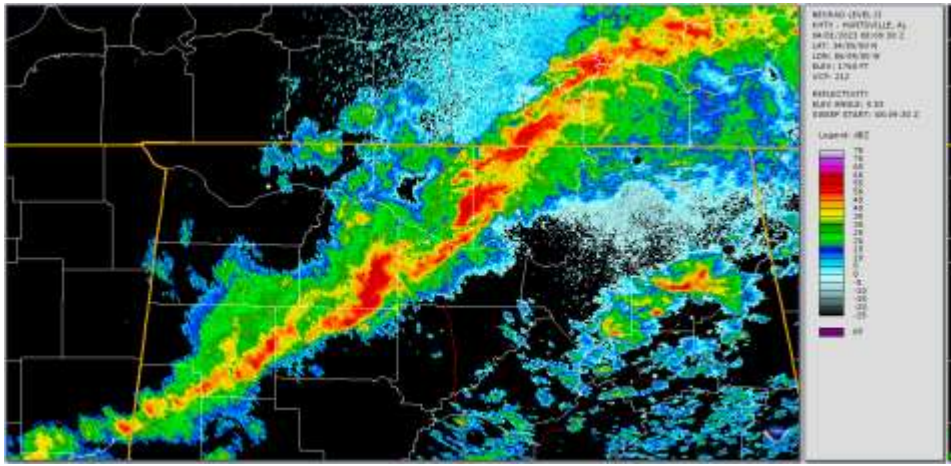


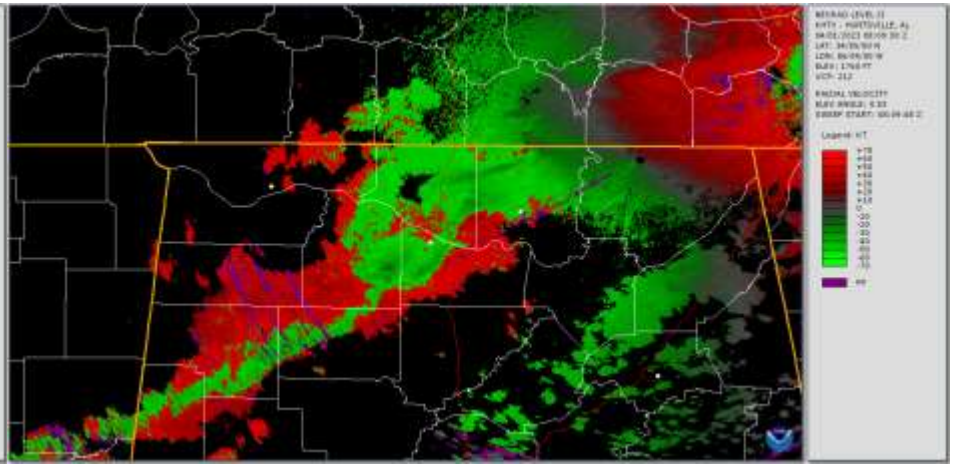




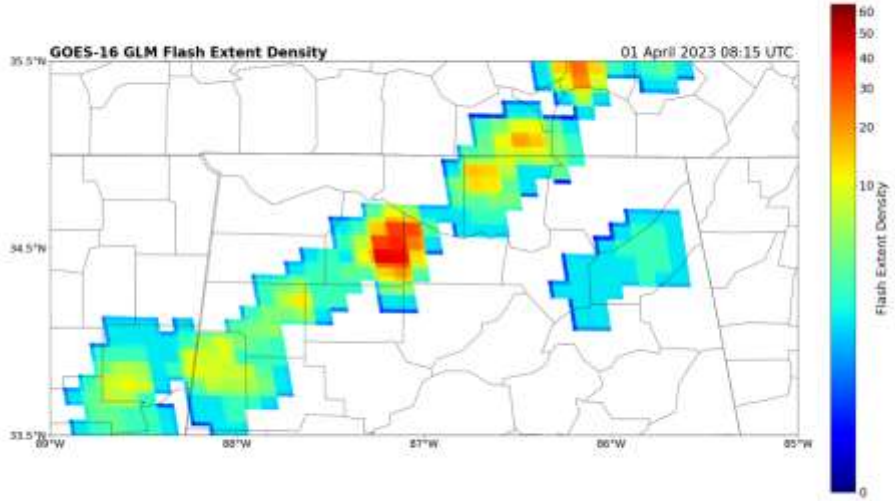
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

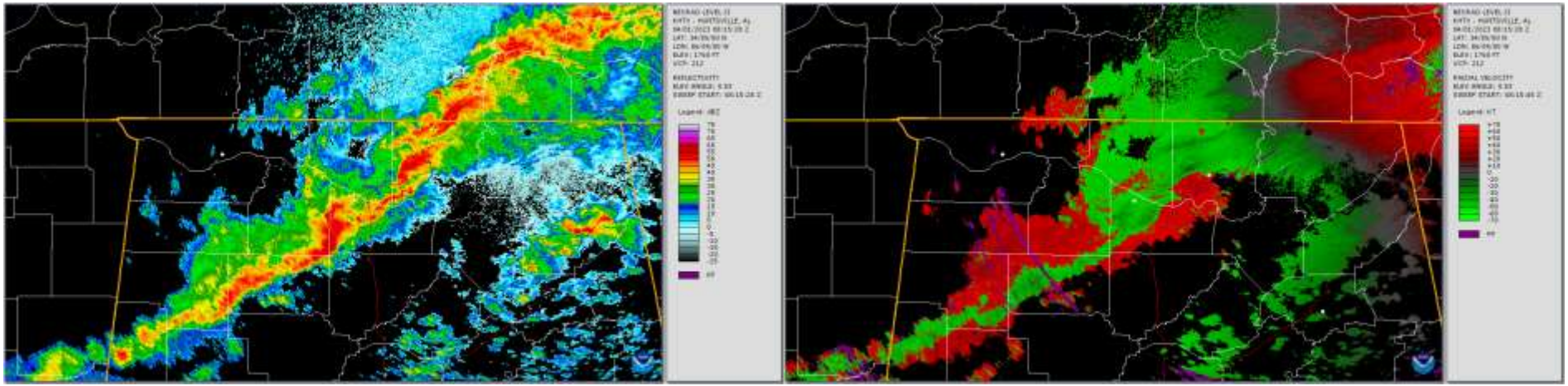




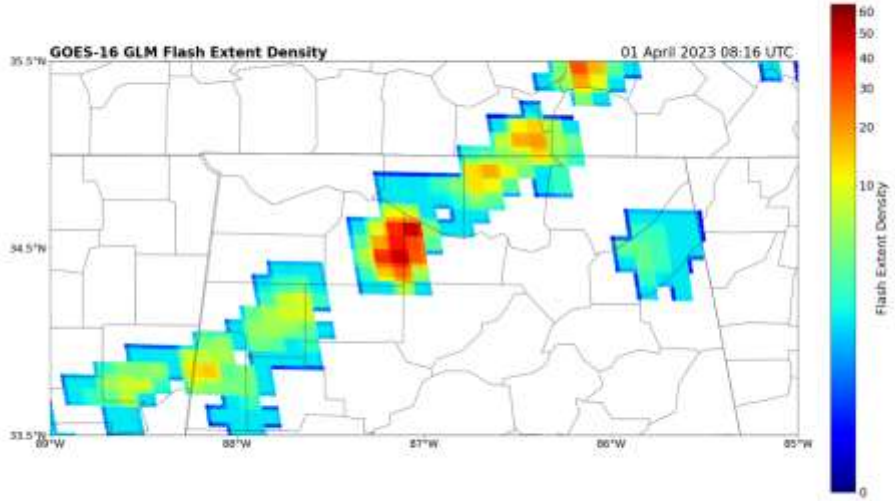


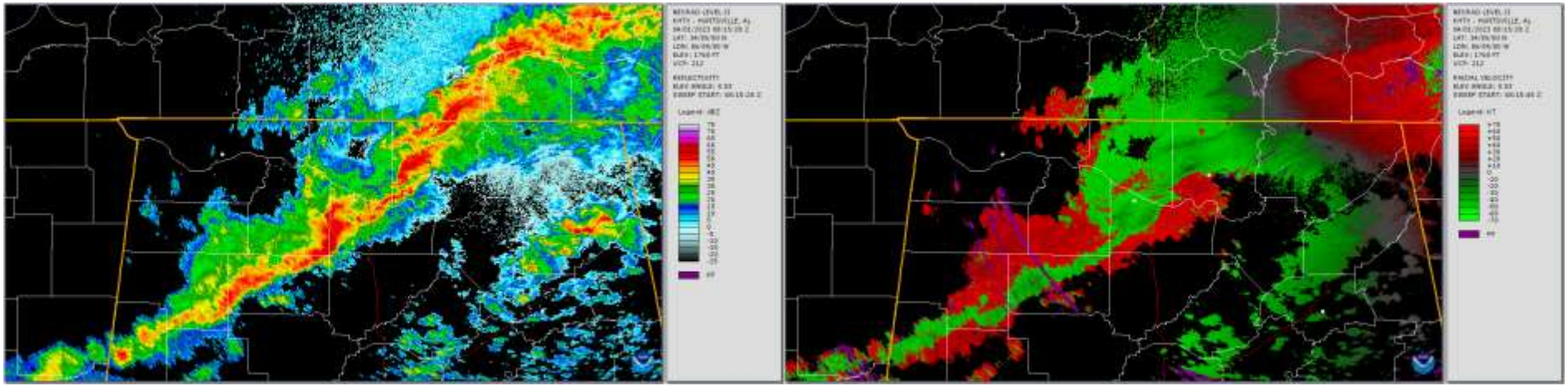
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)



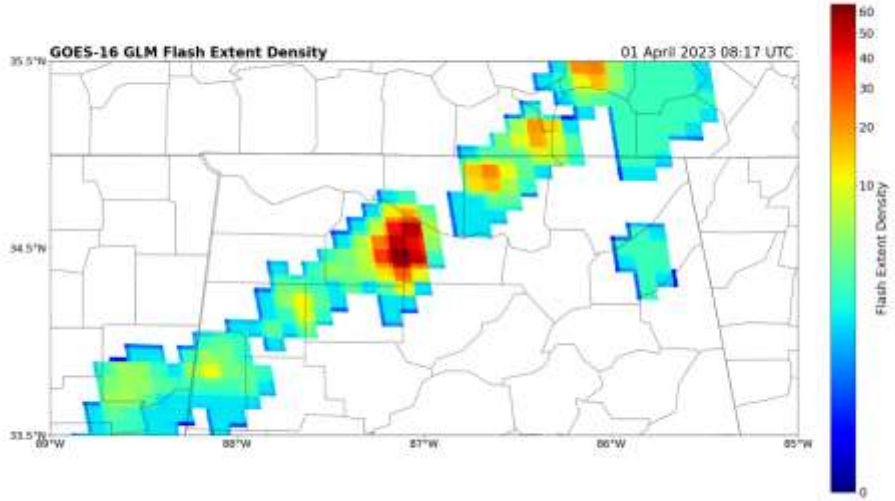


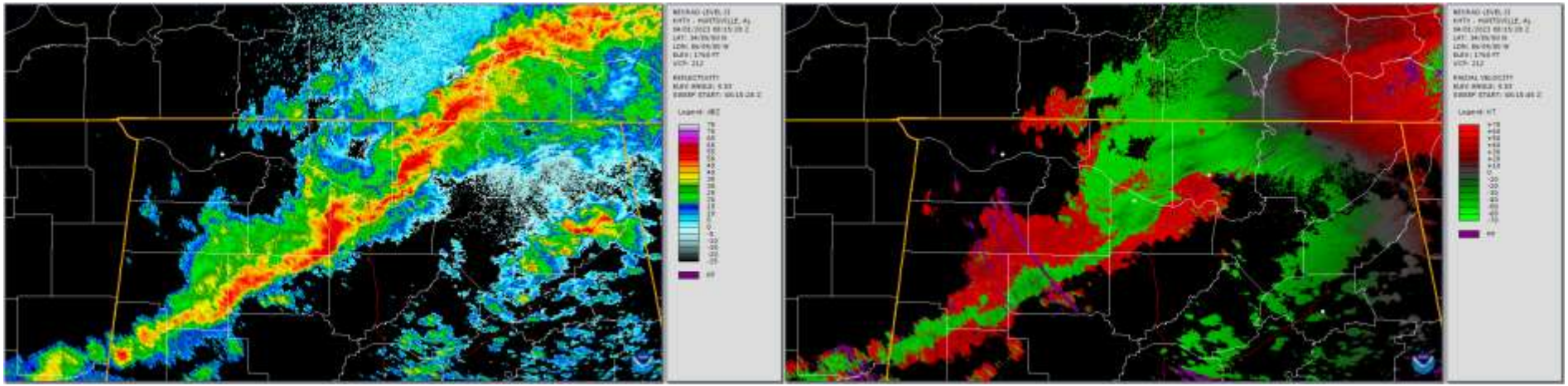
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)



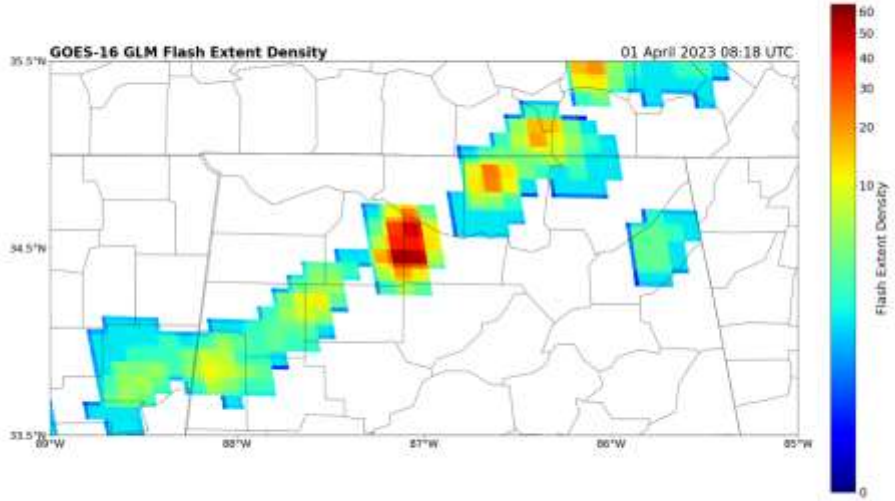


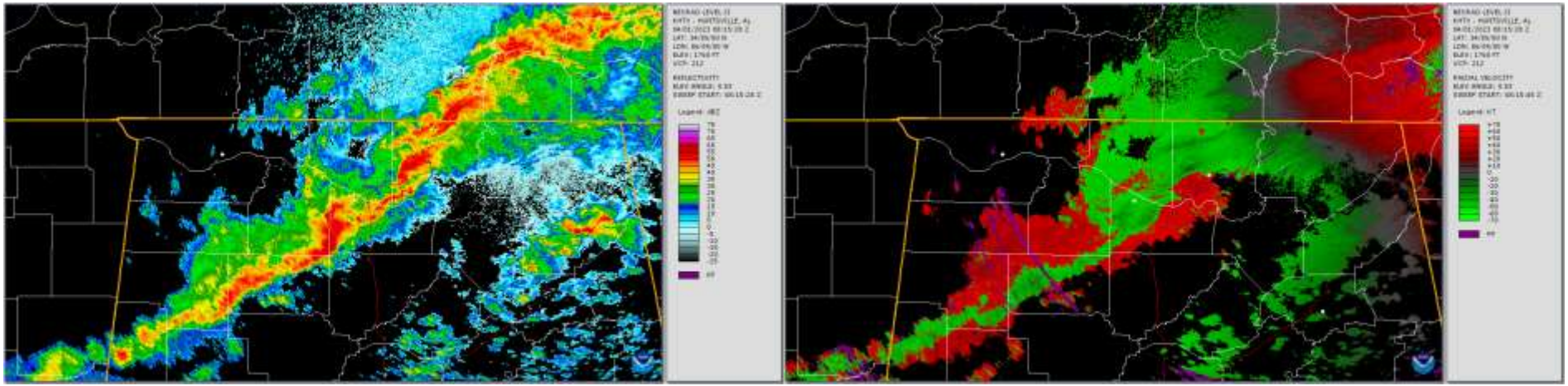
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)



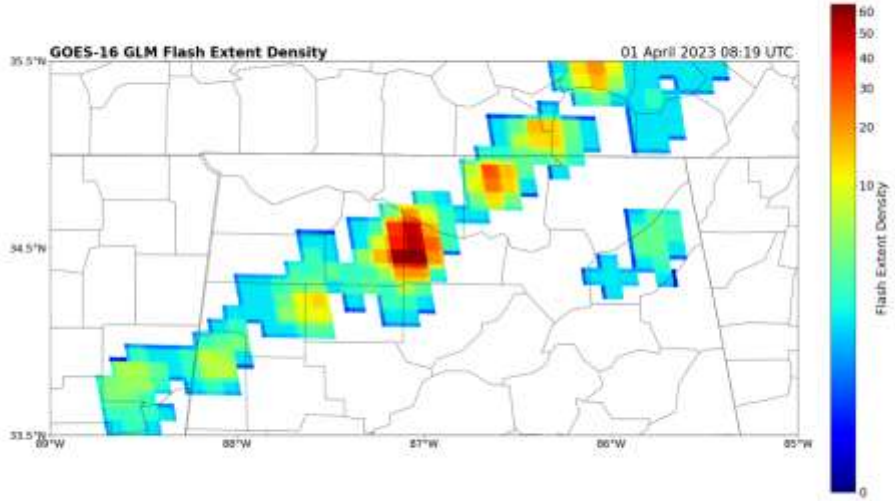


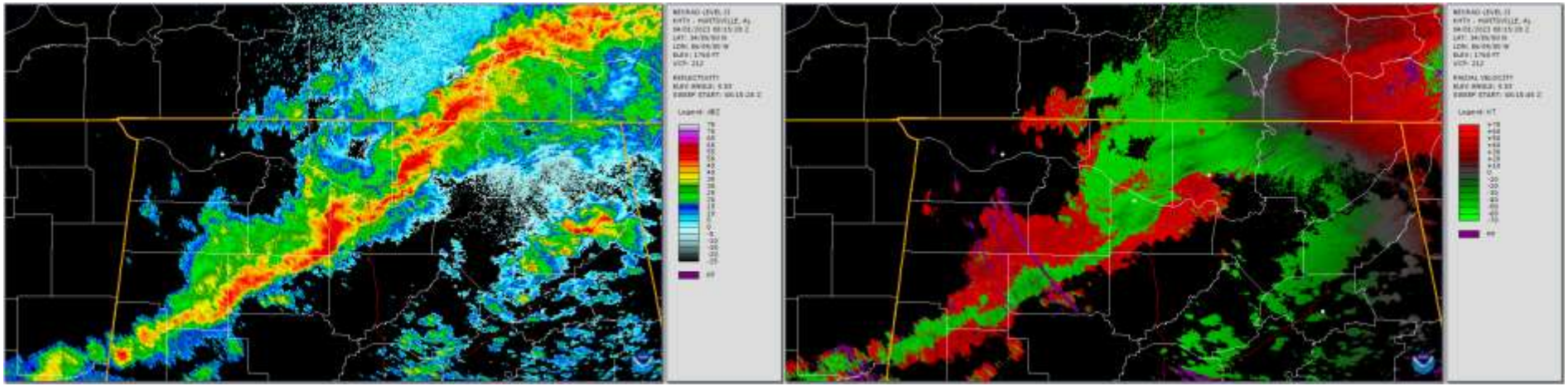
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)



