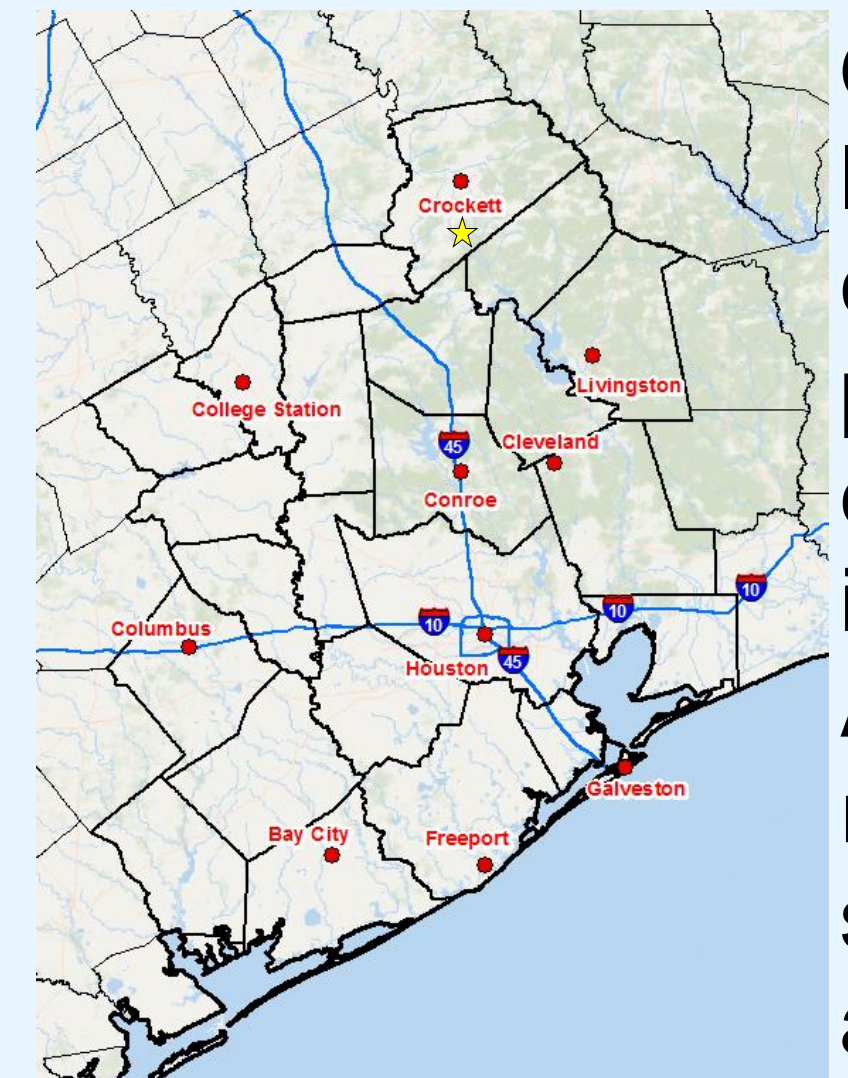
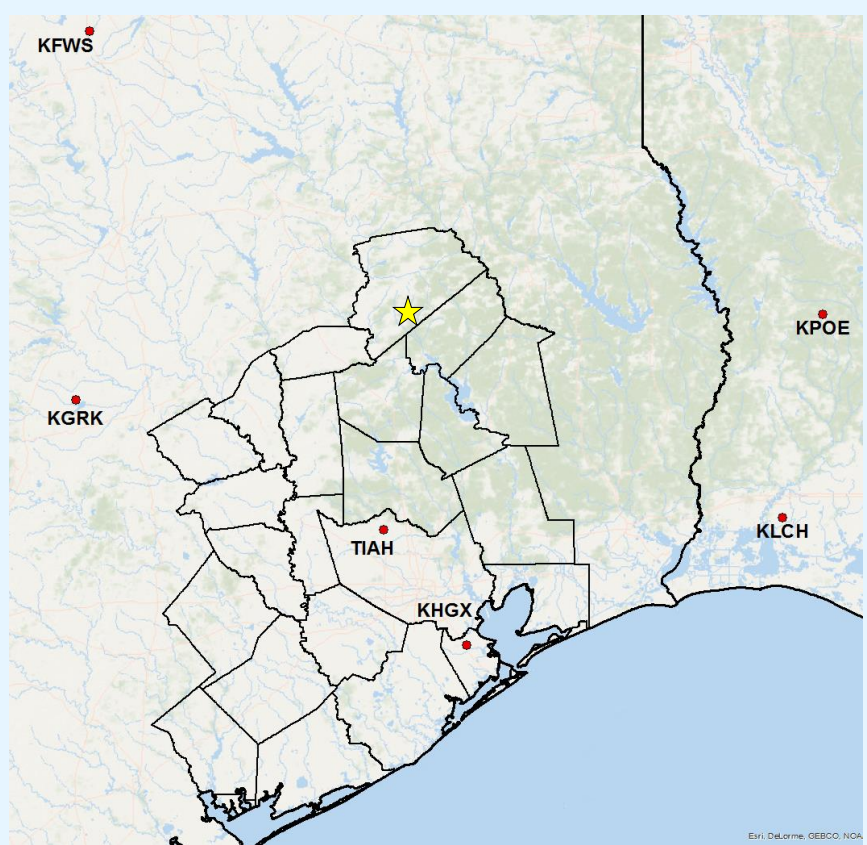


