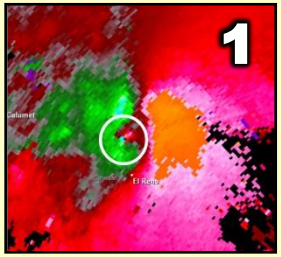
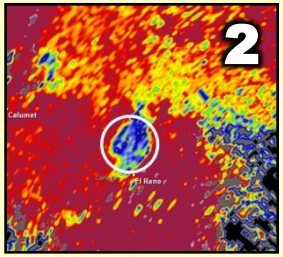
# Radar Tornado Intensity Estimation Guidance

## Identifying a Tornadic Debris Signature (TDS)

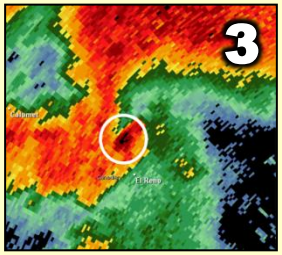
*Provides radar confirmation of a damaging tornado in progress.*



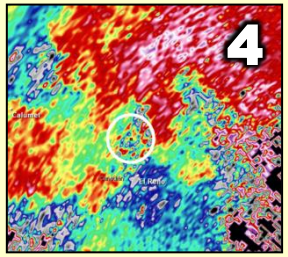

*First, identify a valid velocity circulation.*



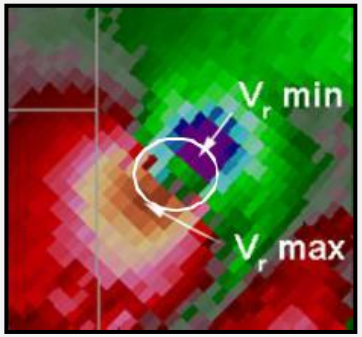

*Next, ensure correlation coefficient (CC) is below 0.90*




*Next, ensure reflectivity is over 35 dBZ and co-located with #1/2*




*Not necessary but adds confidence: ZDR reduced to ~0 or below zero in spots.*

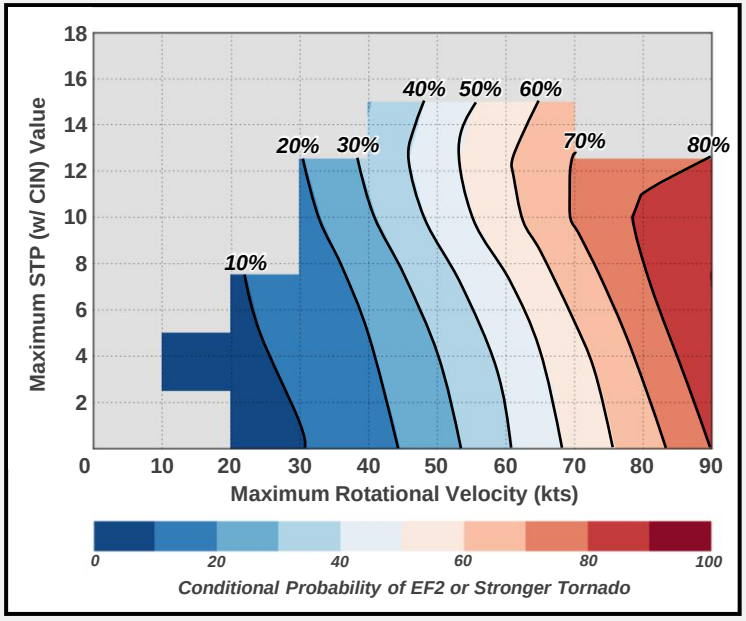



$$V_{rot} = (|V_{in[max]}| + |V_{out[max]}|) / 2$$

*To determine rotational velocity, add the absolute value of the highest inbound and outbound velocity values in the couplet, and then divide by 2.*

## Considerations and Tips

- EF2+ tornadoes are likely if TDS has debris ball (reflectivity > 50-55 dBZ)
- With split cut mode VCPs, TDS can have a slight offset from velocity sig.
- **Discriminating between supercellular weak and strong tornadoes**: Heidke Skill Scores maximized with LLRV in the 45-55 knot range.
- **In borderline intensity cases, push up a category if**: tornado is moving fast, conditions very favorable for EF2+, or signature is poorly sampled.

| Tornado Intensity | Supercells Only | QLCS Only | MOST RELIABLE: Maximum TDS Height |
|---|---|---|---|
| | Rotational Velocity (kts) — *Only valid within 70nm of the radar site* | | |
| **WEAK** EF0/EF1 | *40 knots or less* | *30 knots or less* | *Under 8,000 ft* |
| | Overlap 40-55 knots | Overlap 30-45 knots | Overlap 8-10 kft |
| **STRONG** EF2/EF3 | *55 to 75 knots* | *45 knots or more* | *10,000 to 15,000 ft* |
| | Overlap 75-85 knots | | Overlap 15-18 kft |
| **VIOLENT** EF4/EF5 | *85 knots or more* | *Insufficient cases* | *Over 18,000 ft* |

## Conditional EF2+ Tor Probability