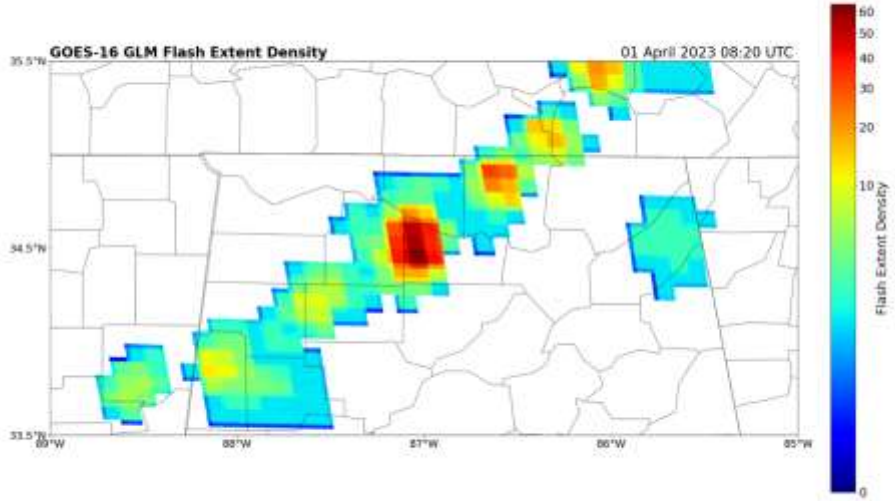


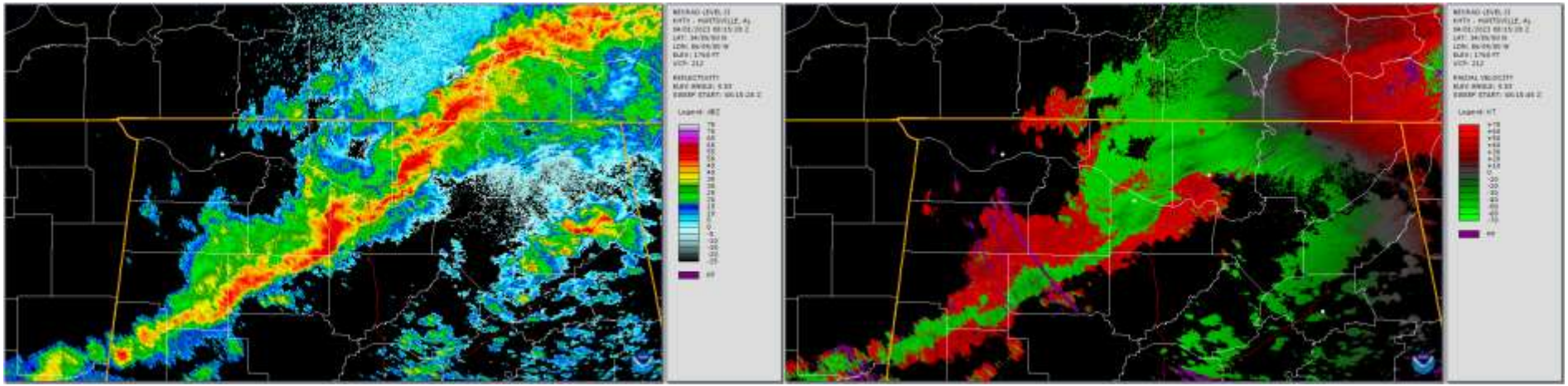
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)



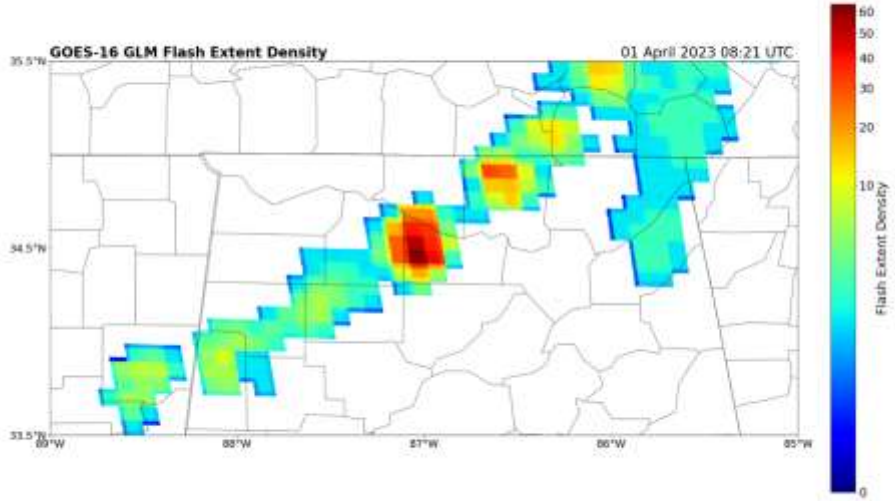


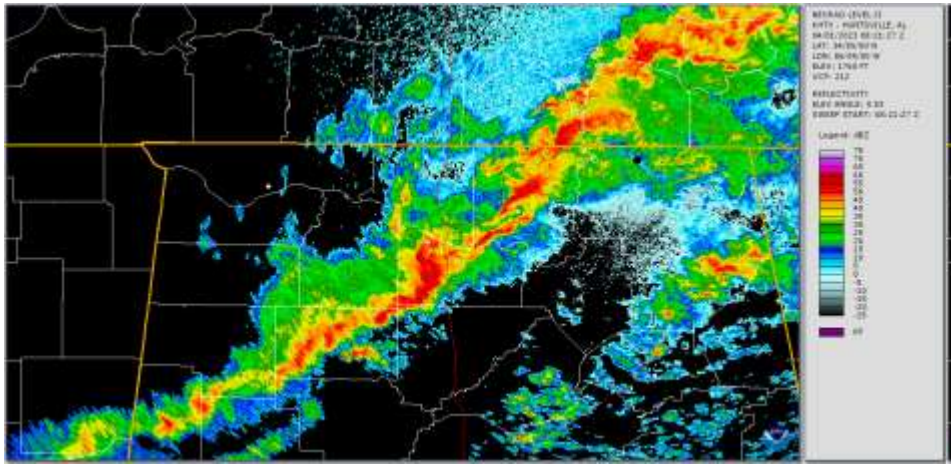
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

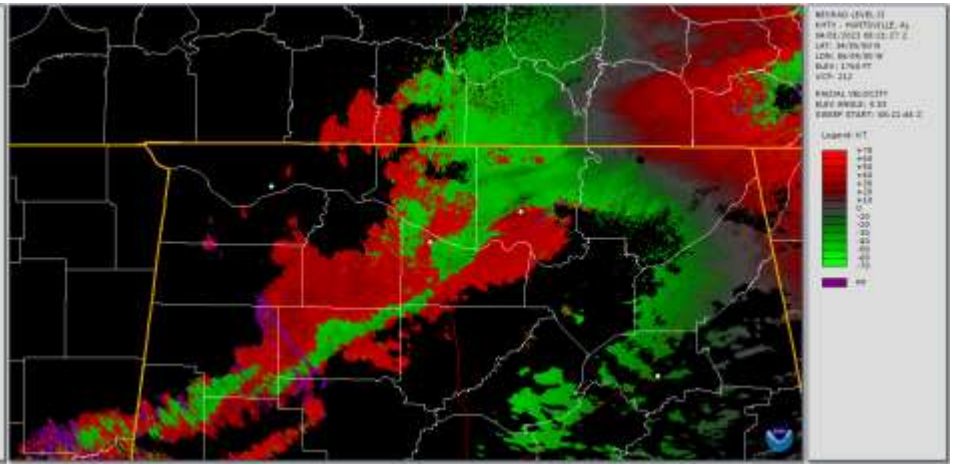




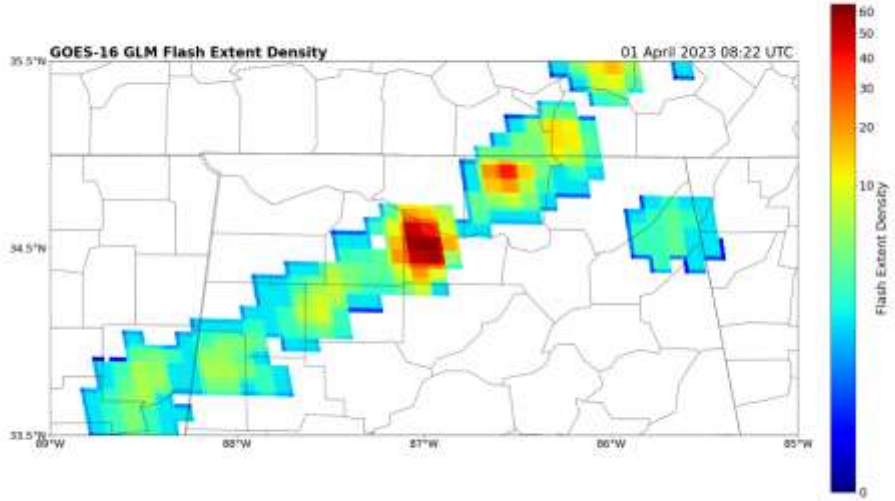
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

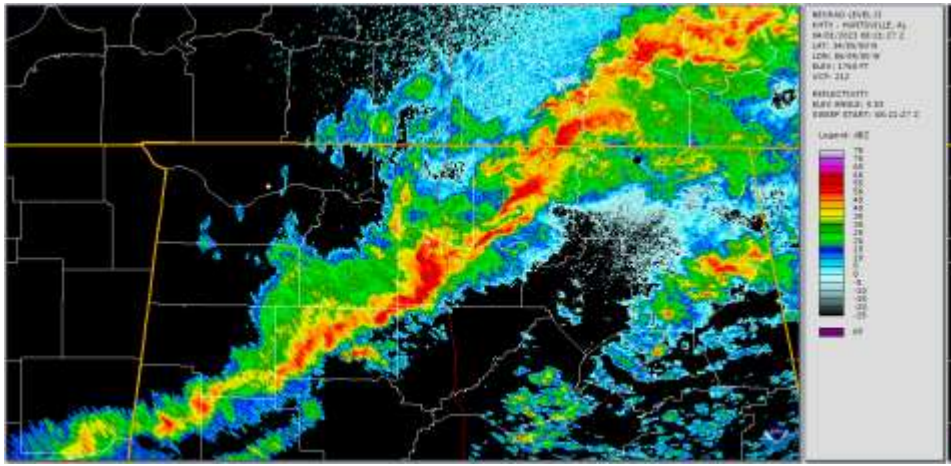


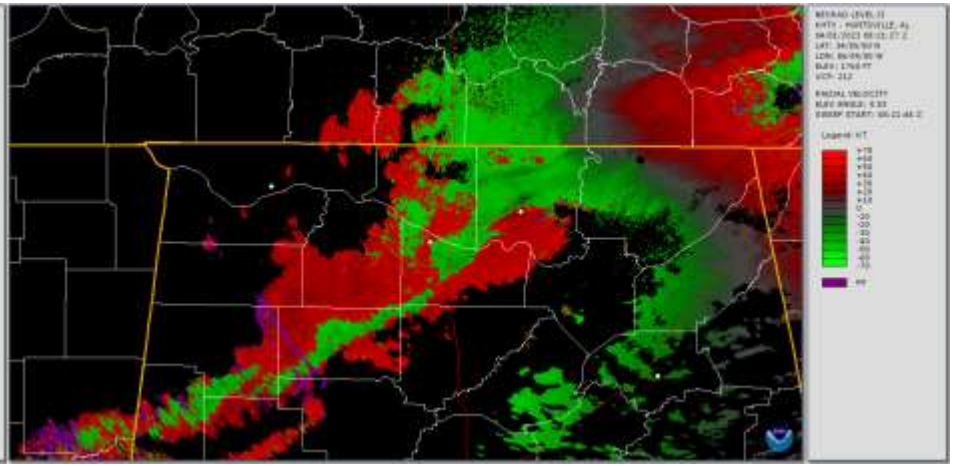




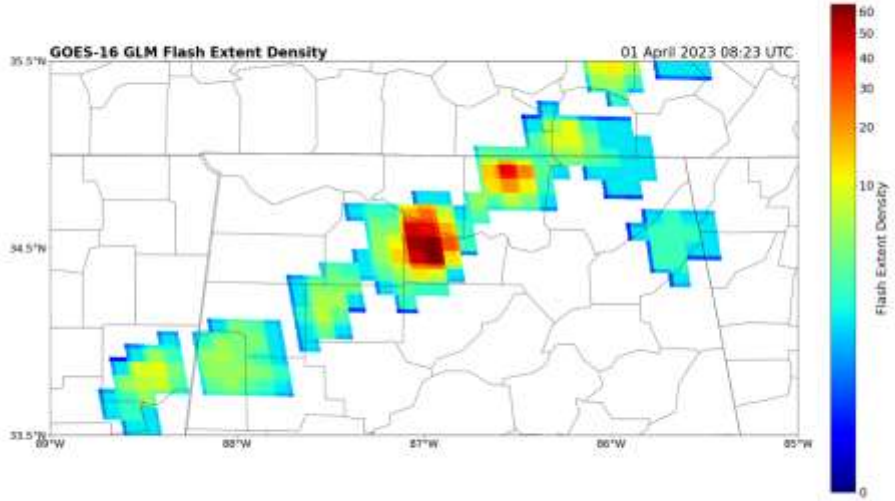
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

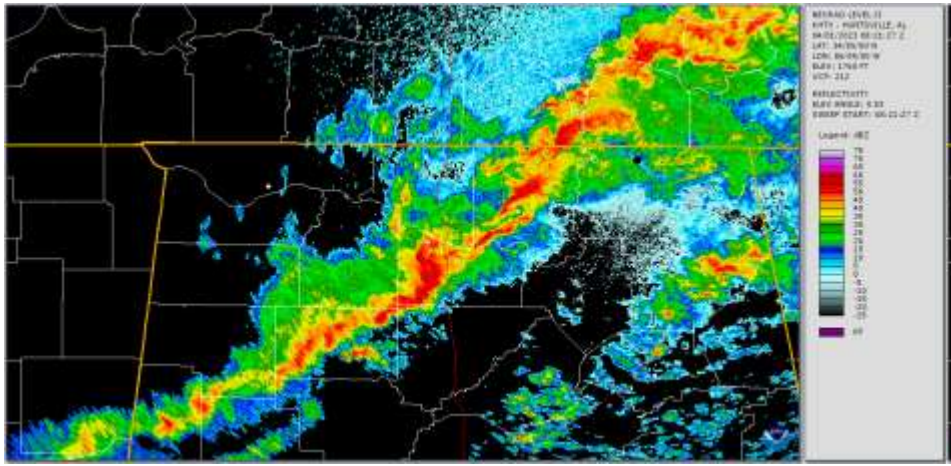


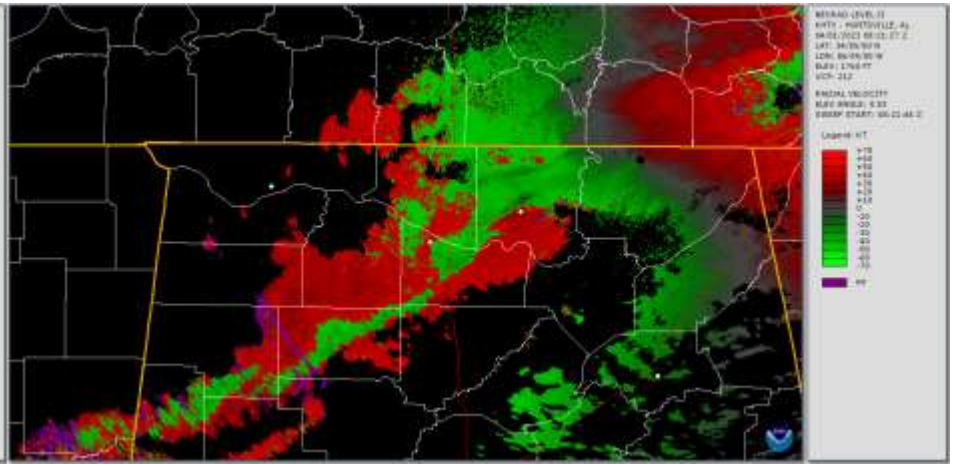




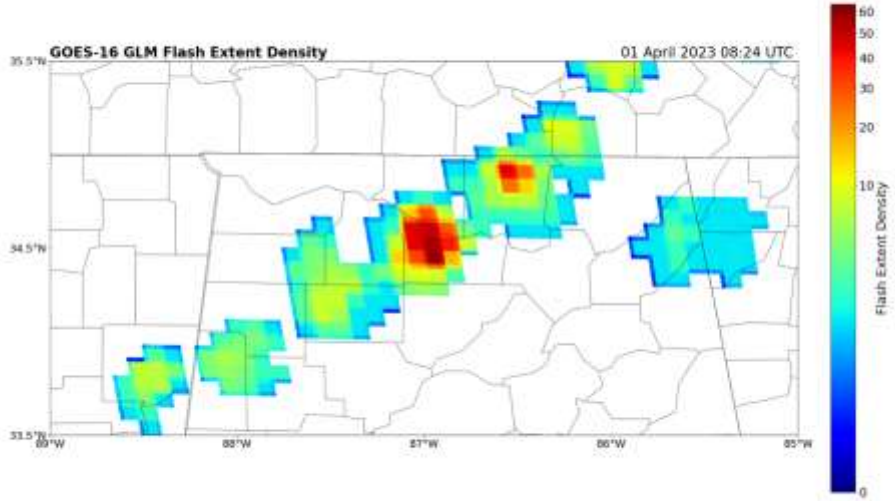
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