Overview



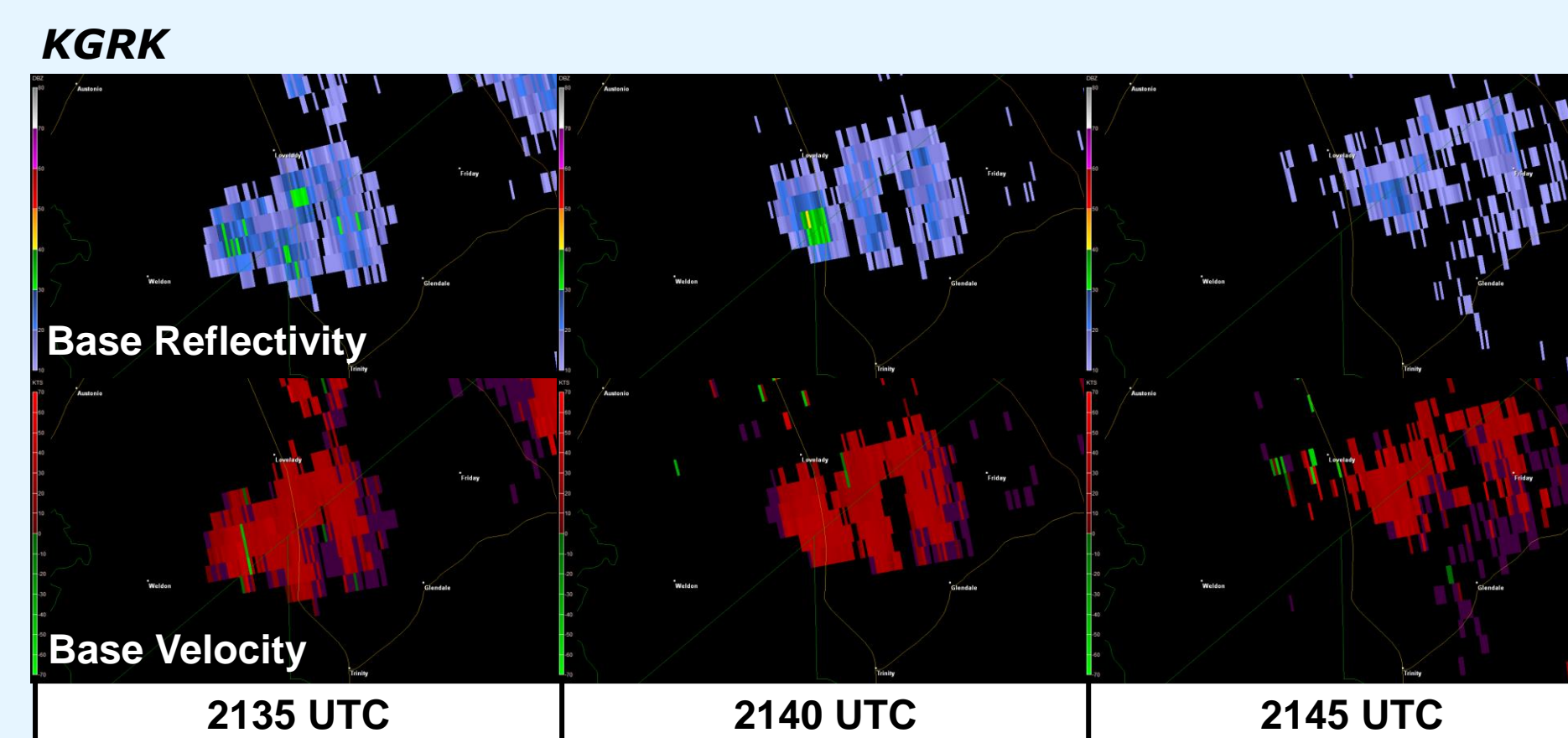
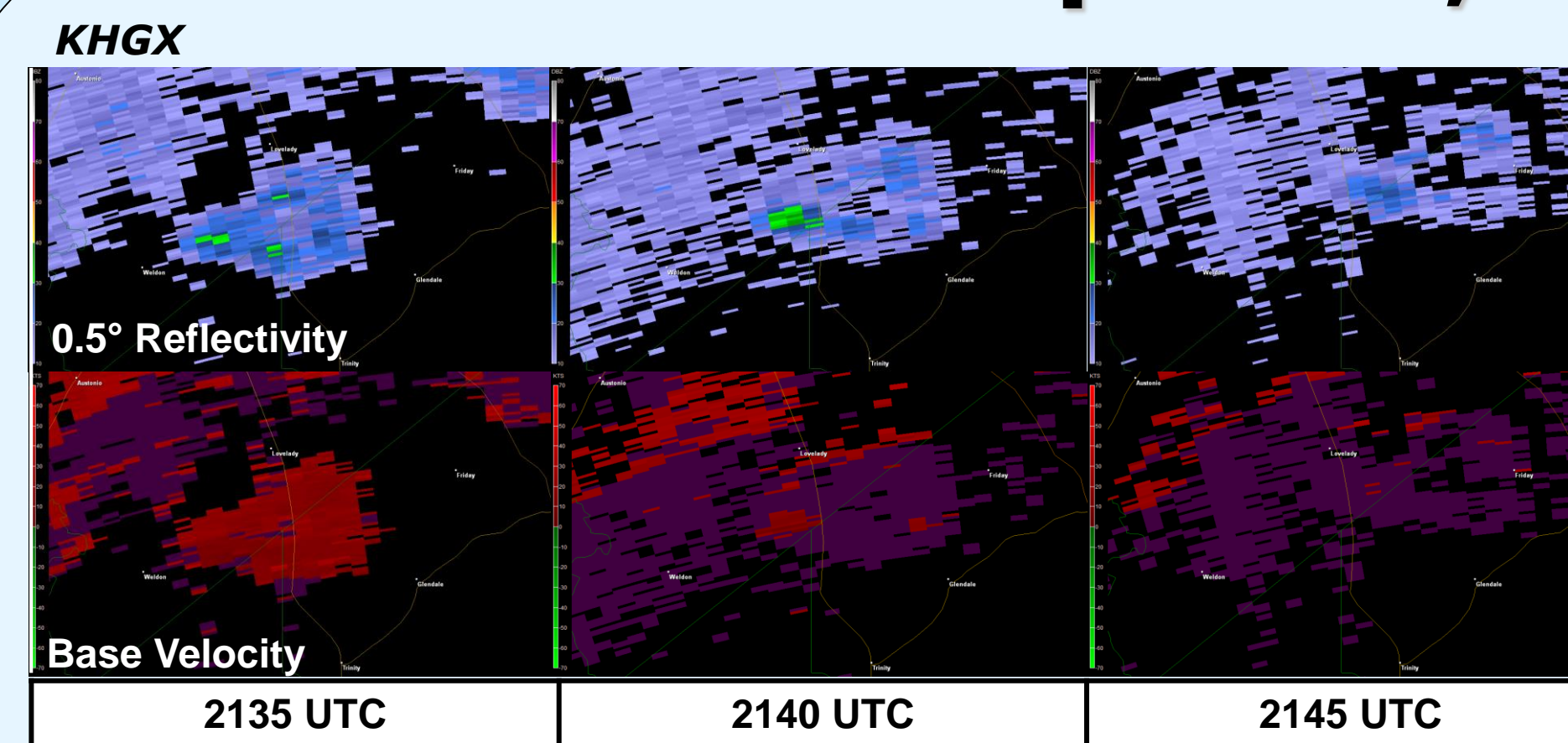
On the afternoon of April 13, 2014 a short lived tornado touched down within the community of Lovelady, TX injuring one and producing damage rated as EF-1 on the enhanced Fujita scale. This community lies in an area of poor low level radar coverage. At the reported time of the tornado, the radar presentation was of a weakening shower with no associated lightning. An analysis of upper air observations shows that the tornado occurred in a region characterized by strong low level shear due to a strengthening low level jet and weak instability. Following this analysis an attempt is made to determine whether the tornado formed from a parent supercell or through non-supercell processes.

