

# Evolution of Shear Profiles Preceding Tornadic and non-Tornadic QLCs

Todd Murphy, Isaiah Montgomery, & Haniston Holloway

University of Louisiana Monroe

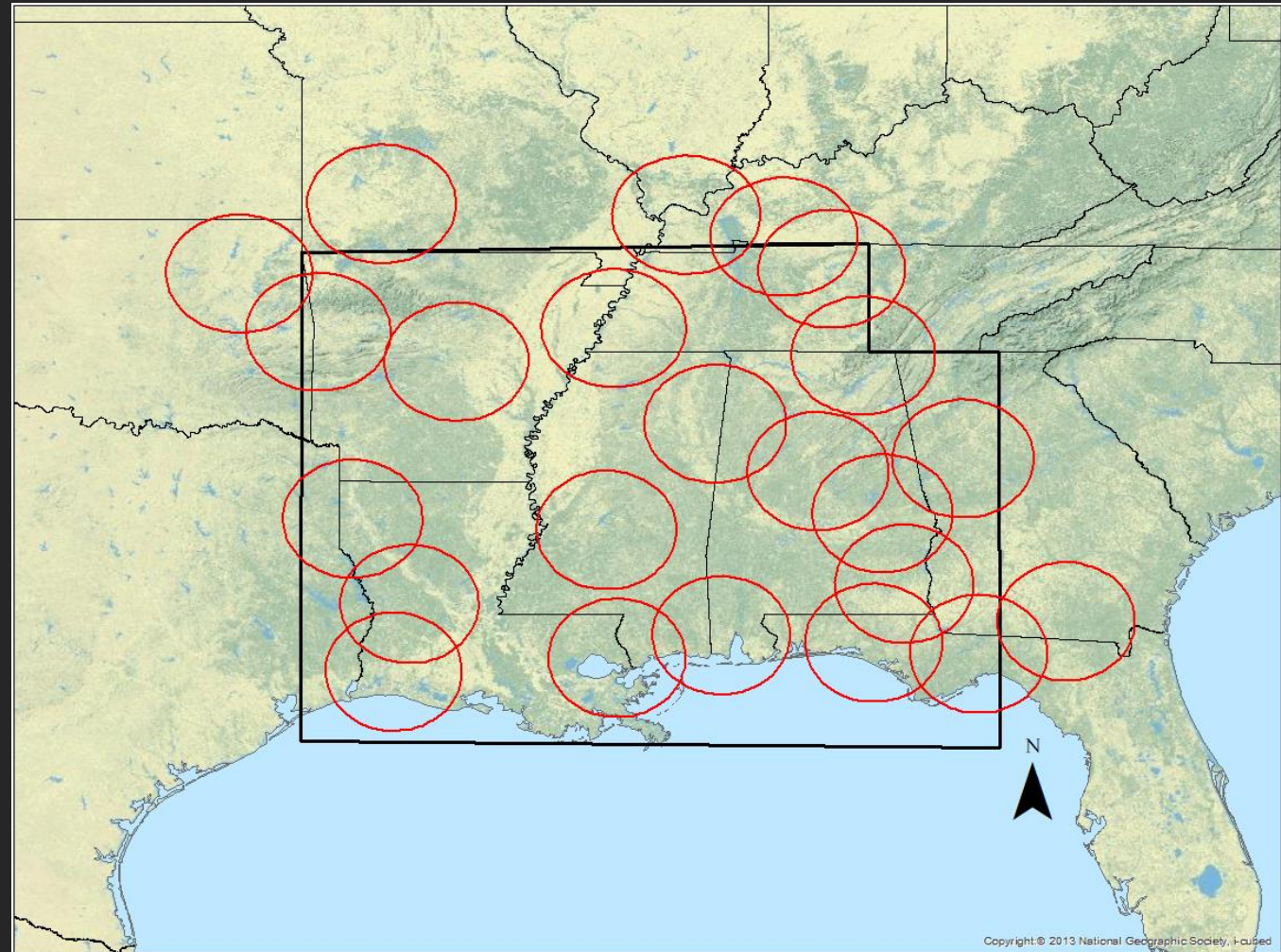


PERiLS Science Meeting  
11/16/23



# Methods

- Using NEXRAD VAD wind profiles to examine temporal evolution of kinematic profiles ahead of:
  - **Non-tornadic QLCs** (but must produce wind damage)
  - **Weakly tornadic QLCs** (only 1 TOR report within 100-km radius of NEXRAD)
  - **Strongly tornadic QLCs** ( $\geq 5$  TORs within 100-km radius of NEXRAD)