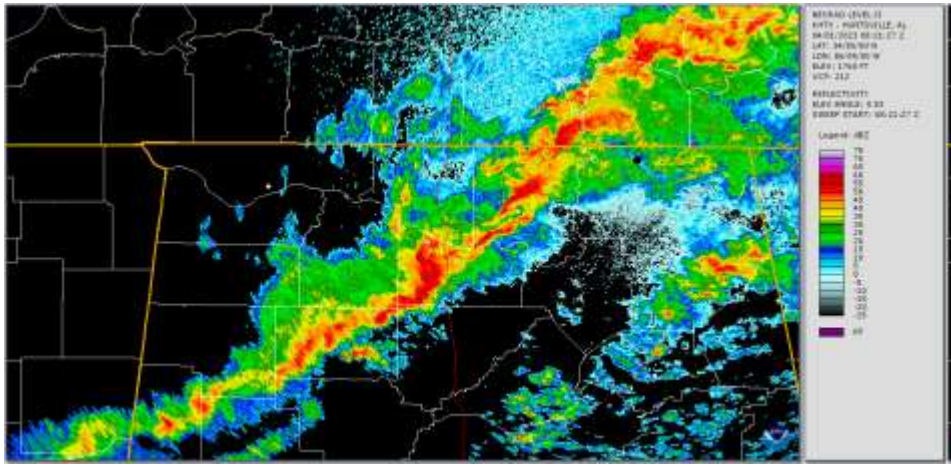


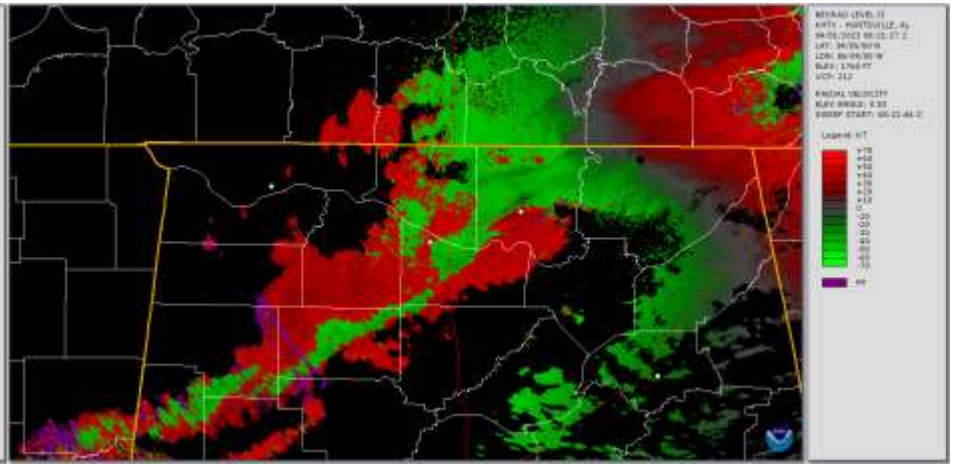




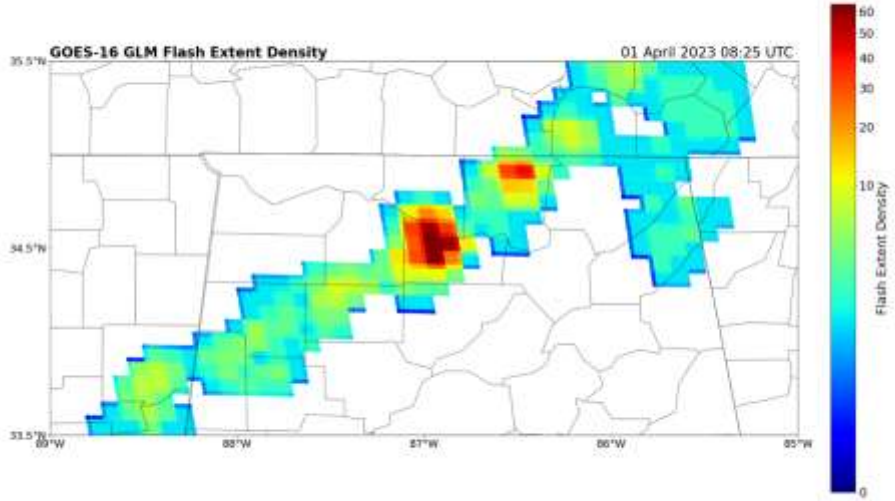
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

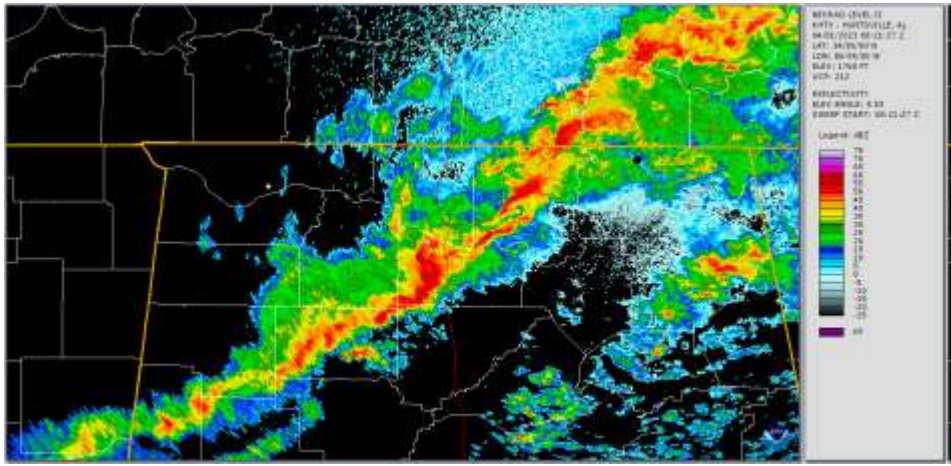


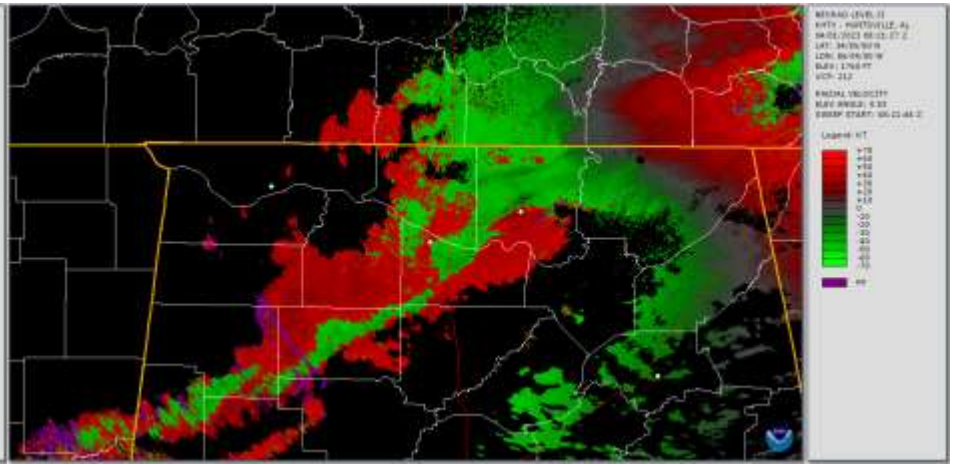




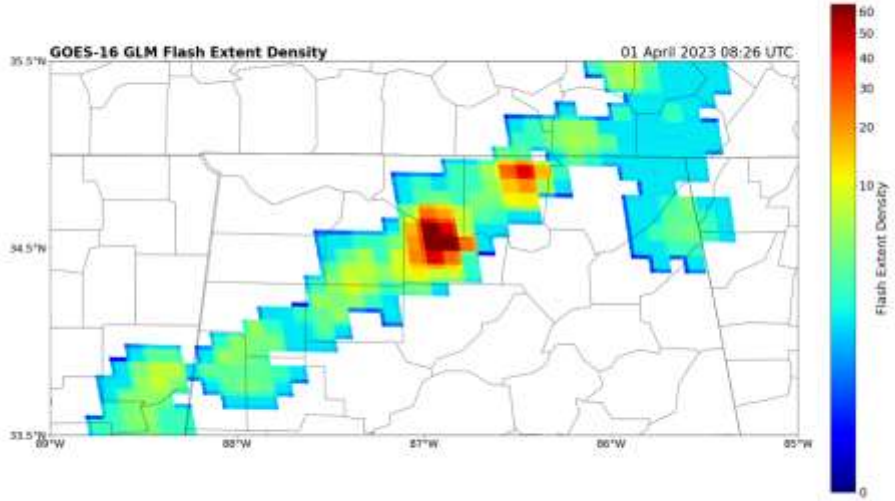
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

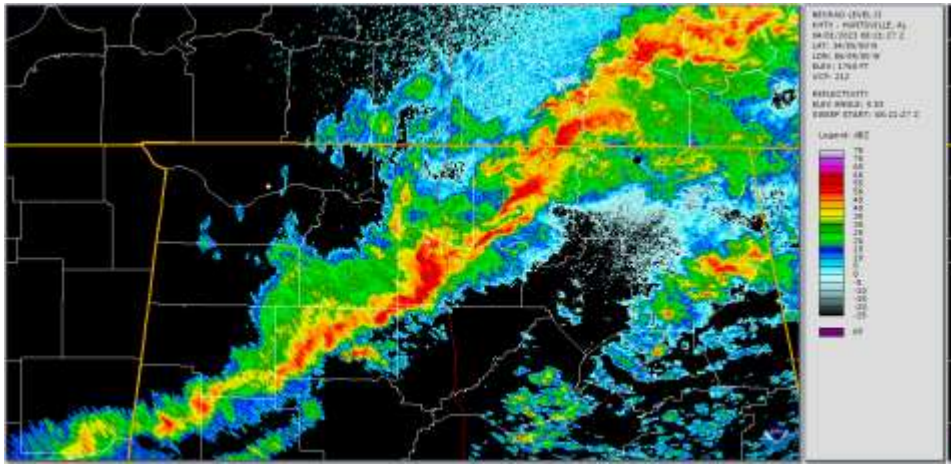


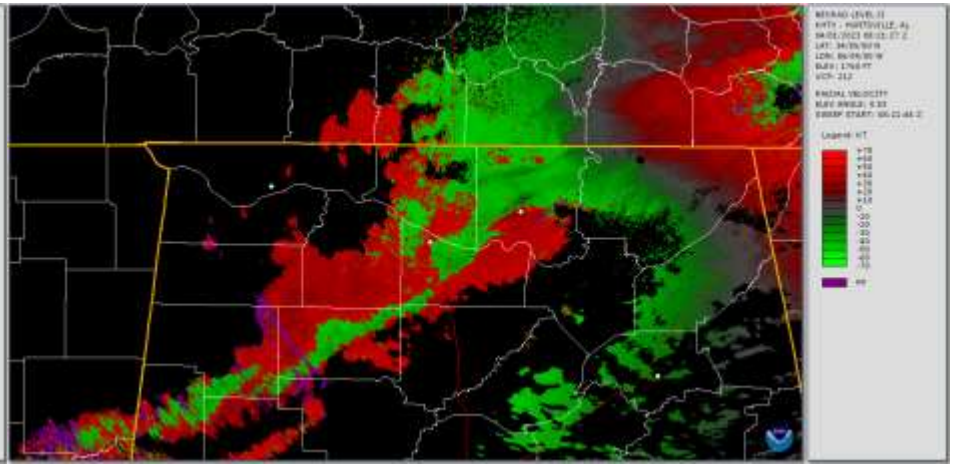




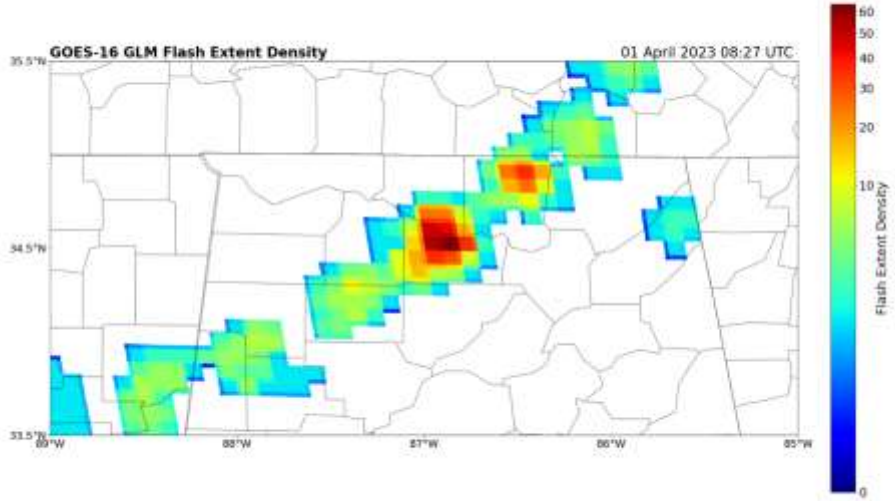
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

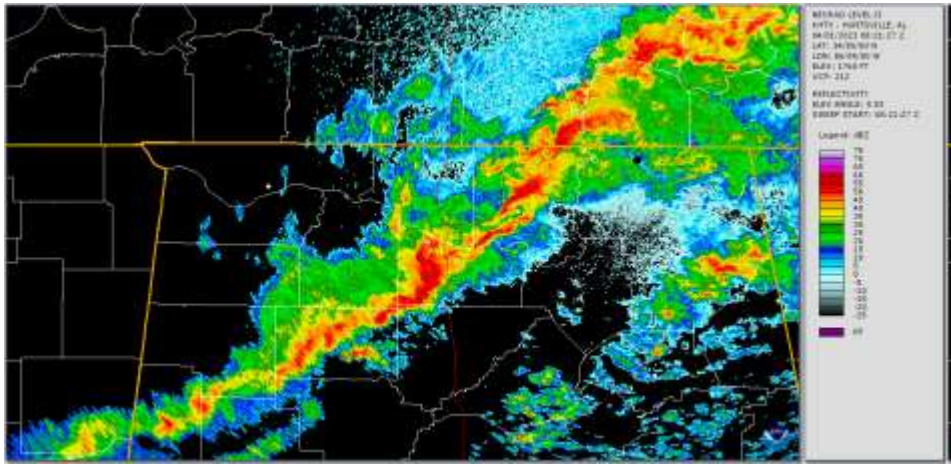


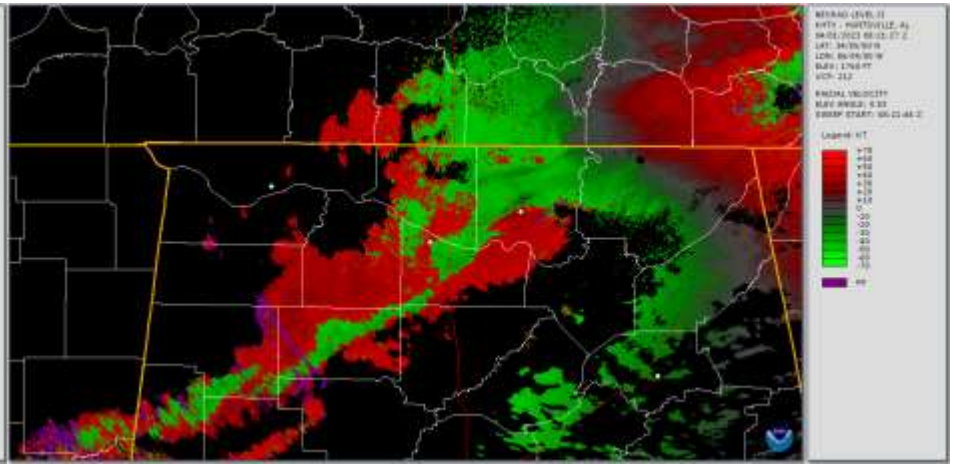




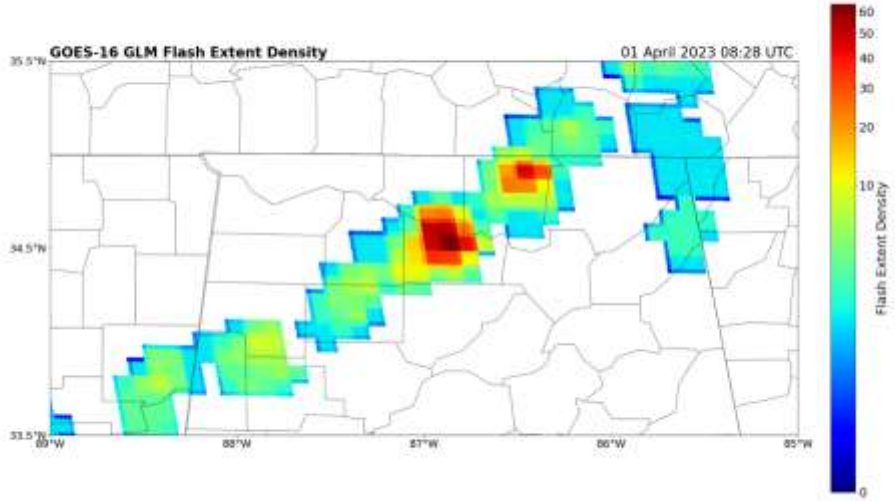
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