Radar Coverage

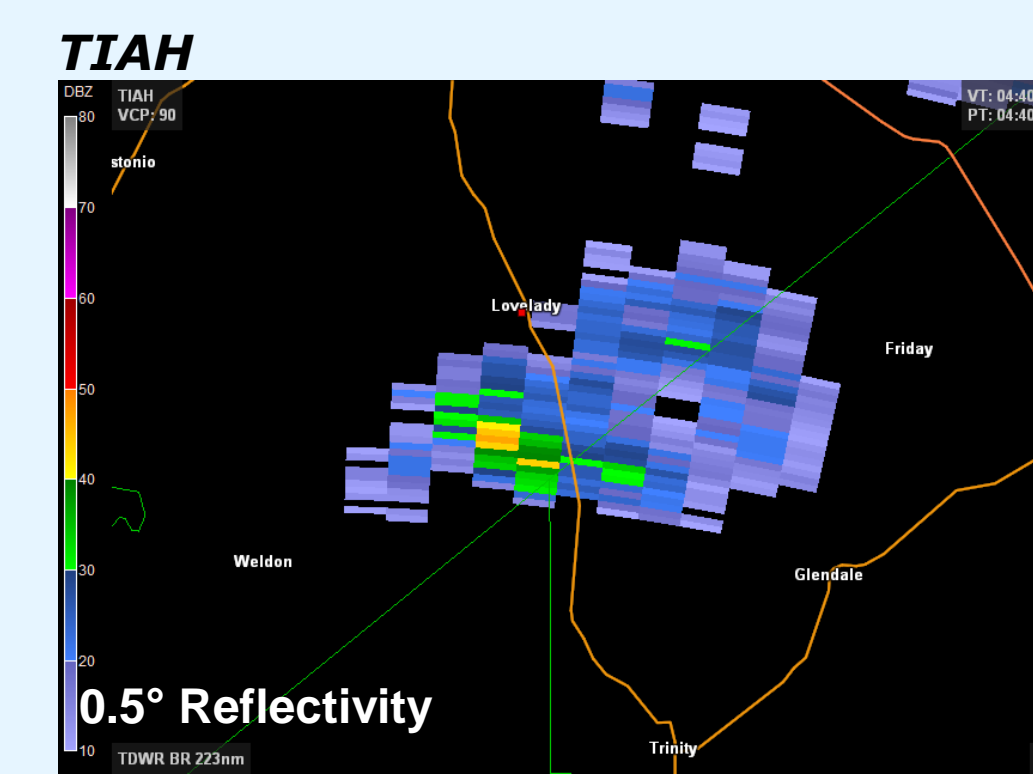


- Nearest WSR-88D to Lovelady is KHXG, 116 miles to the south
- Lowest elevation angle from KHXG (0.5°) is centered at 12,000ft over Lovelady
- Radar beamwidth is ~ 9,900ft (7,500ft to 17,500ft)

April 13, 2014



- Est. time of tornado: 4:45 - 4:50 pm CDT (2145 UTC)
- First call to NWS Houston at 5:40 pm CDT
- Reflectivity weakening prior to tornado formation
- Little evidence of rotation from either radar, despite de-aliasing issues.