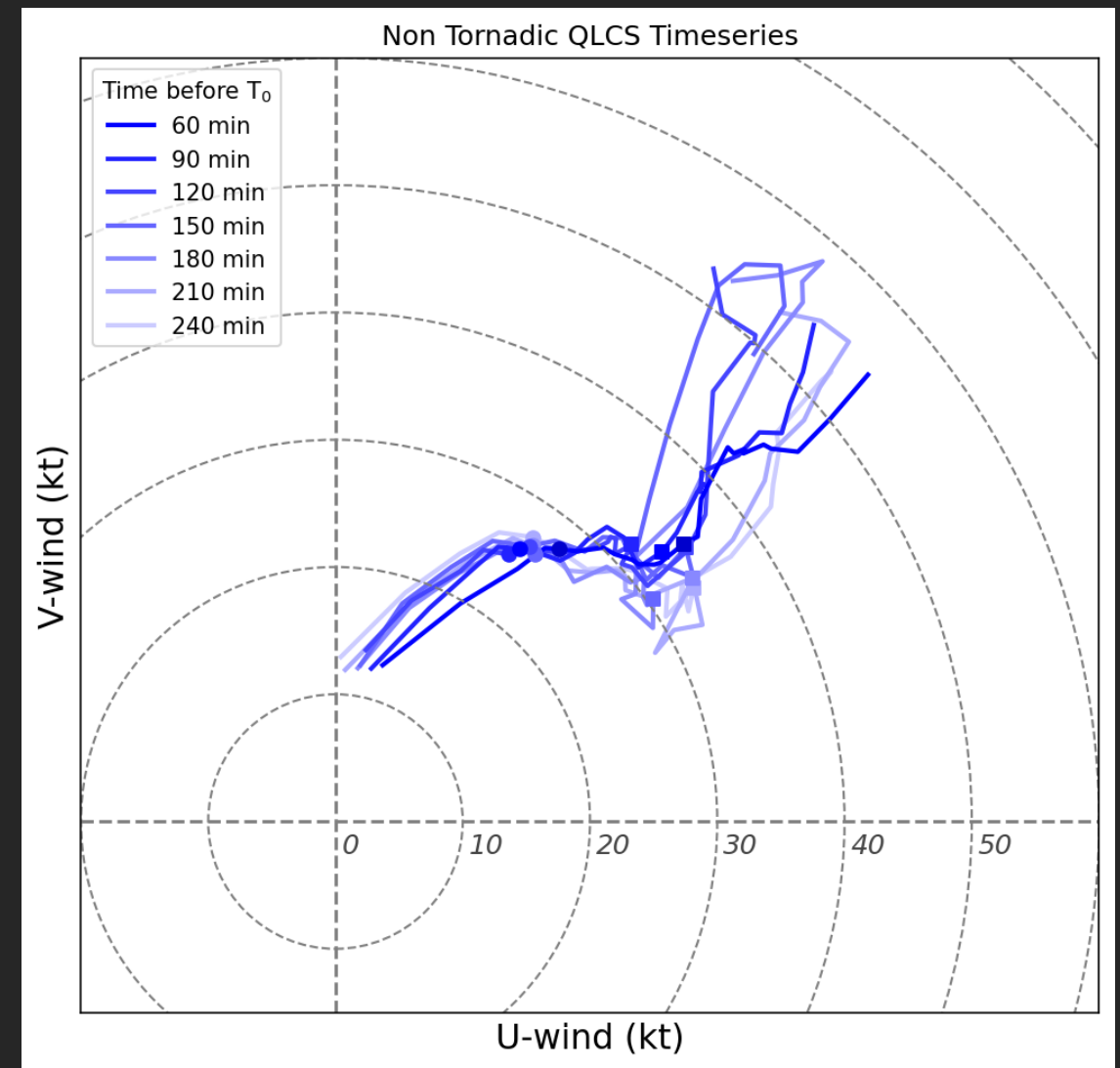


**Black outline = primary study domain**

**Red circles = 100-km NEXRAD range ring**

# Mean Wind Profiles

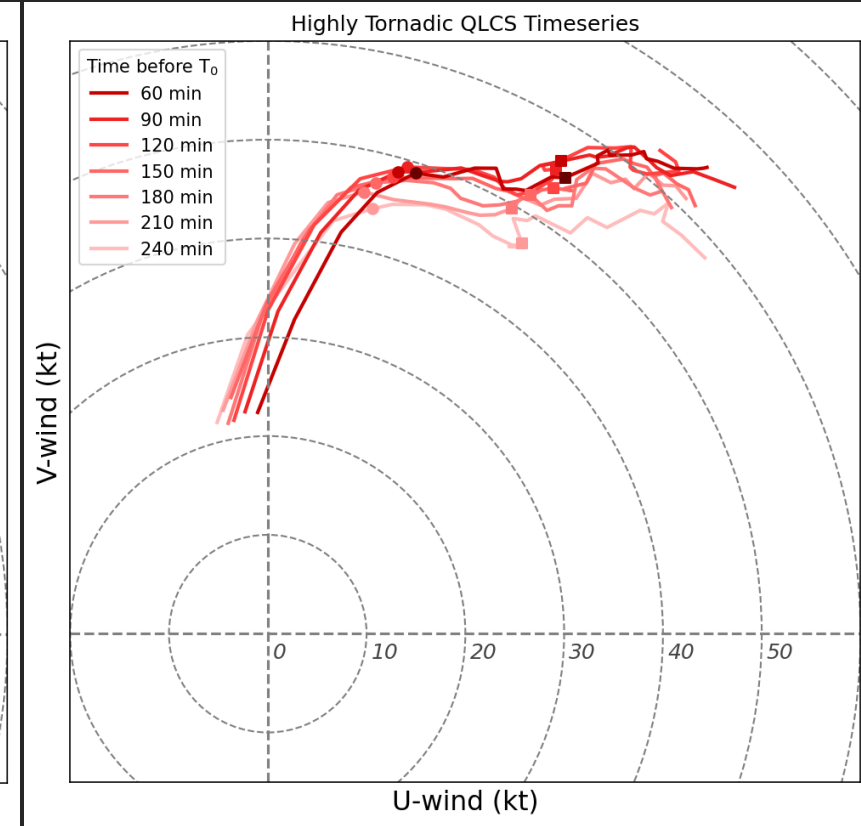