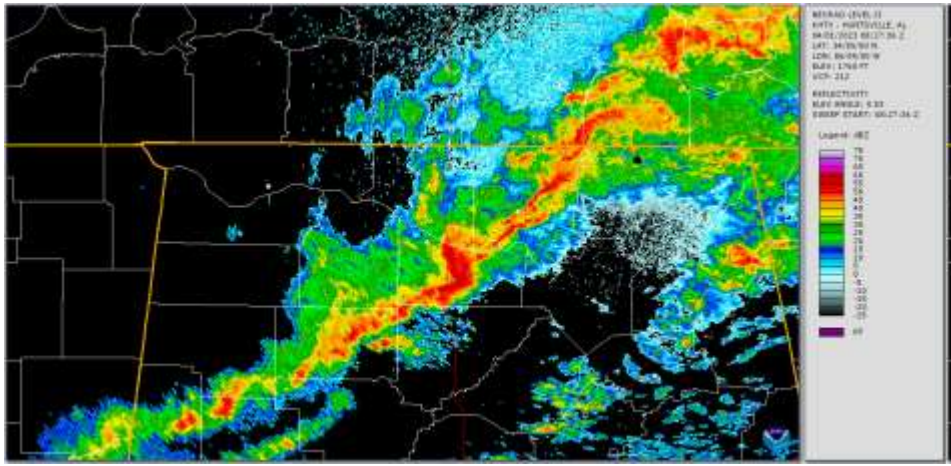


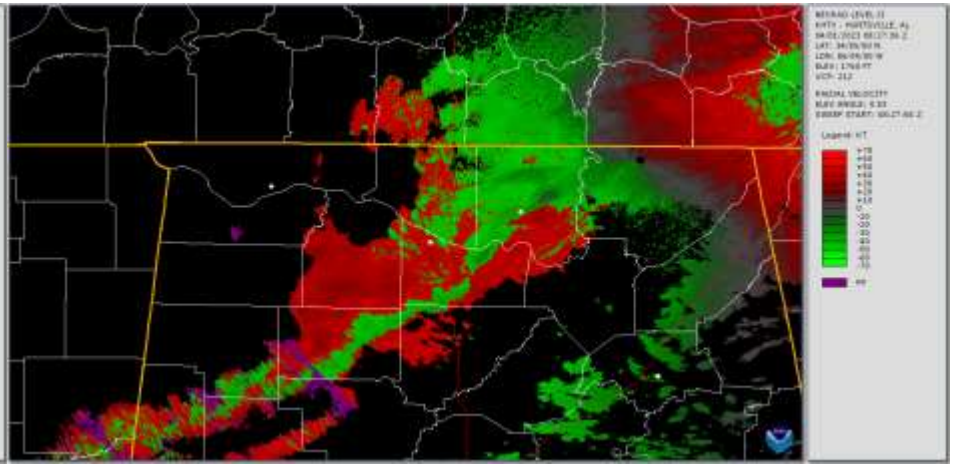




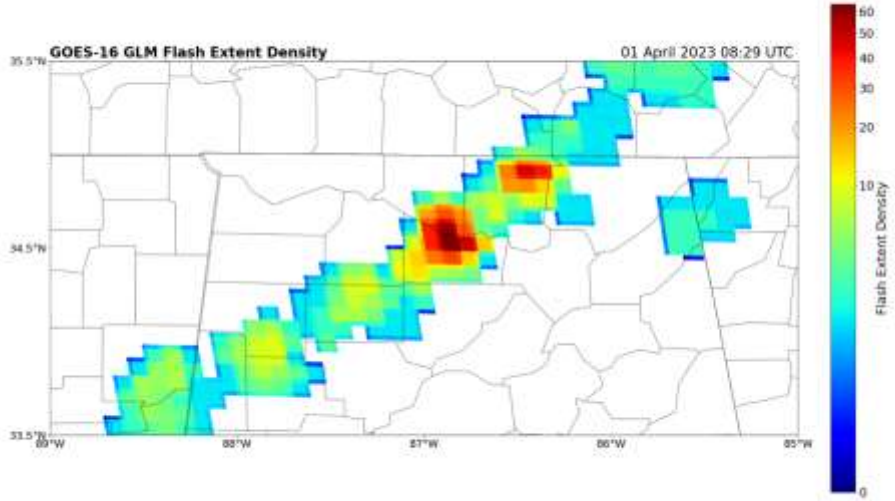
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

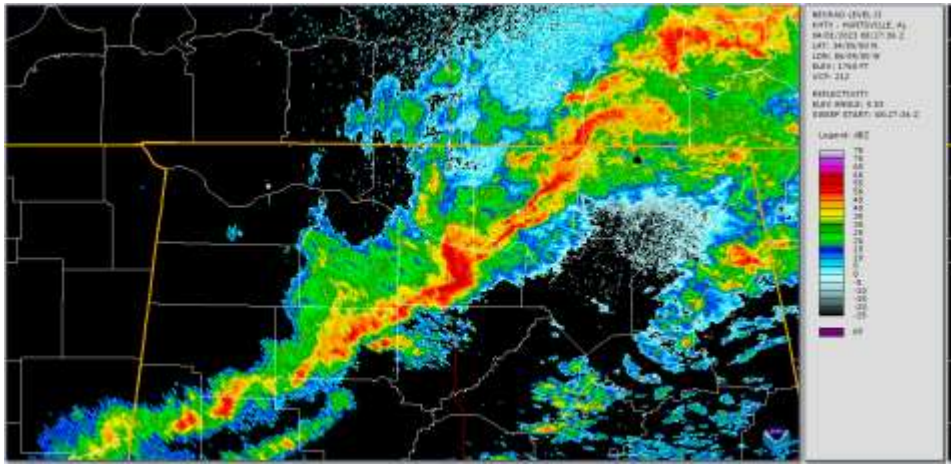


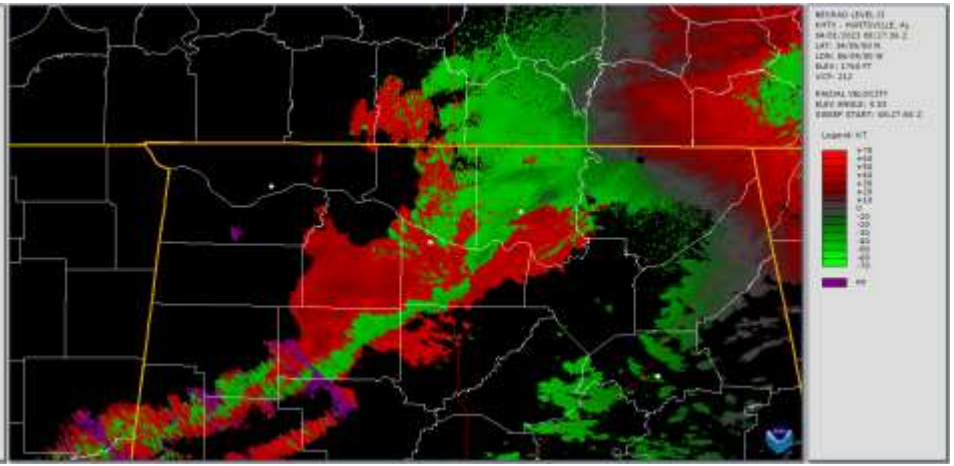




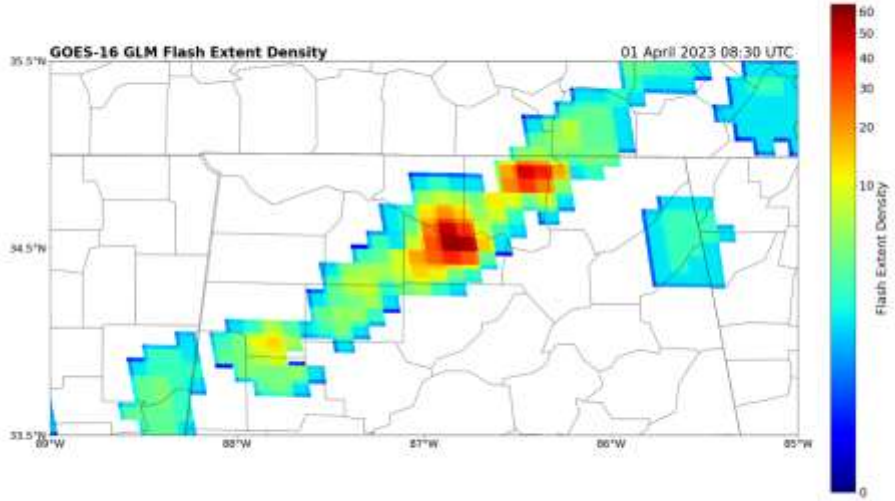
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

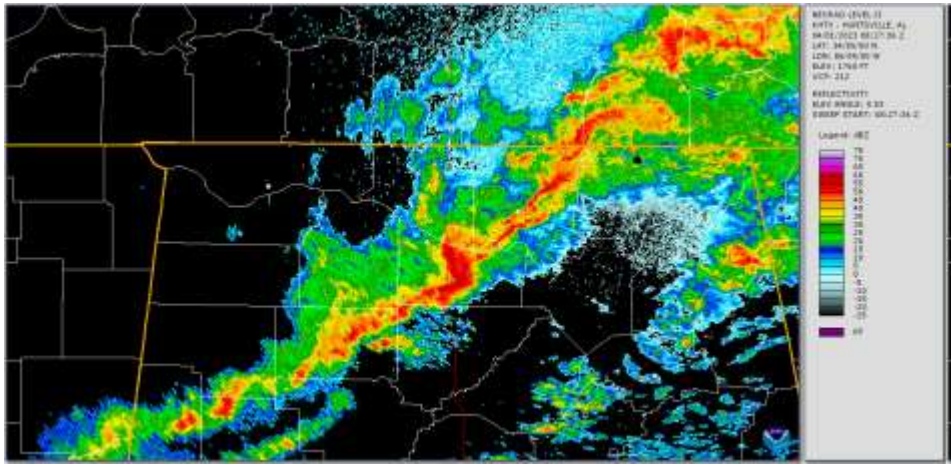


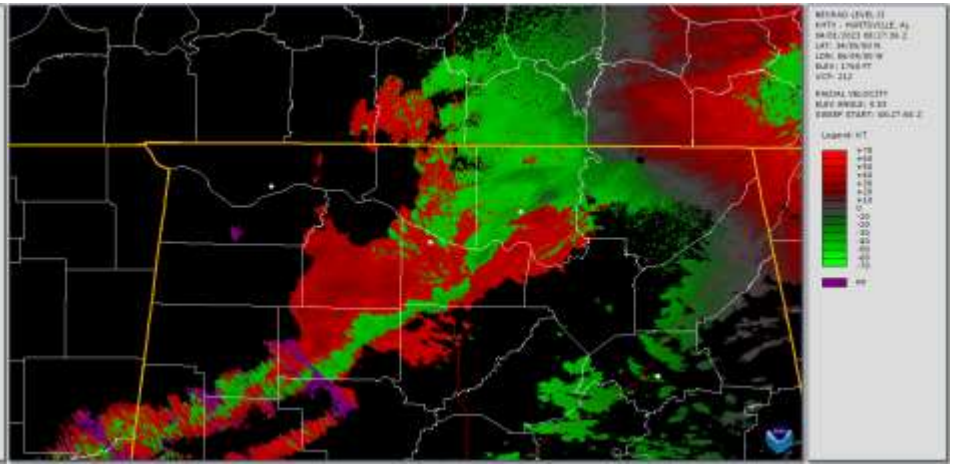




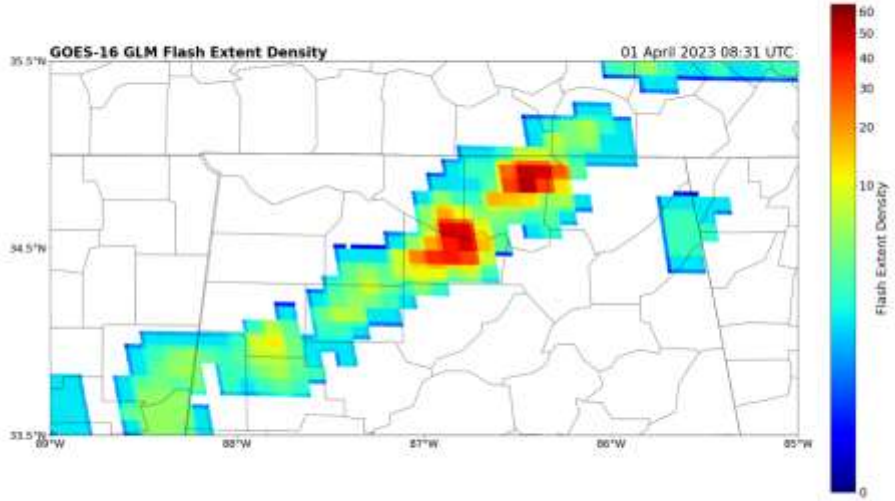
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

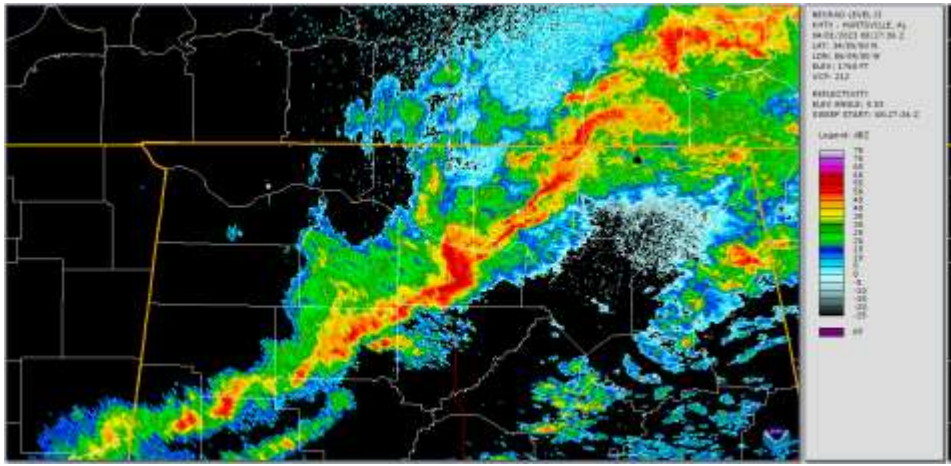


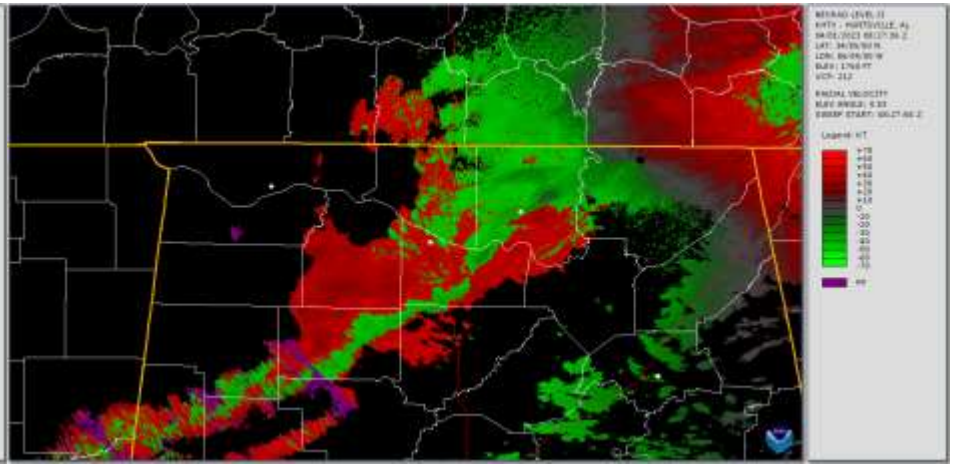




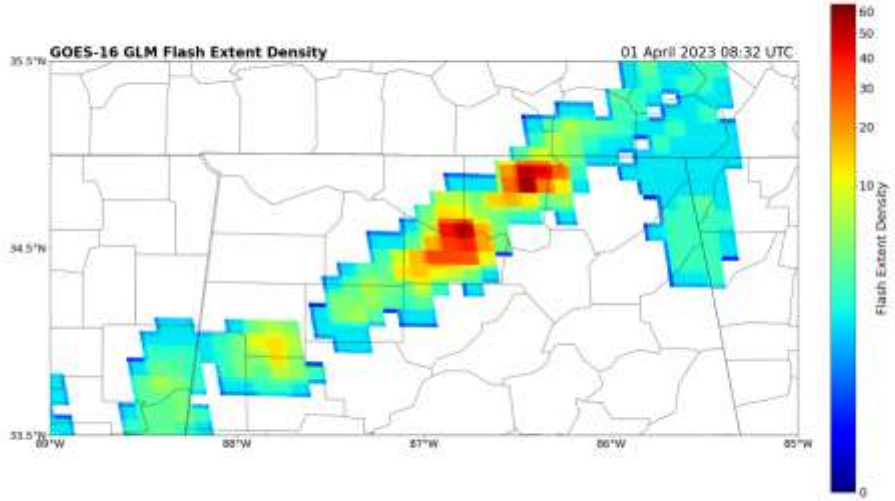
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

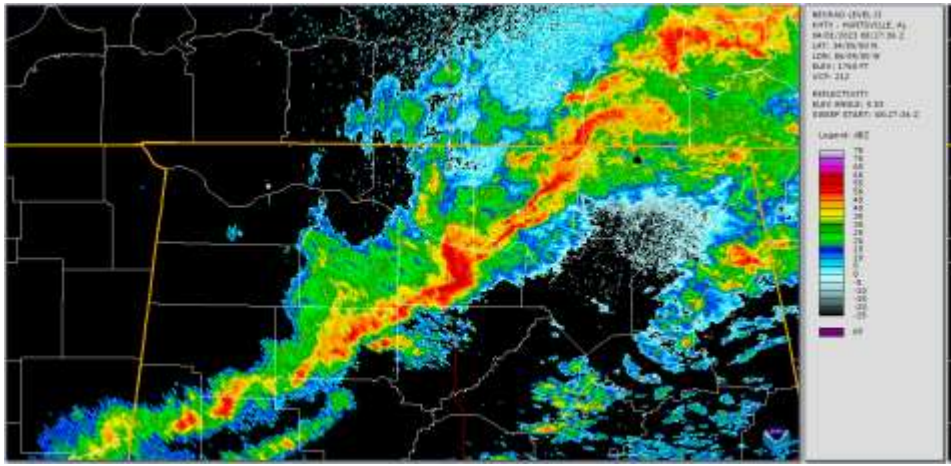


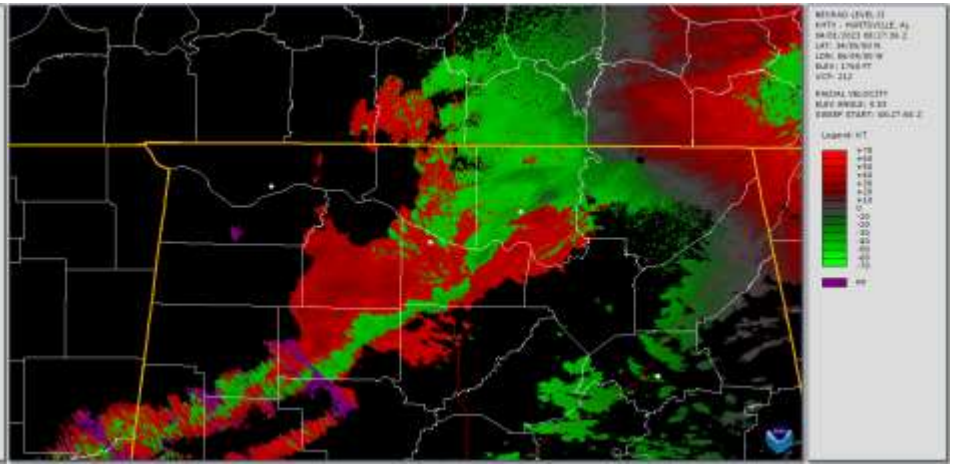




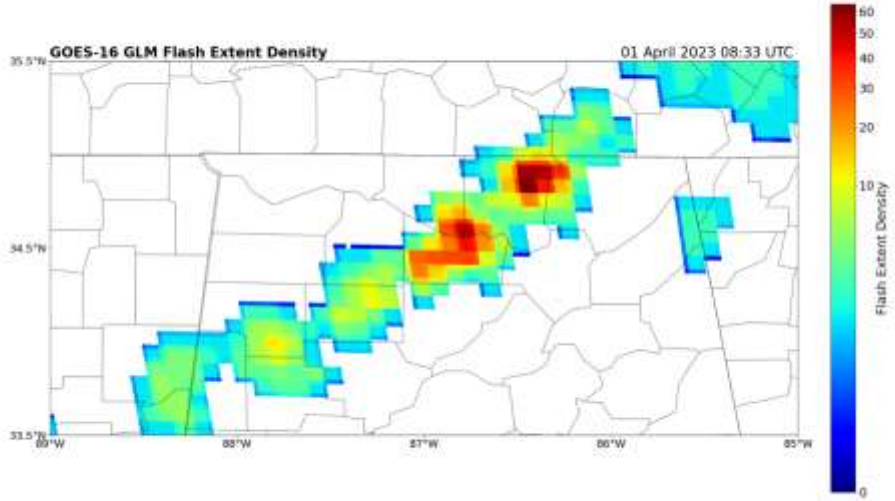
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