- Radar returns displaced south of Lovelady
- No watches or warnings for affected area



- Damage Picture
- 1 minor injury
 - Trailer overturned and tree uprooted
 - Damage rated as EF-1 on the Fujita Scale

Potential Tornado Formation Processes

Landspout



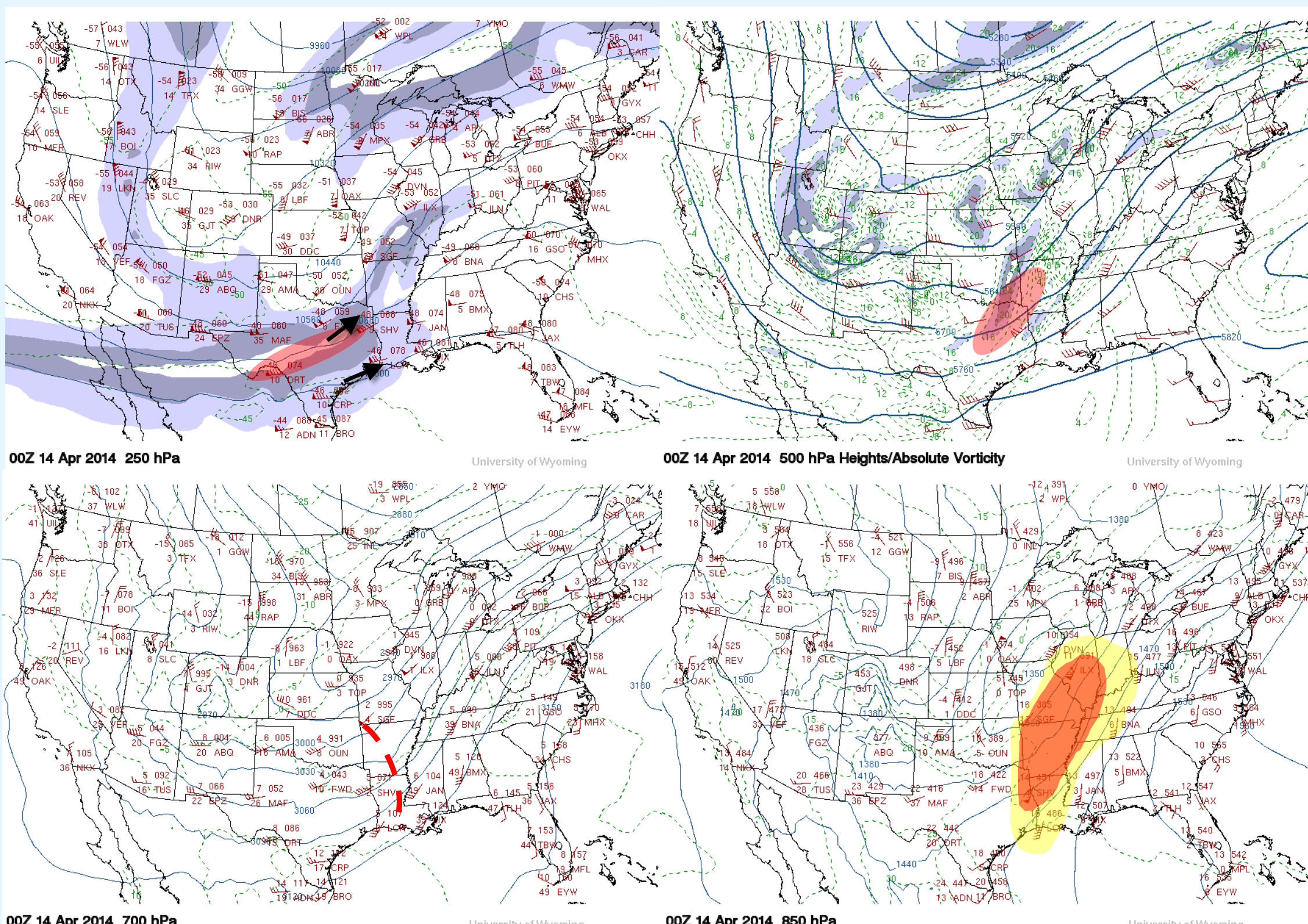
- Requires pre-existing vertical vorticity
- Sharp wind shift along boundary
- Steep low level lapse rates
- Low CIN & high 0-3 km CAPE/ LCL
- Small SRH and weak deep layer shear
- Forms during updraft stage of thunderstorm life cycle