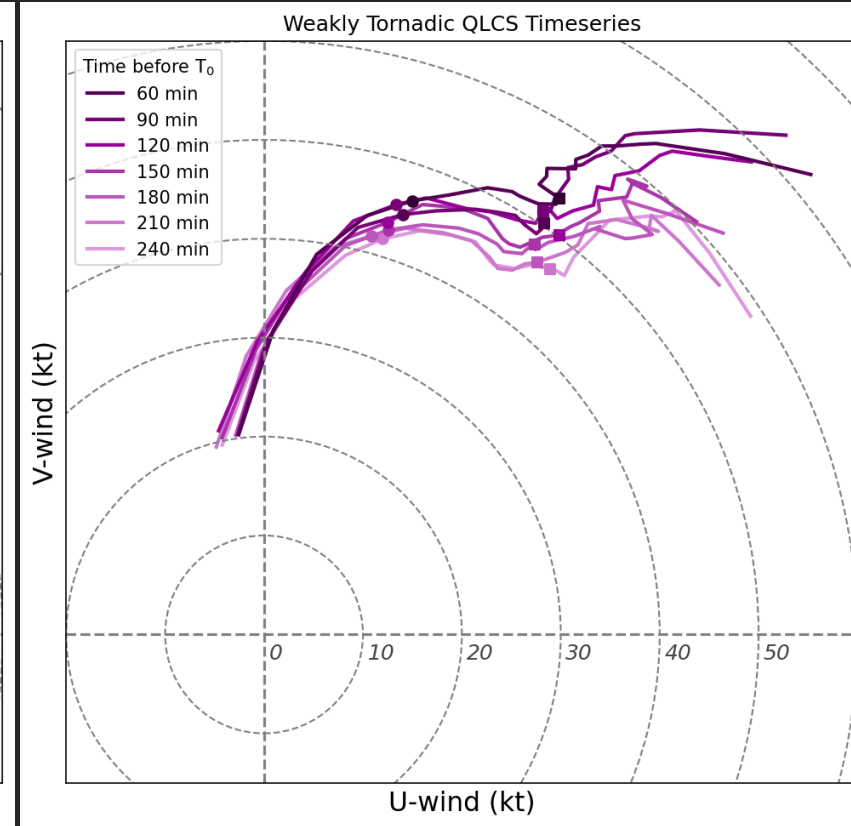
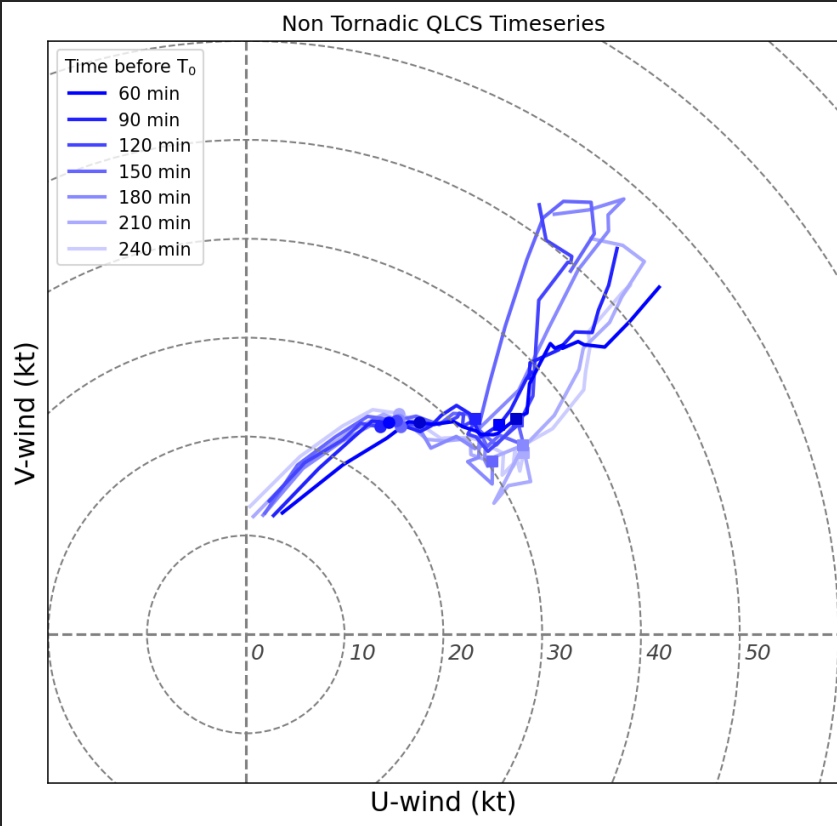
- Mean wind profiles created at 15-min intervals beginning 4-hours prior to QLCS passage over NEXRAD
- VAD retrieval data quality issues
  - At  $T < 60$  min convection has typically entered domain, increasing wind field temporal variability and thus VAD retrieval error
  - Only using wind profiles where RMSE is minimized across entire profile