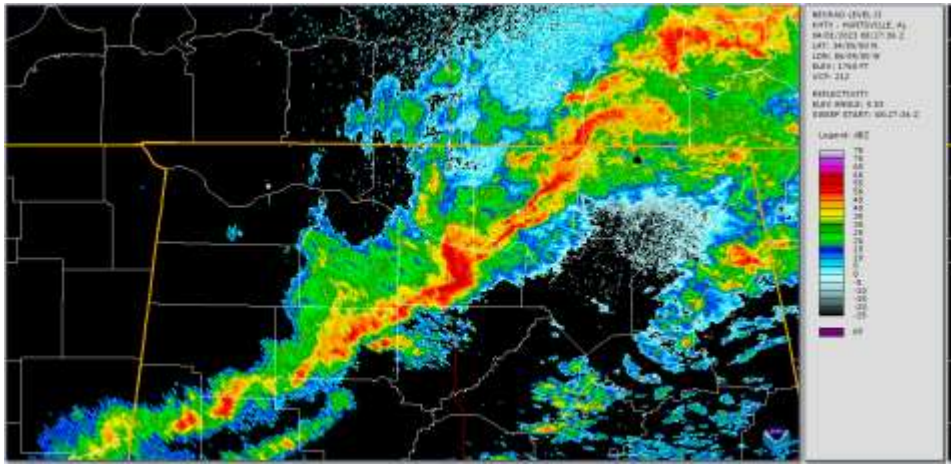


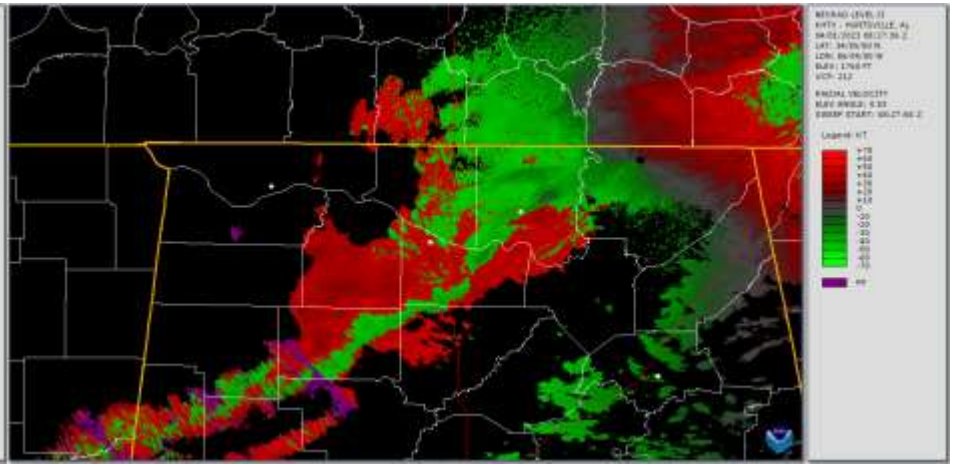




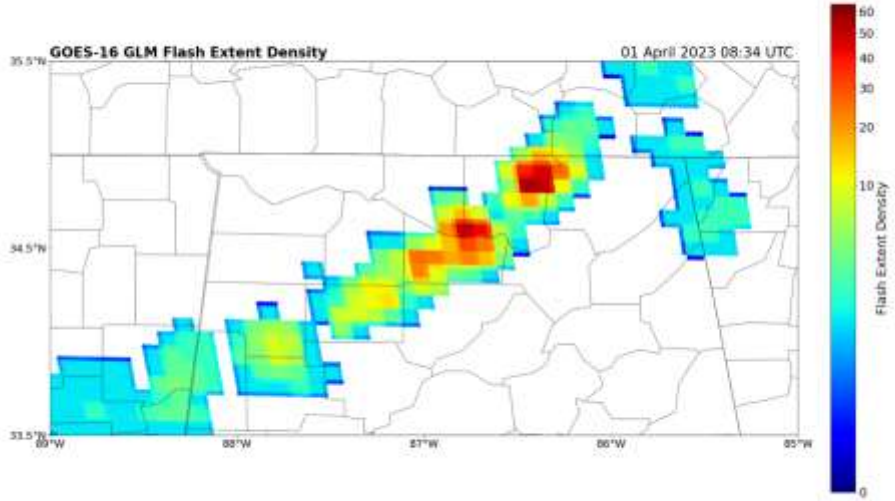
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

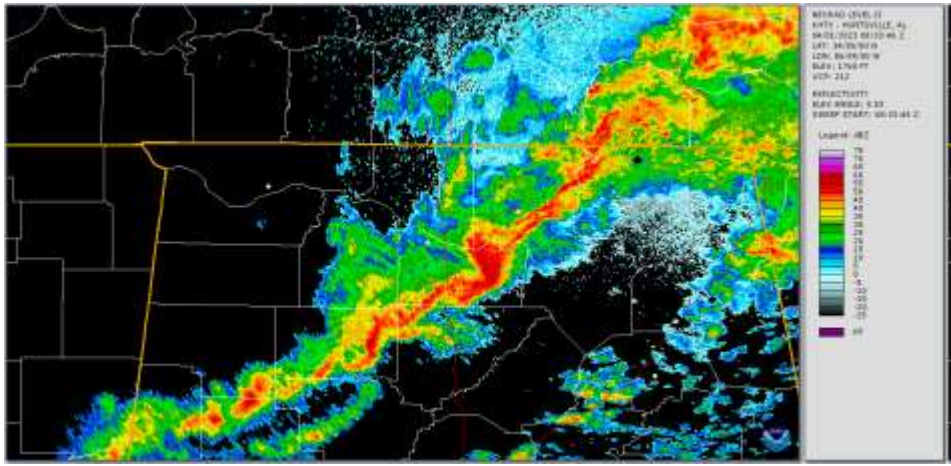


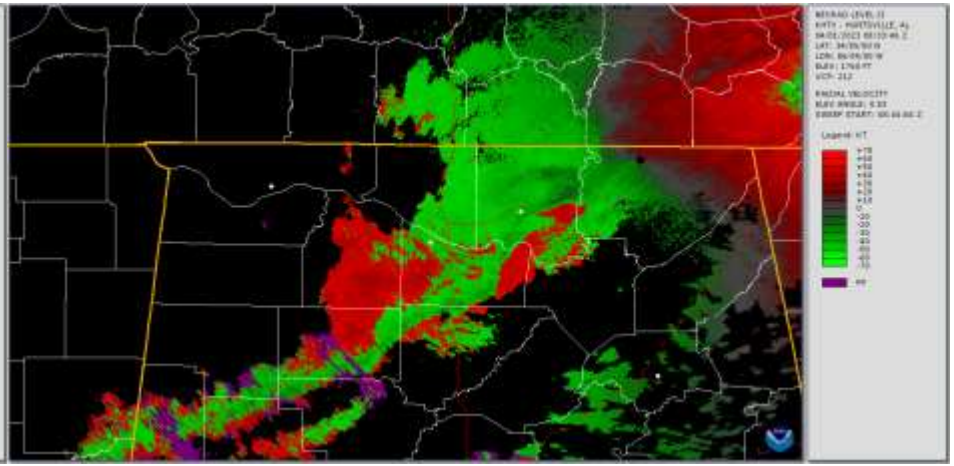




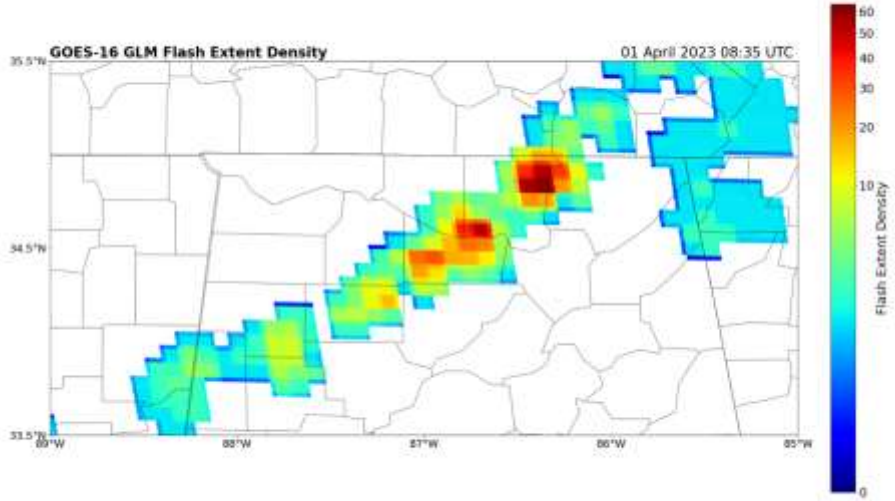
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

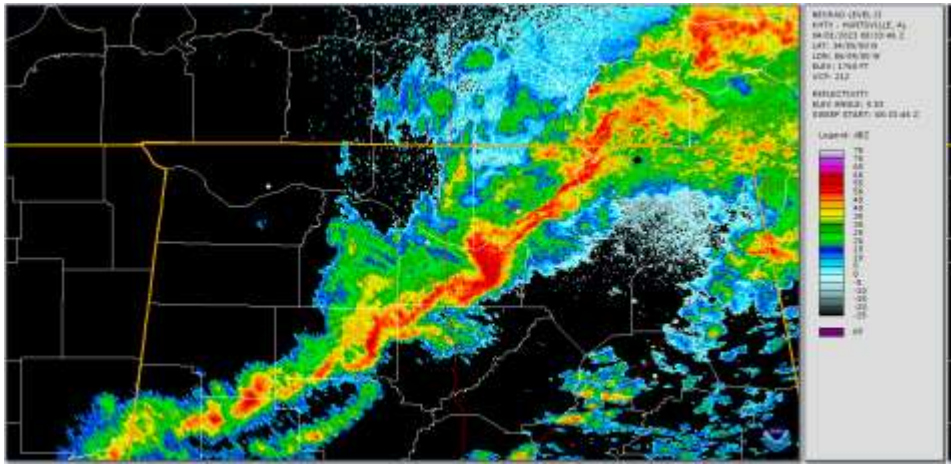


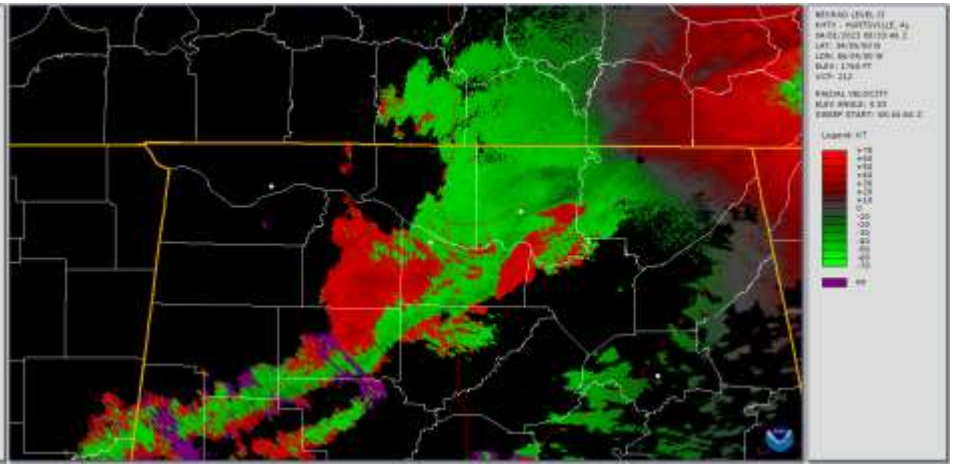




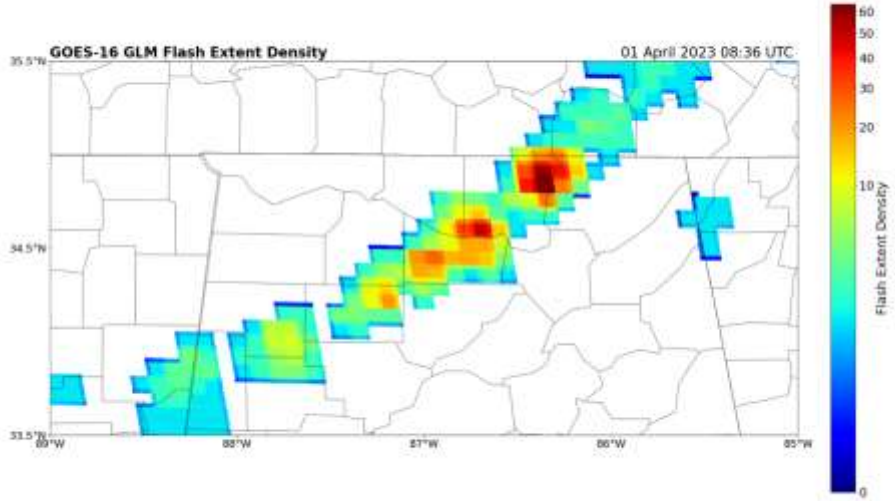
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

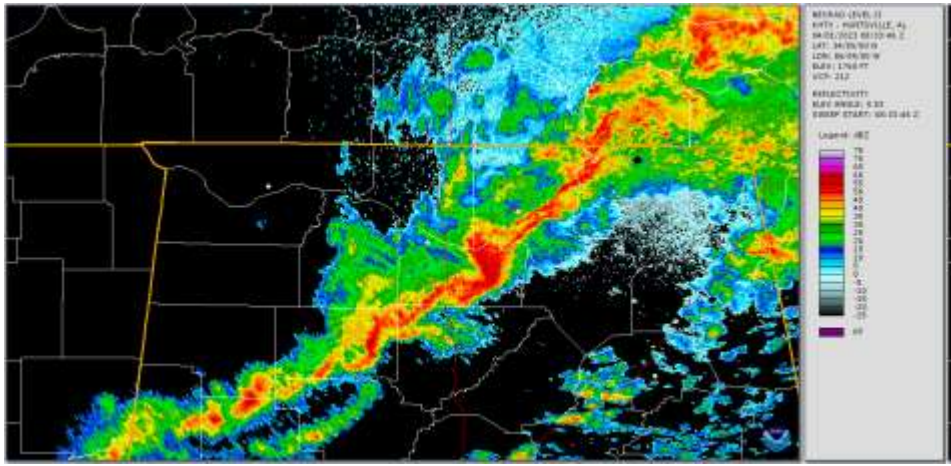


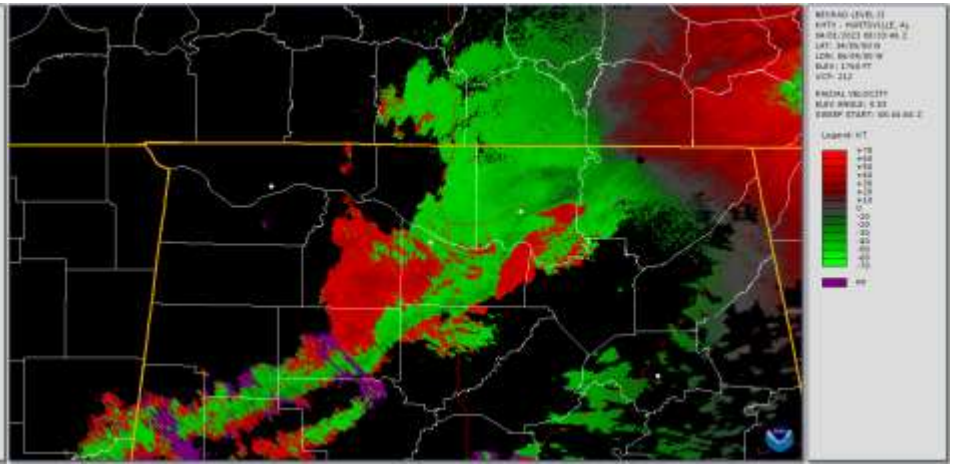




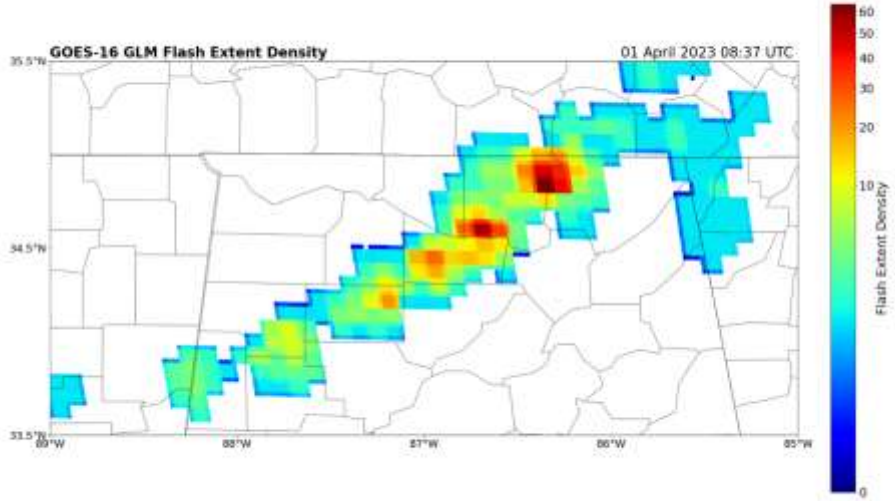
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