Low-topped Supercell

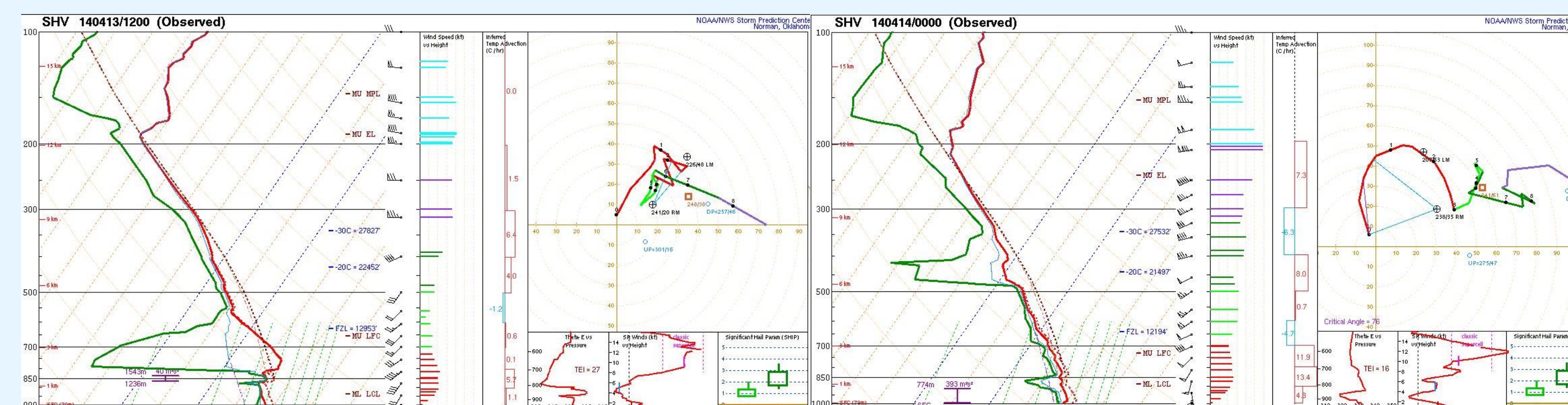


- Weak/moderate instability and low equilibrium level
- Strong shear ~40kts
- 0-3km storm relative helicity 200-500 m²s⁻²
- Bulk Richardson number 10 or less
- Forms during mature stage of thunderstorm

