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Errors Encountered When Analyzing Radar and Storm Data

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Overview

- In 2014, 373 severe wind cases occurred within seven County Warning Areas: Huntsville, AL, Chicago, IL, Hastings, NE, Norman, OK, Albany, NY, Glasgow, MT, and Grand Forks, ND.
- Each case had winds speeds greater than 56 kts.
- Dual polarization radar images used to analyze Horizontal Reflectivity (DBZ), Doppler Velocity (BV), Normalized Rotation (NROT), and Correlation Coefficient ($\boldsymbol{\rho}_{hv}$) for each case.

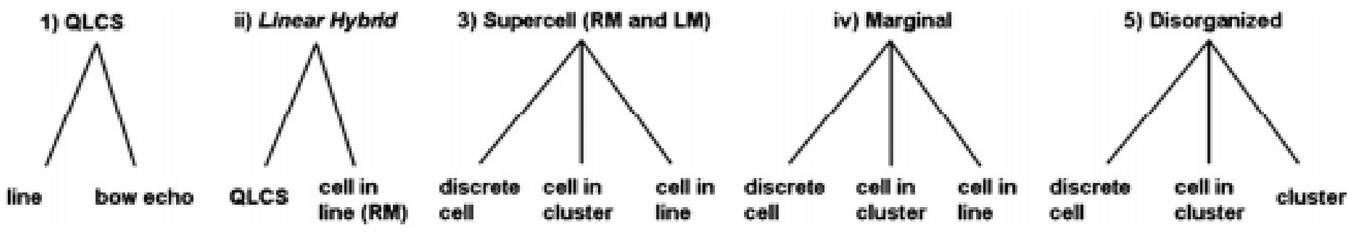

Fig.1 Convective mode decision tree used in order to classify each severe wind case from 2014. Picture courtesy of Smith et. al (2012).

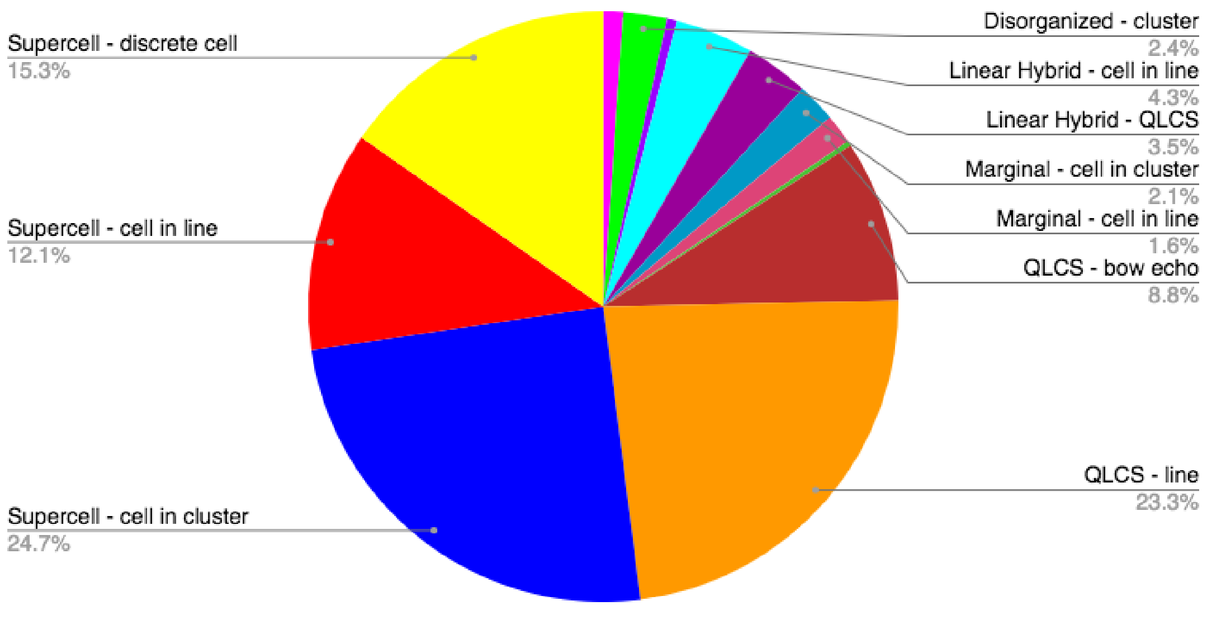

Fig. 2 Chart showing classification analysis based off the decision tree in Fig. 1

Materials and Methods

- ArcMap was used to store and organize information for each case based on County Warning Areas listed in the Storm Events Database as determined by the National Weather Service.
- NOAA National Centers for Environmental Information NEXRAD Archive was used to determine which radar to use for each location. The archive was also used to download Level-II radar archives for each case.
- UCAR Mesoscale and Microscale Meteorology Laboratory Image Archive was used when the NOAA Archive had irretrievable data.
- GR2Analyst was used to analyze the downloaded files in order to analyze and classify each case according to the Smith 2012 paper.