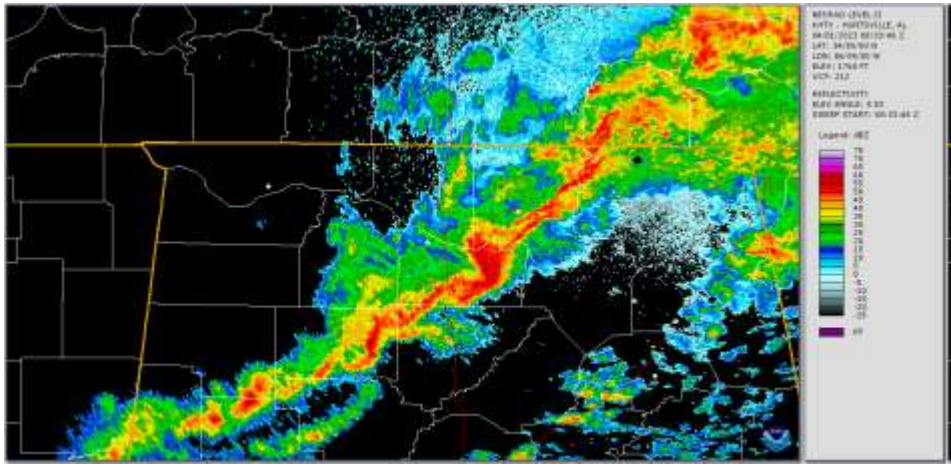


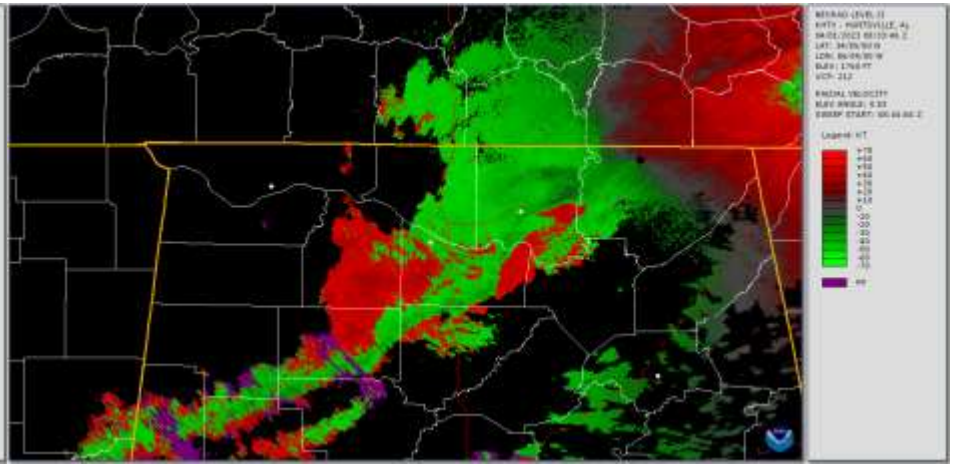




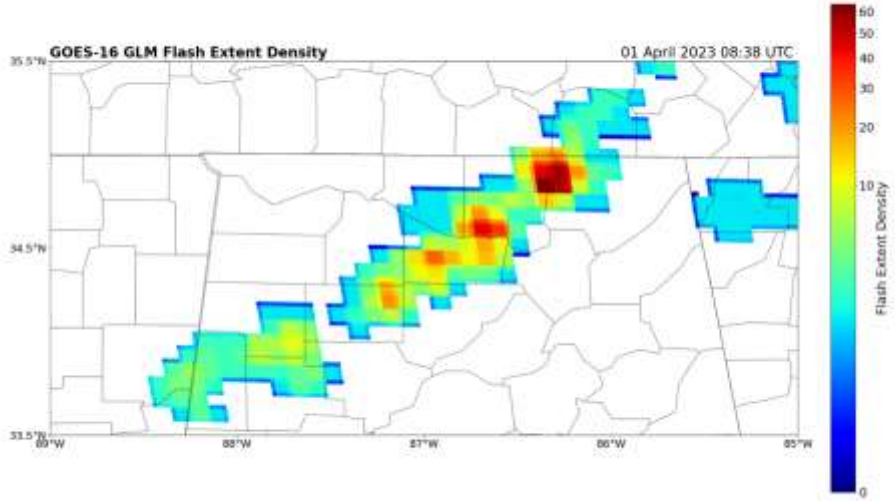
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

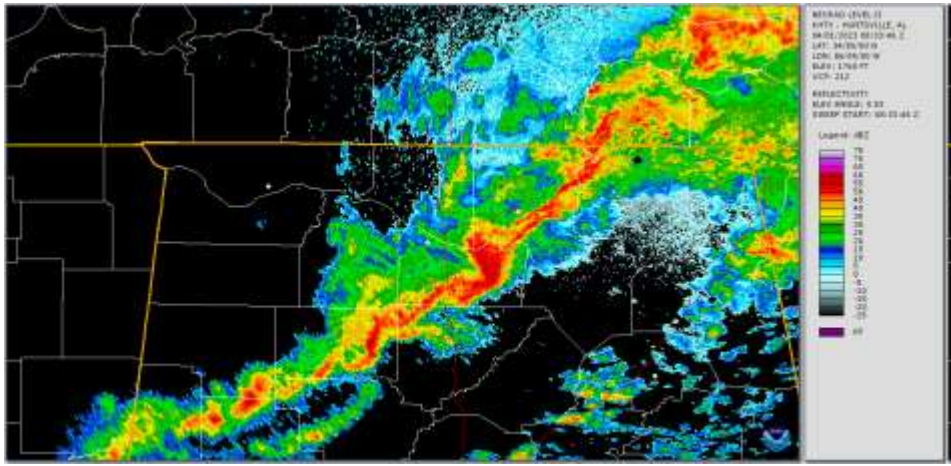


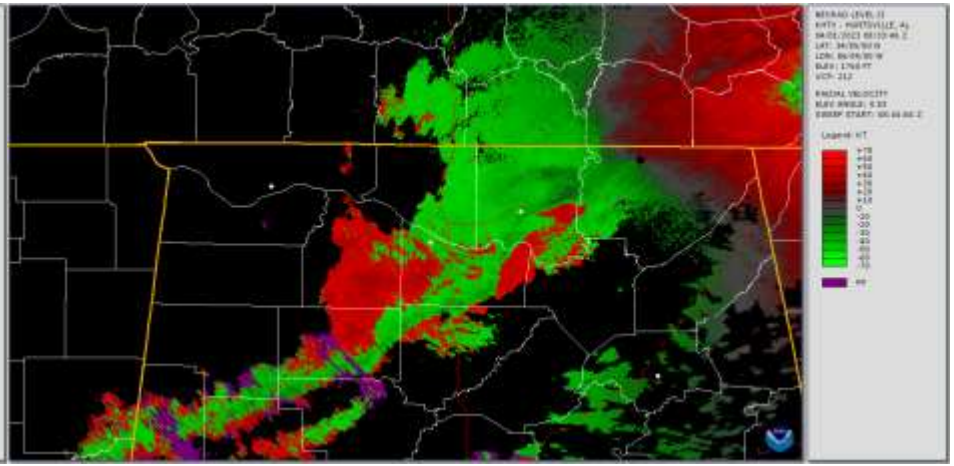




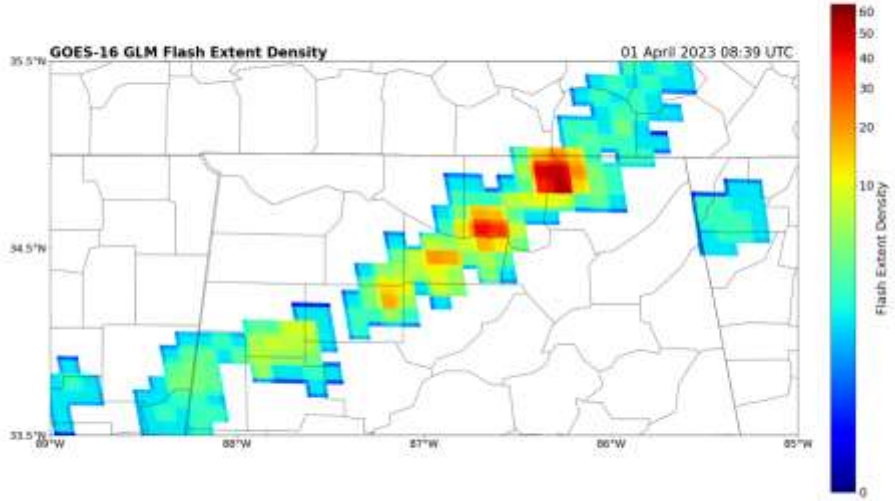
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

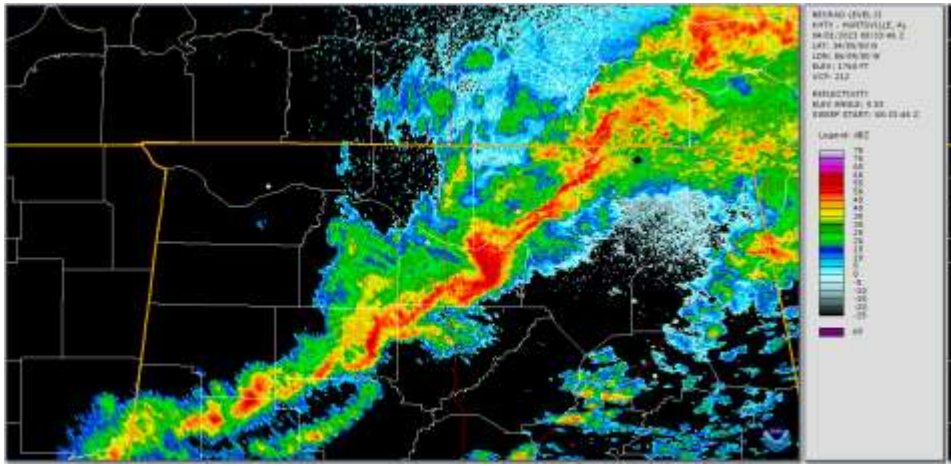


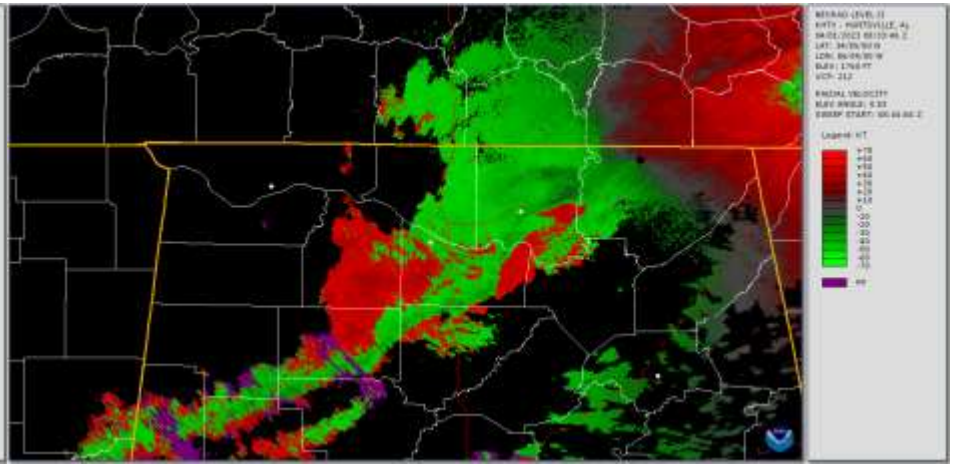




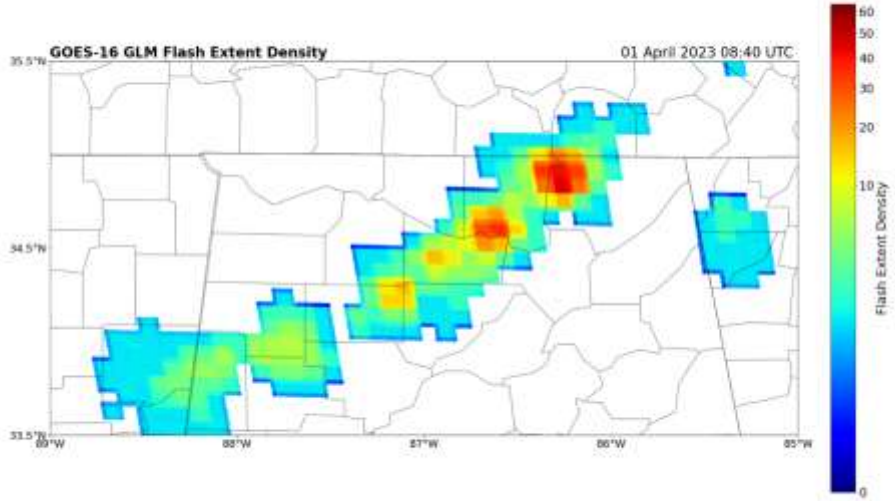
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

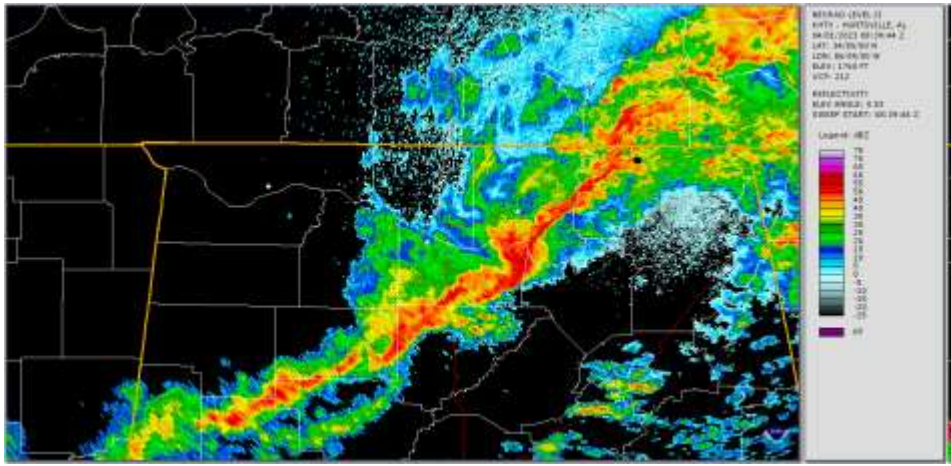


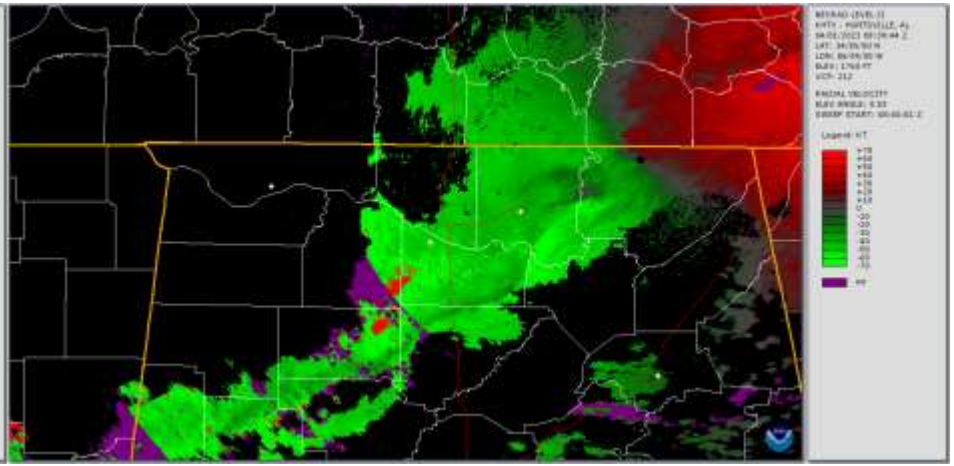




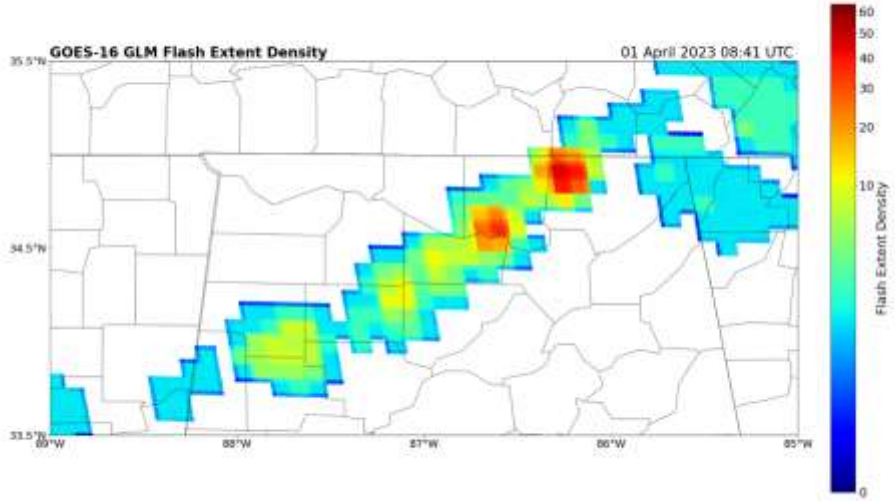
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