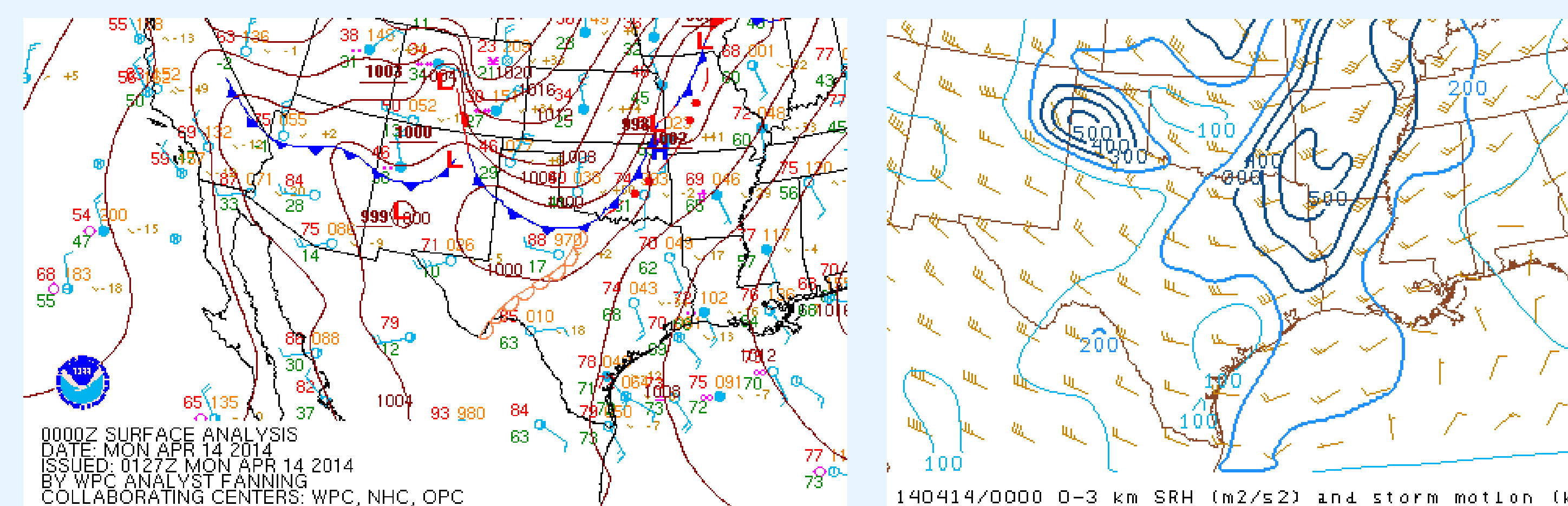
Synoptic Setup



- **250mb** analysis shows axis of upper level jet to the northwest of Lovelady and weakly diffluent flow across East Texas
- **500mb** analysis shows a 50kt jet streak across East Texas (Lovelady falls into the right entrance region)
- **700mb** analysis showing shortwave trough exiting the region (moved from NM to TX at approximate time of the tornado)
- **850mb** analysis showing a strong low level jet extending southward into East Texas



- Capping inversion present at 13/12z is removed 12 hours later
- Note strongly curved hodograph at 14/00z due to increasing low level winds
- Strong low level jet present in KSHV sounding – 55kts observed at 850mb level



- Surface analysis from 14/00z shows an approaching cold front across Eastern Oklahoma and North Texas
- Surface winds across East Texas are backed ahead of this feature
- High helicity values present across East Texas as a result of backed surface winds and strong low level jet

Conclusions

While the cause of the tornado cannot be definitively stated, evidence points toward development due to a low topped supercell:

- Weak instability (CAPE 400 – 800 J/kg) in a highly sheared environment
- High SRH (SFC – 1 km 400 – 500 m²s⁻²)
- No evidence of a pre-existing disturbance from earlier convection
- Low LCL height
- Visual appearance of tornado suggests parent supercell (rain free base, RFD clear slot)

Detection of these events will remain problematic in areas with poor low level radar coverage.

References

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Acknowledgments

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