Mean hodographs for non-tornadic QLCSs at 30-min intervals from 4-hrs (lightest color) to 1-hr (darkest color) prior to passage over NEXRAD

Circles = 1 km; Squares = 3 km; profiles truncate at 6 km

# Mean Hodograph Evolution



- Weak winds
- Little hodograph evolution
- Shape suggests little tornado potential
- Recall: these cases still produced damaging wind

- Stronger 1- and 3-km flow
- Significant hodograph curvature
- But apparent backing near 3-km

- Similar to weakly tornadoic except
  - Stronger 1- and 3-km flow
  - Less 3-km backing

# To Do

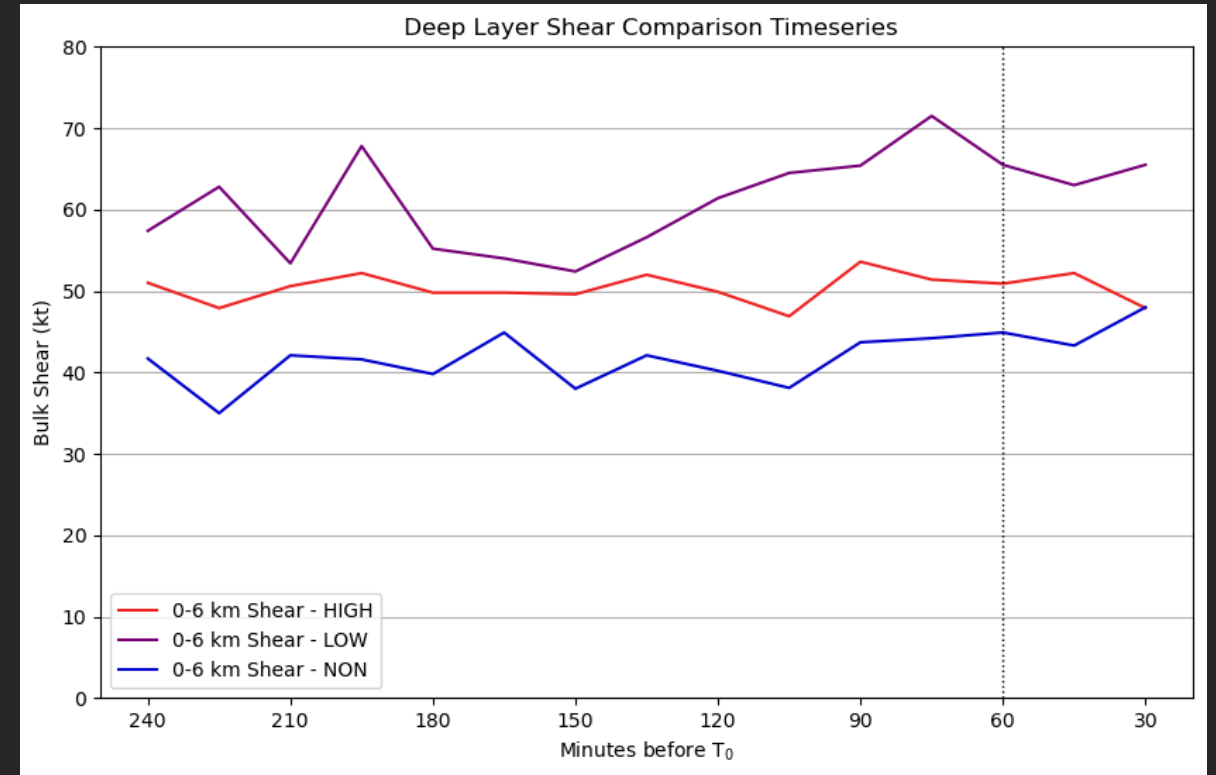
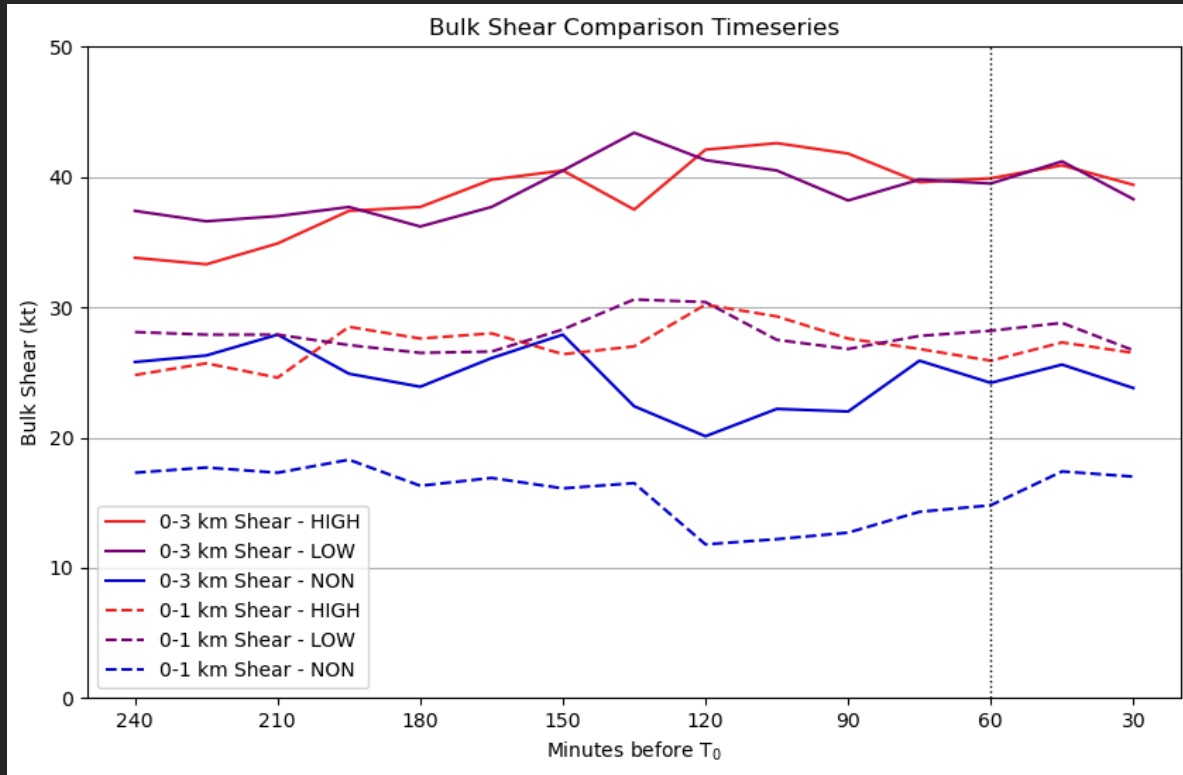
- Adding additional cases
- Comparison with PERiLS datasets