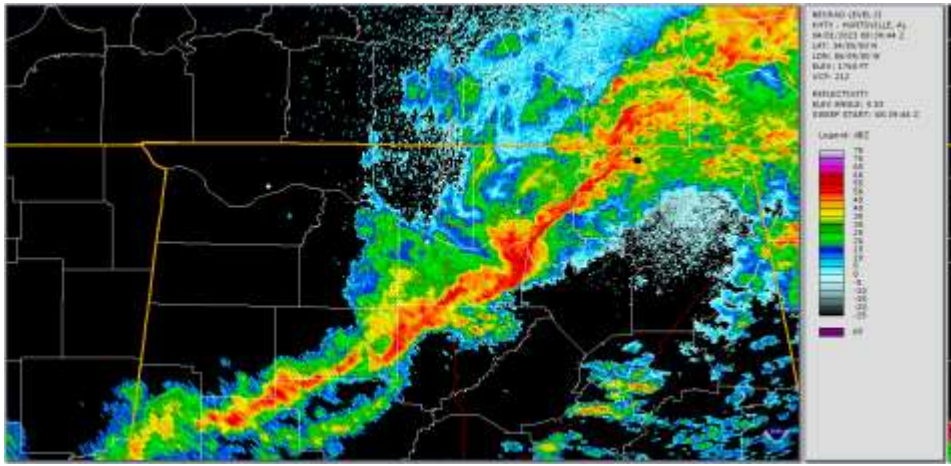


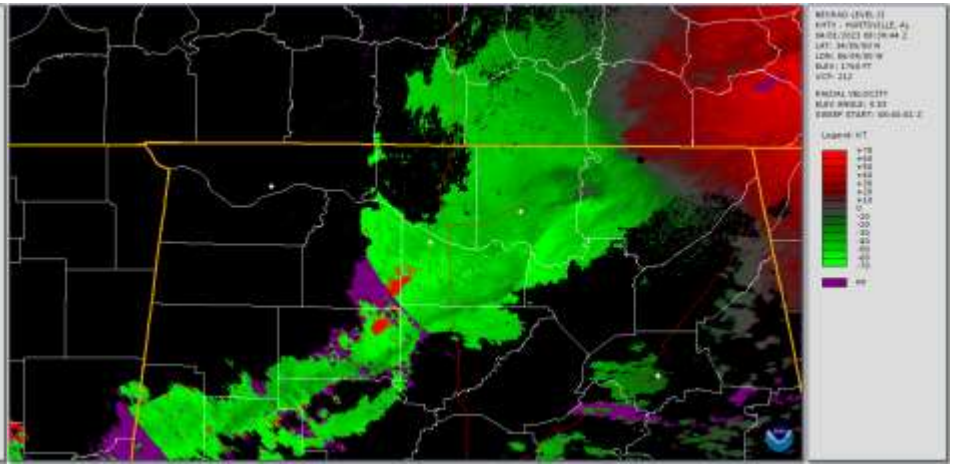




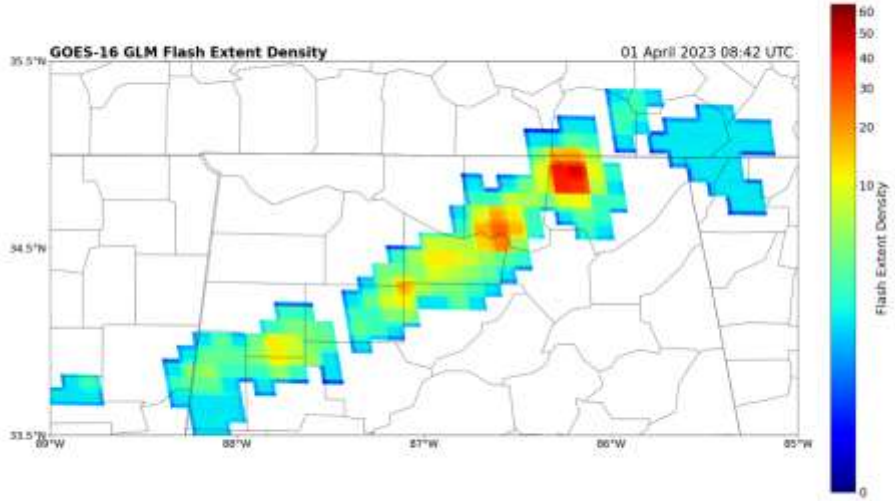
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

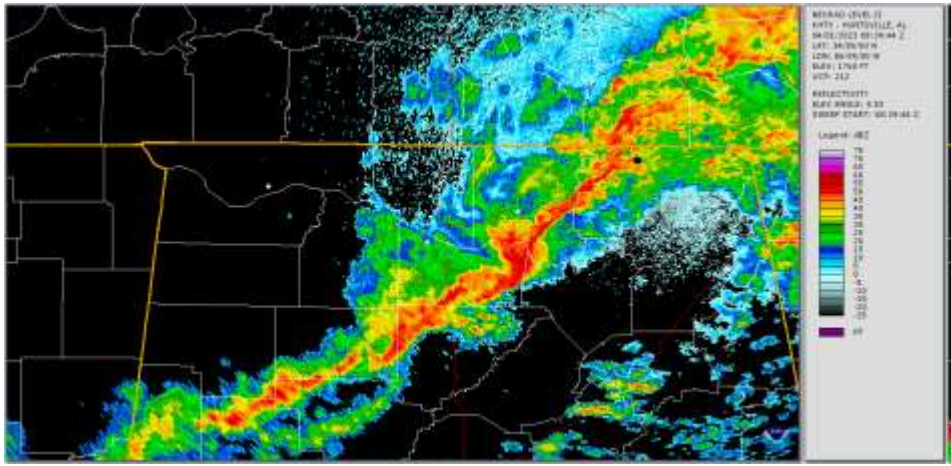


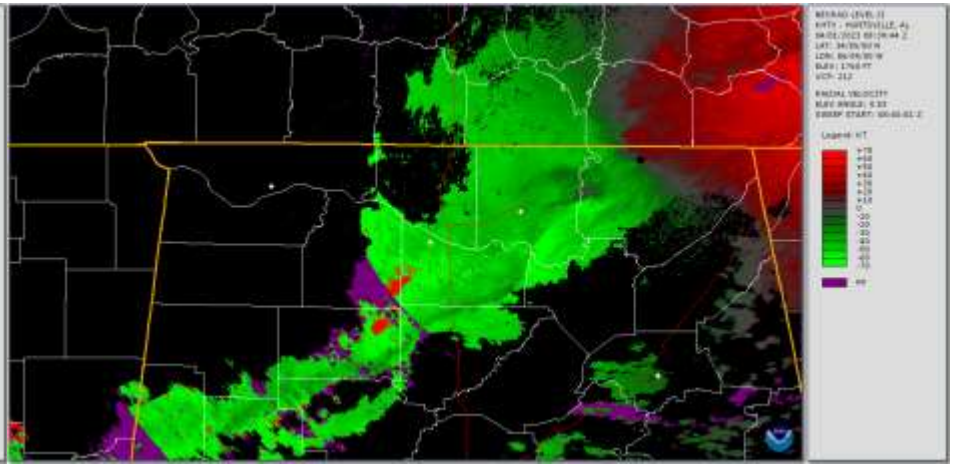




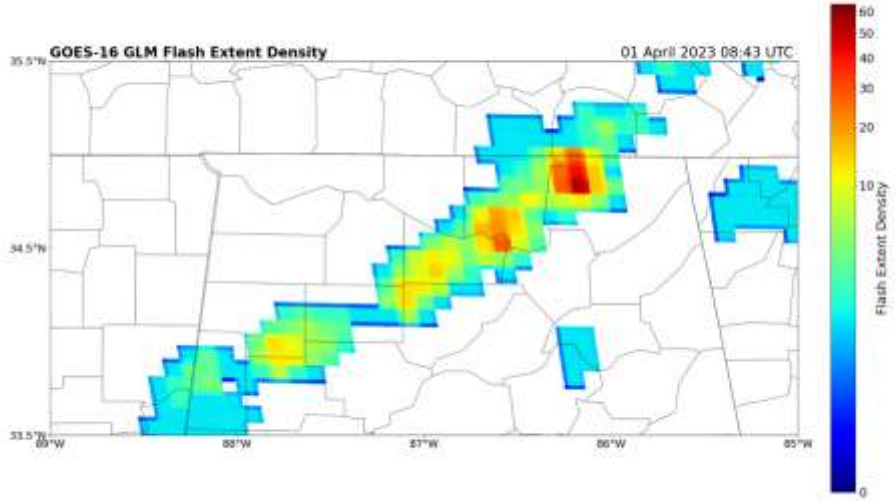
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

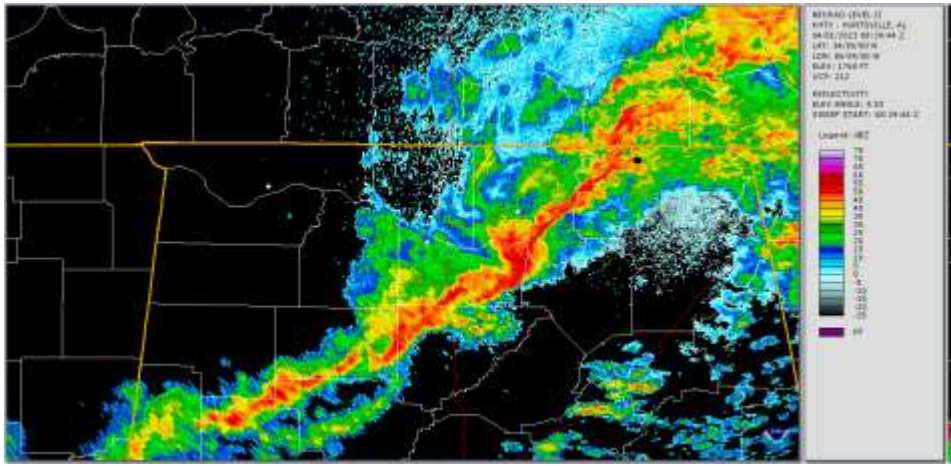


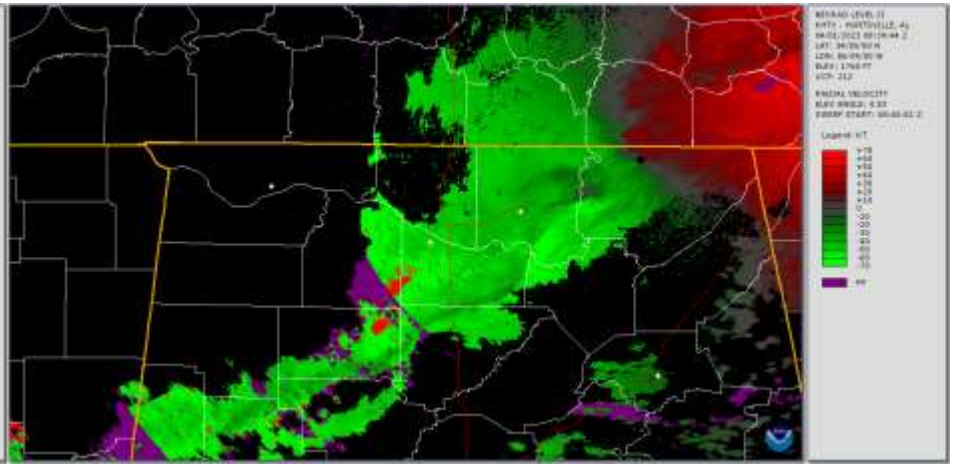




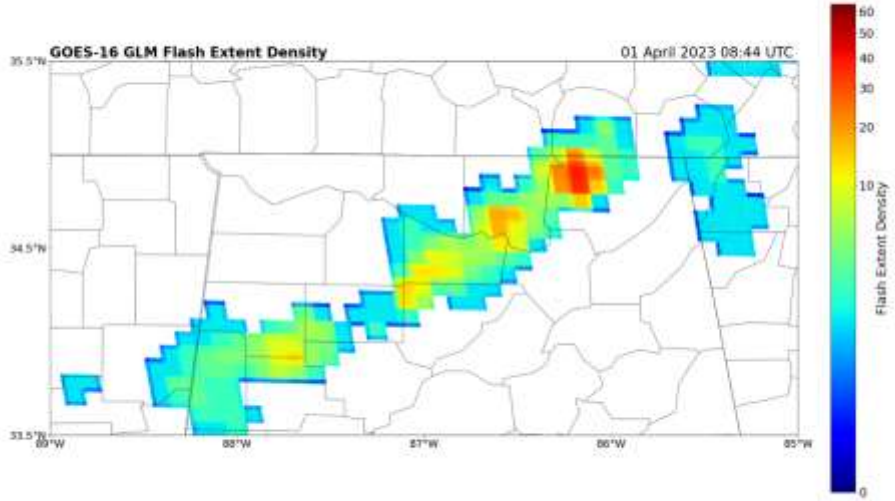
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

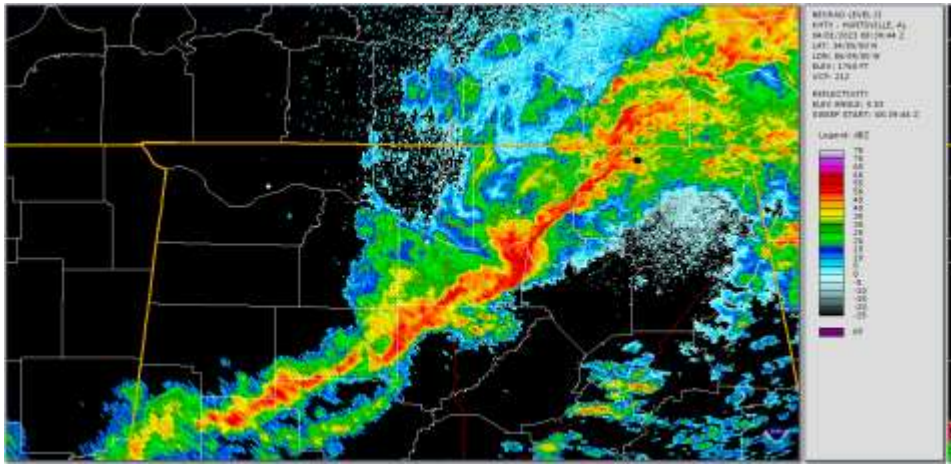


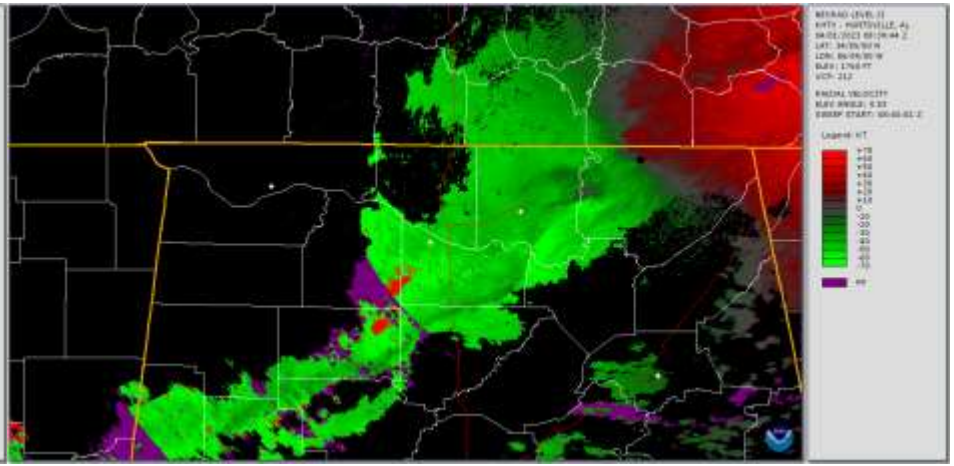




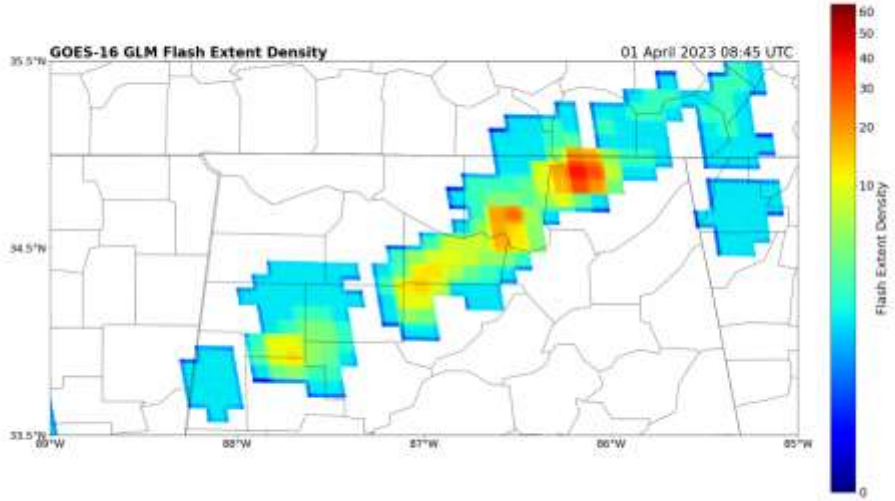
GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)

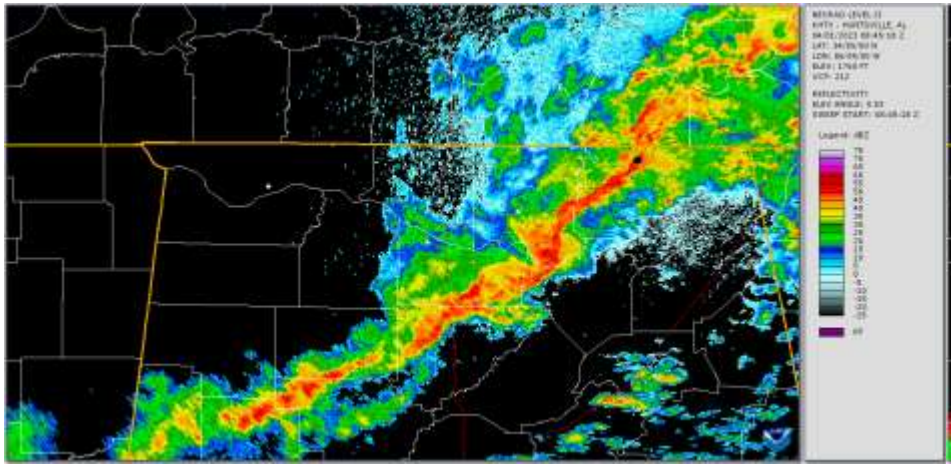




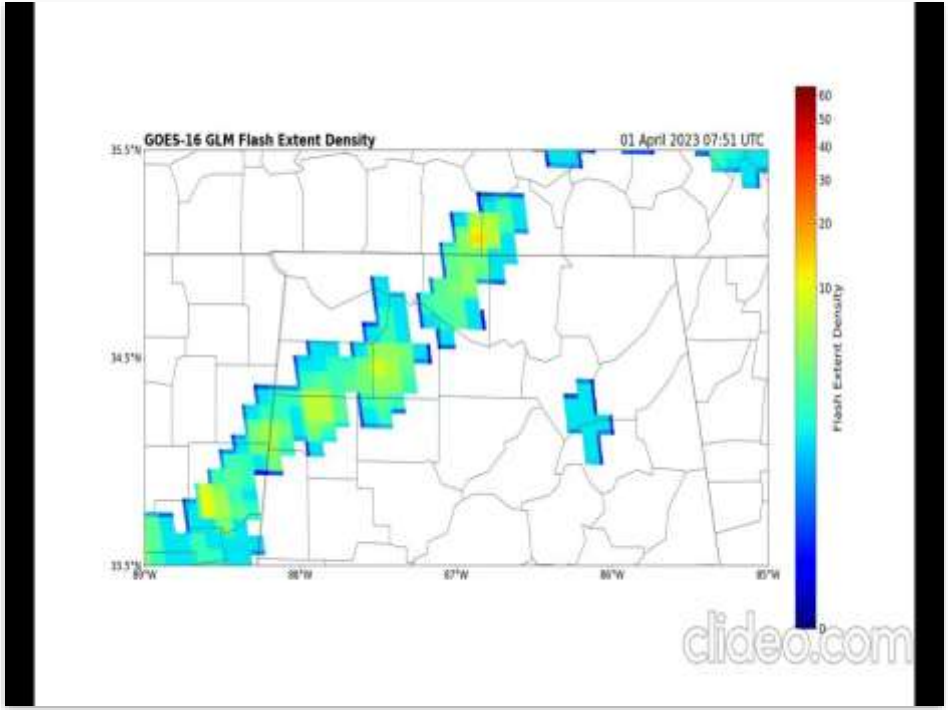


GLM FED (top) and KHTX Refl (lower-left) and Vel (lower-right)





Observed Lightning Jumps ahead of Severe Wx



As the radar operator - what am I focussing on?

