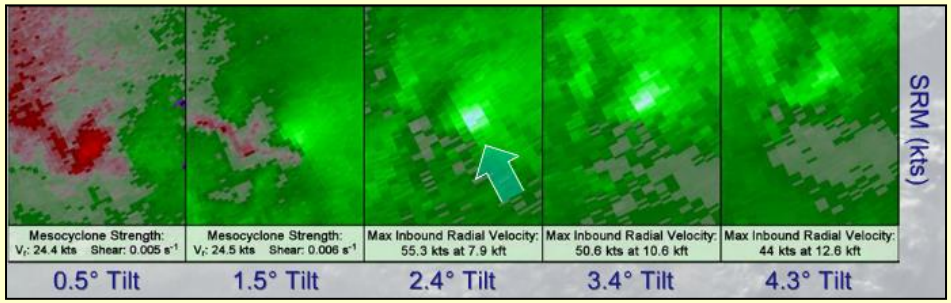
Tropical Cyclone Tornado Guidance (WDTB, 2014)

Range from Radar	LL V_{rot}	LL Shear	Circulation Contracting	Inflow Notch or Hook	ZDR/KDP Displacement	Mesocyclonic VES
0-39 nm	*20+ kts*	≥ 0.01 s^{-1}	✓	✓	✓ ← *1 of 2* →	✓
40-70 nm	*15+ kts*	✗	✓	✗	✓ ← *1 of 2* →	✓
>70 nm	*12+ kts*	✗	✗	✗	✗	✗

Identifying Mesocyclonic VES

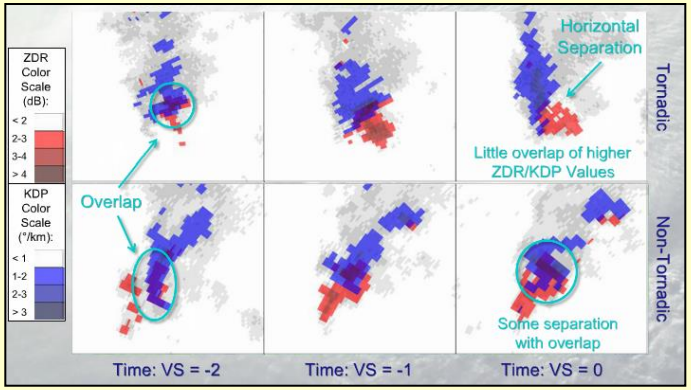


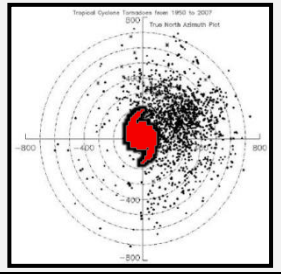
"Velocity Enhancement Signature" – enhanced radial velocities of <u>30+ knots</u> between 7,000 and 14,000 feet AGL on the right flank of a mesocyclone

- Occurs when storm motion deviates from mean flow, leading to an asymmetric mesocyclone velocity pattern.
- Located above low-level inflow and vertically co-located with the low-level mesocyclone and hook signature.
- WDTB analysis showed about **85% of tornadic events had this signature** while about 42% of non-tornadic events did.
- **Max values generally 1-4 volume scans before the tornado.**

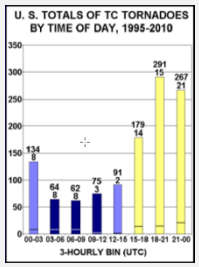
Horizontal Displacement of ZDR/KDP

- Implies size sorting of hydrometeors from increased directional shear within the storm due to strong mesocyclone development.
- Maximum KDP values displaced left of the maximum ZDR values relative to the mean storm motion.
- Can be detected in storms greater than 40 nm from radar.
- WDTB analysis: **70% of tornadic events had this signature** while about 58% of non-tornadic events did.





Most occur in right front quadrant of the TC and within 300mi of center. 80% occur from 350° to 120°



Mid-afternoon peak (19-21Z), earlier than non-TC peak. More nighttime events than non-TC.

INGREDIENTS

- 200mb jet streak NE of cyclone
- Organized, large, directionally symmetric wind field at 850mb
- Reduced RH at 700-500mb
- Baroclinic boundaries.
- Mid-level RH should not be too dry, limiting convection
- 0-1km SRH generally above 170 m^2/s^2 (*supercell tors*).
- 25th and 75th %-ile MLCAPE is 320 and 870 j/kg (*supercell*)