Acknowledgements

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Key Findings/Results

- 72 cases with incorrect time reports.
- The average time error was 15 to 30 minutes after the event happened, while the extreme error was an hour.
- 3 cases with no Level-II radar data available.
- 102 cases of incorrect velocity recorded wind speeds when compared to Storm Data wind reports out of 111 cases measured.
- 52 % of all cases studied had no errors.

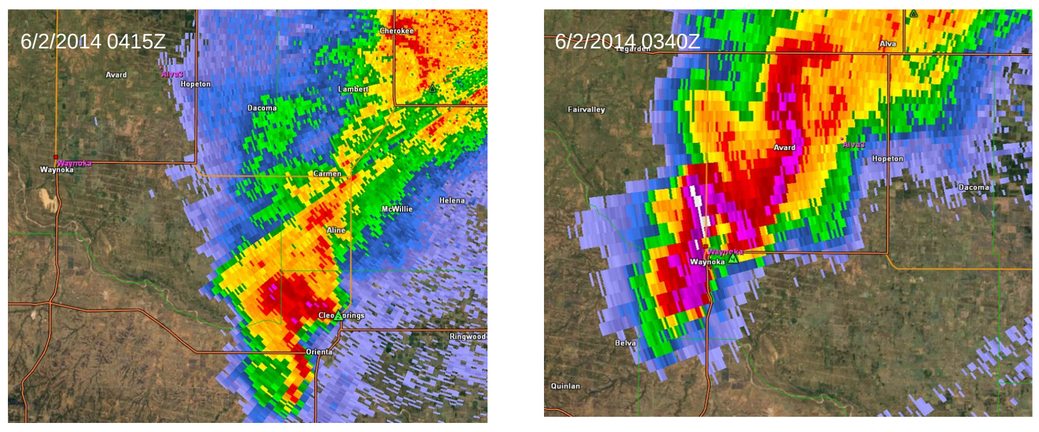

Fig. 3. Radar comparison depicting the misreported time (left) compared to when it should have been reported (right). Images are from the KVNX radar from the Vance Air Force Base, OK. The location of the storm report is represented by a red square in Waynoka, OK.

Impact/Conclusions

- Analyzing radar data to confirm Storm Data records can highlight several errors that are both human and radar generated.
- In 2014, clusters of supercells were the most common convection mode observed of the 373 cases with QLCS lines second.
- This case set is important as it shows the importance of solving/preventing any possible errors when entering data for future analysis.

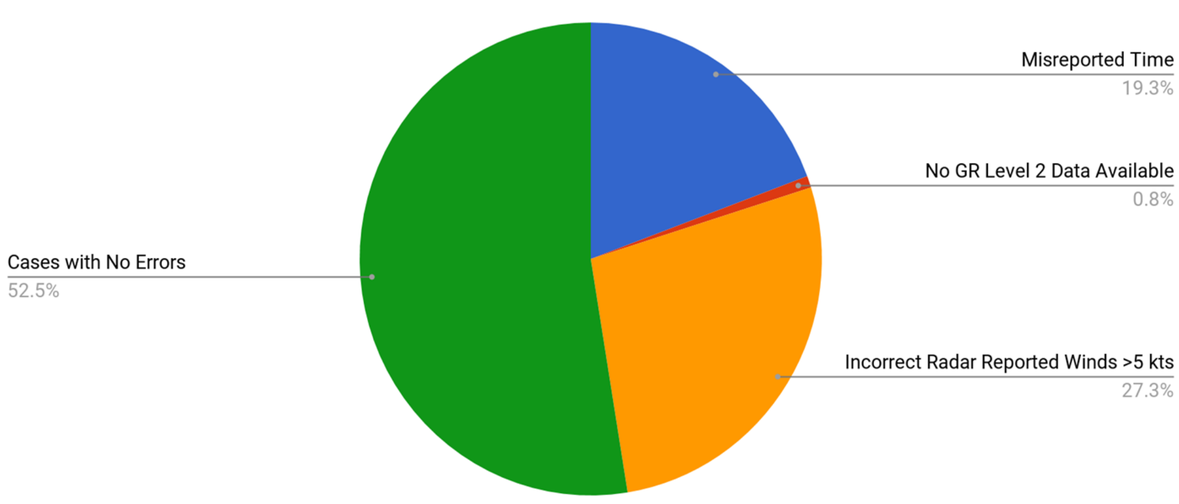

Figure 4 Pie Chart demonstrating the total number of cases analyzed with categorized errors compared to the percent of total cases with no errors.

References

Smith, B.T., R.L.Thompson, J.S. Grams, A.R. Dean, and C. Broyles, 2012: Convective Modes for Significant Severe Thunderstorms in the Contiguous United States. Part II: Supercell and QLCS Tornado Environments. Weather and Forecasting, 27, 1136–1154.