**Importance and Impacts**

A TDS observation can provide a warning forecaster with confirmation of a damaging tornado, especially in events where ground truth may not be available such as when the tornado is rain-wrapped or occurring at nighttime.

**Defining a Tornado Debris Signature (TDS)**

Tornadic debris contains a diverse range of shapes, sizes, and orientations of meteorological and non-meteorological scatters. When debris are lofted into the beam of a polarimetric radar, a tornadic debris signature (TDS) is formed.

**Characteristics of a TDS**

- Presence of velocity couplet
- Decrease in differential reflectivity ($Z_{DR}$) to around zero
- Increase in horizontal reflectivity ($K_{dp}$)
- Decrease in co-polar cross correlation coefficient ($\rho_{hv}$)
- Higher values of azimuthal shear as a proxy for vertical vorticity
- Thresholds by minimum height does little to separate lower intensity tornadoes (EF2)
- Further discrimination analyses needed

**Challenges of a Standalone Algorithm**

The offset of the time between the polarimetric moments and azimuthal shear. Polarimetric moments are collected before velocity data on separate revolutions of the radar. Note* The difference in timestamps due to the split cuts of lower tilts.

**Manual vs. Automated Tracking**

Previous research has shown that manual versus automated identification resulted in different parameter distributions, and low-level elevation scans on the WSR-88D separate the surveillance and Doppler scans, which can lead to disparate locations of polarimetric signature and Doppler velocity couplet.

**Note** The whiskers on this boxplot denote the full range of the data. (0th to the 100th percentile)

**Methodology**

“Definite/Maybe/Loose” Classifications

- **Definite TDS**
  - Velocity couplet
  - Minimum in $\rho_{hv}$ values
  - Reflectivity greater than 40 dBZ

- **Maybe TDS**
  - One of the above specifications for a “Definite TDS” is missing (e.g. minimum in $\rho_{hv}$ values with velocity couplet)

- **Loose TDS**
  - Visual recognition of a TDS using only one of the above specifications (e.g. minimum $\rho_{hv}$ only)

**Future Work**

- Expanding the dataset to include more recent tornado events
- Build a training dataset based on specific geospatial thresholds (beam height, elevation, range) and temporal thresholds (TDS longevity)
- Examine the influence of $Z_{DR}$ biases
- Land cover characteristics

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