# Thanks!

Email: [murphy@ulm.edu](mailto:murphy@ulm.edu)



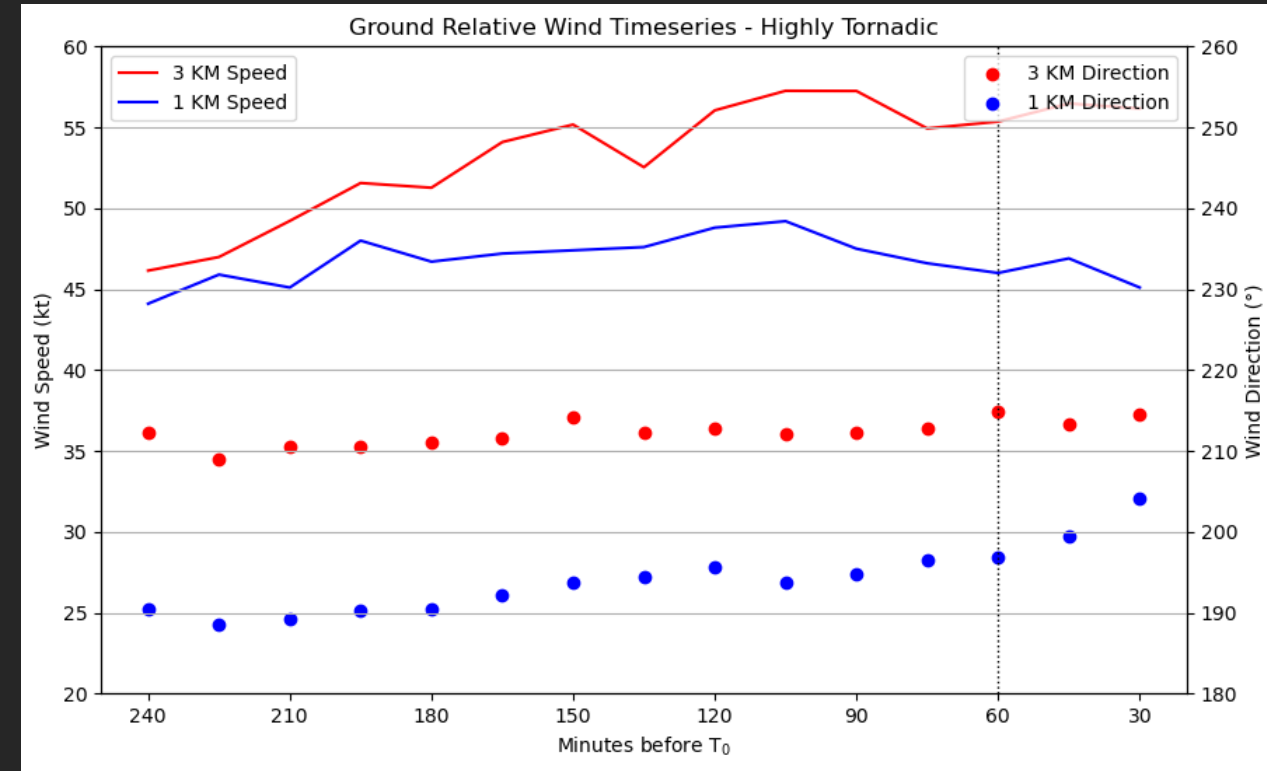
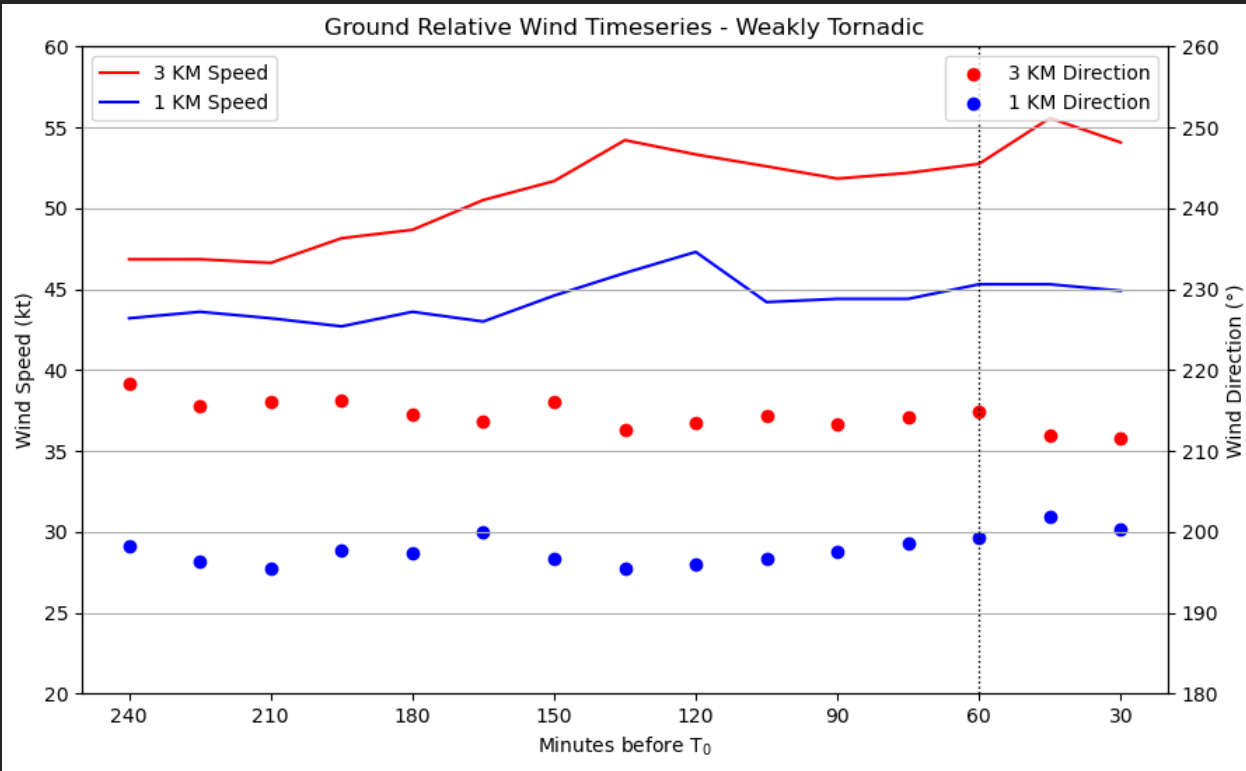
# Bulk Shear Evolution



- Weakly and highly tornadic cases have similar magnitudes and evolution of 1- and 3-km bulk shear

- Weakly tornadic cases greater 6 km shear than highly tornadic

# Mean Hodograph Evolution



- Highly tornadoic has strong 1- and 3-km ground relative winds compared to weakly tornadoic
- 1-km wind veers with time