Two distinct cells based on lightning across N. AL

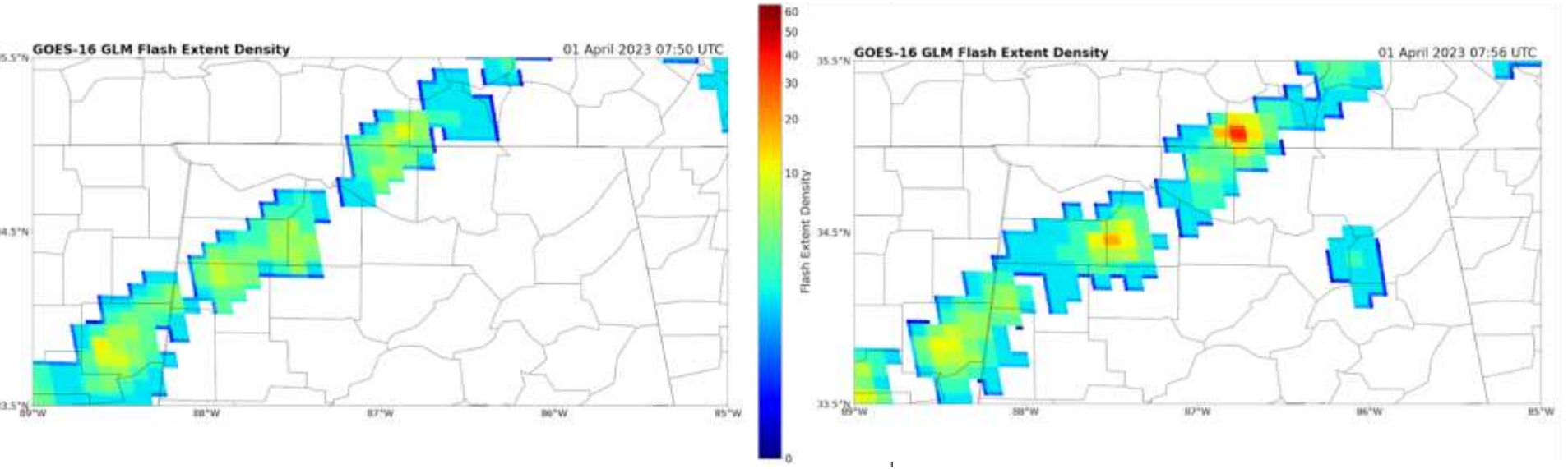
1. Near the AL/TN state line
2. Near the TN River

The northern cell shows a lightning jump as the cell moves east, prior to tornadogenesis

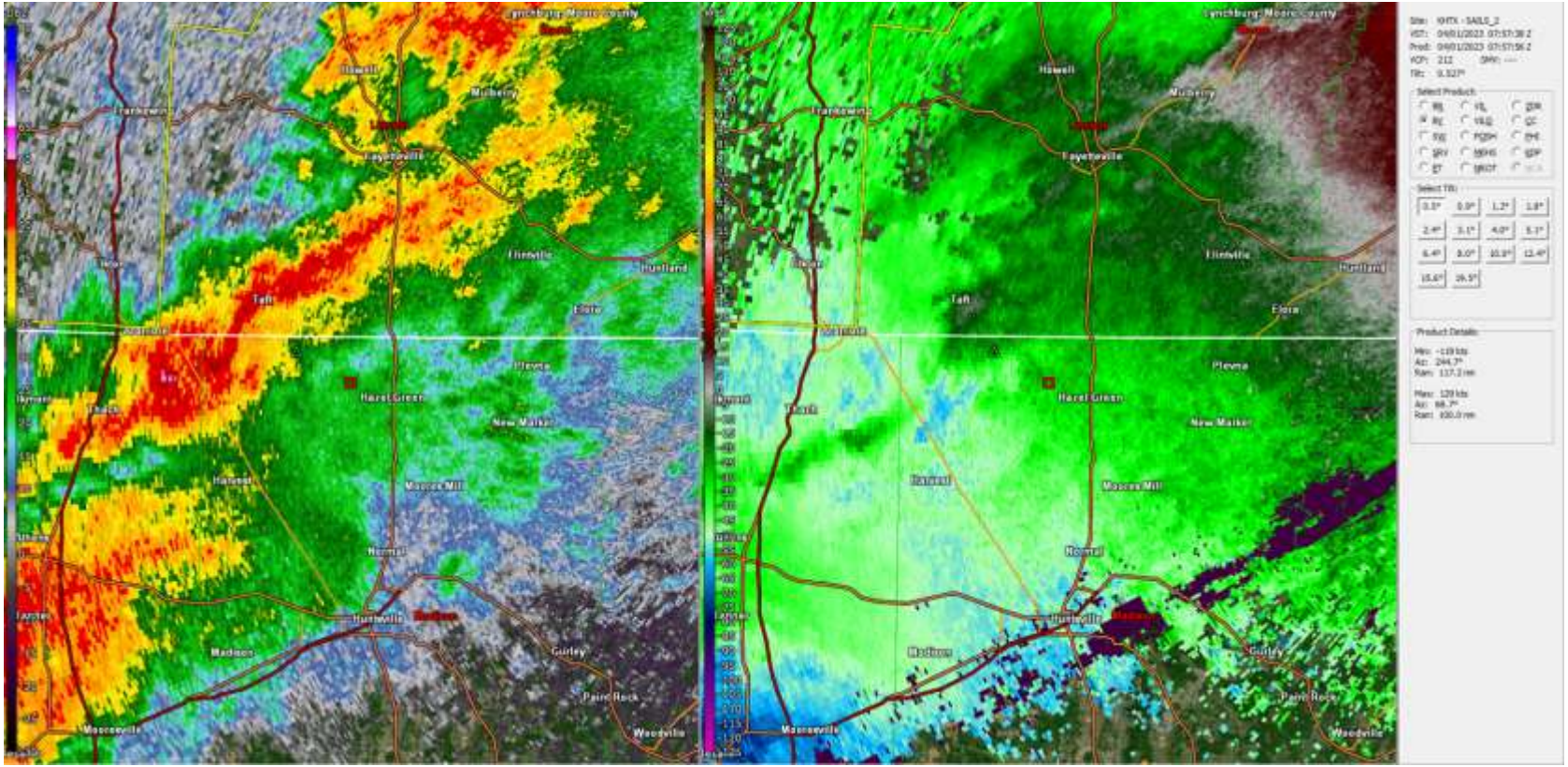
The southern cell, while not the main focus for this talk produced a 65 mph gust at KHSV as FED increased

Looking Closer at the Tornadic Northern Storm

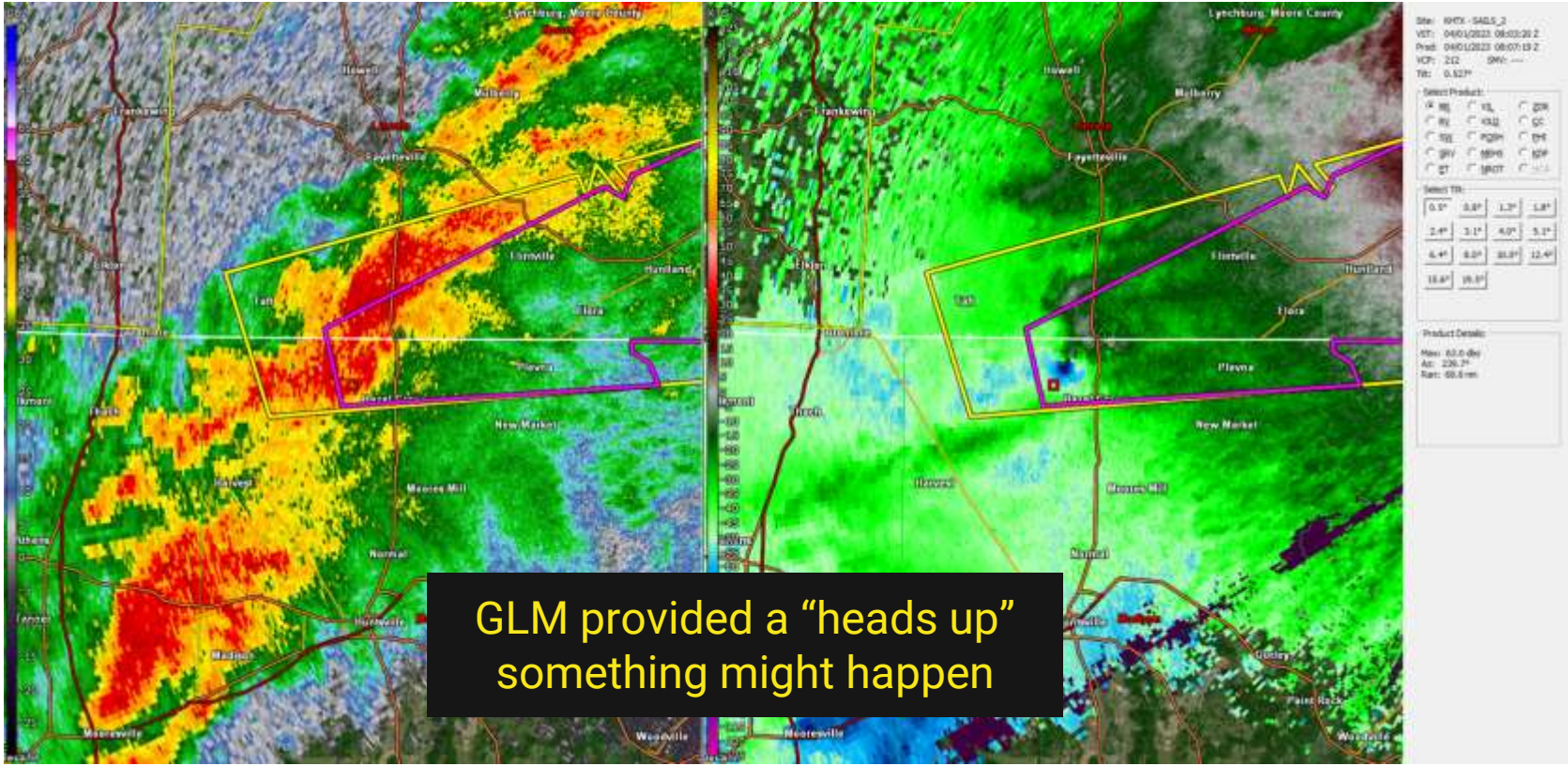
- Rapid increase in FED within 6 minutes
- SVR issued 8 minutes after the image on the right
- TOR issued 10 minutes after



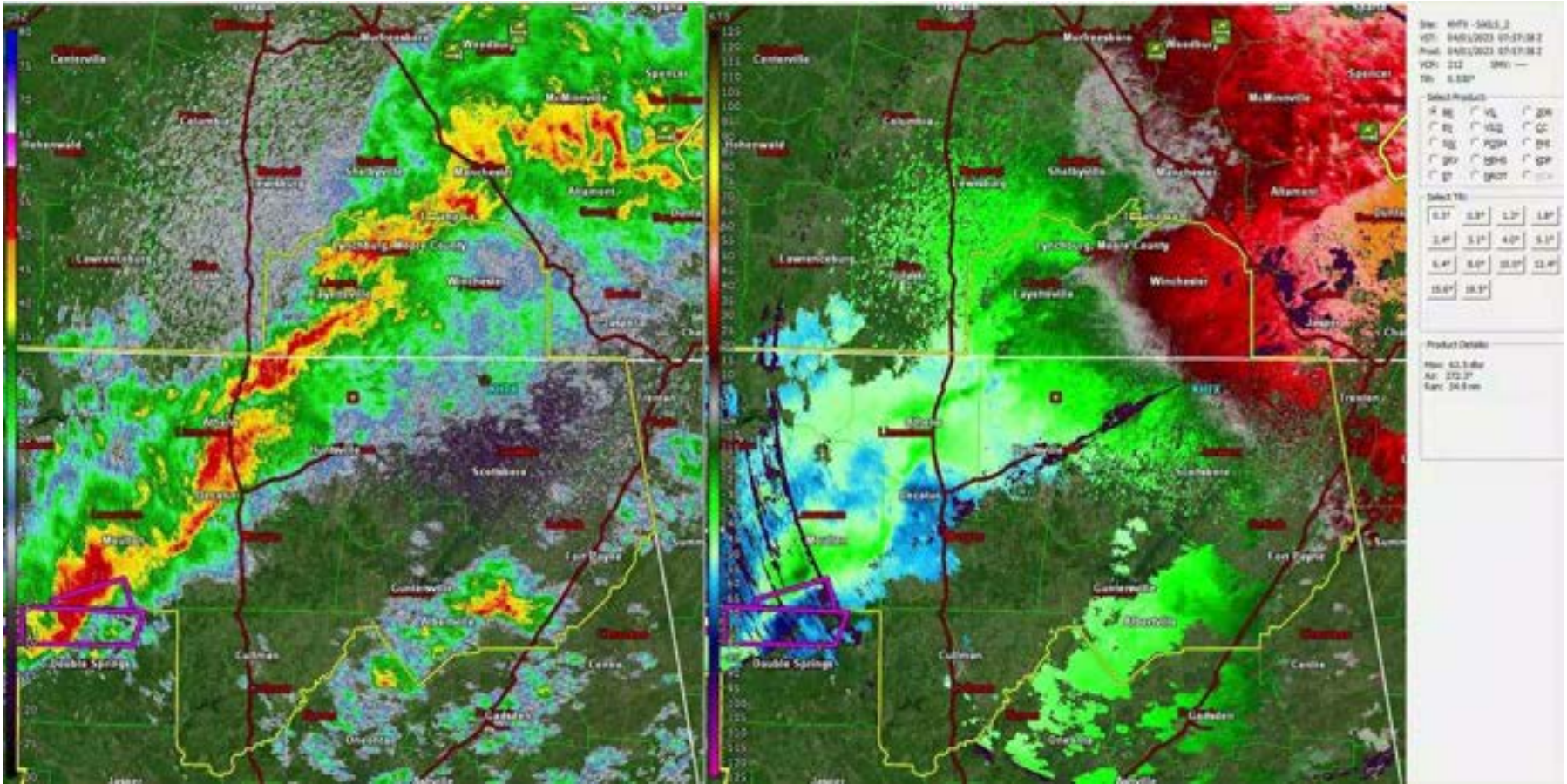
What did Radar Look Like at This Time?



10 Minutes Later (After the Lightning Jump)

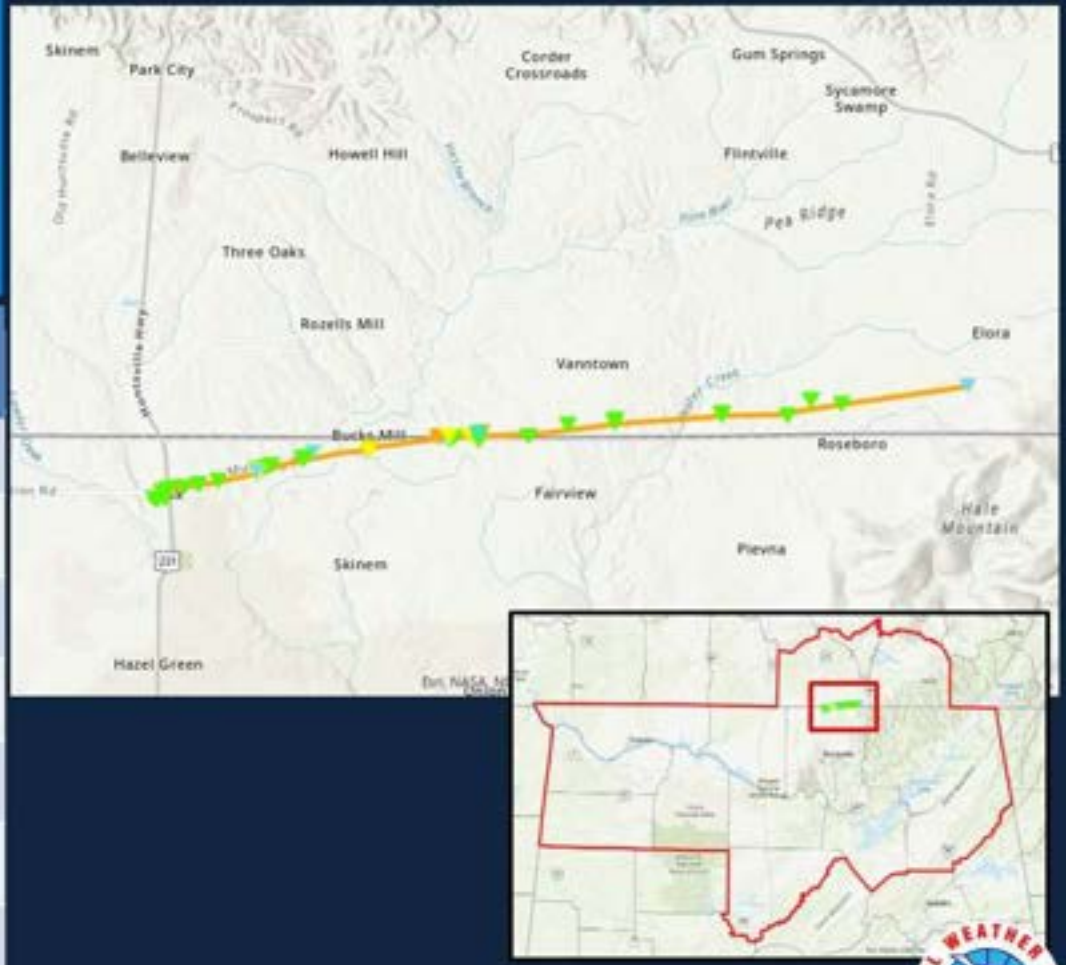


What Happened - Radar Loop with warnings/LSR’s



Preliminary
Damage Survey Results

Borderline Rd. Tornado (Madison Co. AL/Lincoln Co. TN)	
EF Rating	EF-3
Est. Peak Winds	160 mph
Date	4/1/2023
Time (local)	3:09 AM – 3:25 AM
Path Length	12.10 miles
Max Path Width	215 yards
Injuries/Fatalities	5/1



What Happened

- EF-3 tornado (160 mph) –1 fatality
- Tornado Warning issued at 3:07 AM
- 2 minutes of lead time on the warning
- Approximately 15 minutes of lead time from lightning jump
- Utilizing GLM enhanced warning operations

Remnants of a destroyed house on Borderline Rd on the AL/TN border from an EF-3 tornado on April 1, 2023. Photo courtesy of WFAA-48.