Using Dual Polarization Radar to Determine Supercell and QLCS Characteristics Just Prior to Tornadogenesis and Tornado Dissipation

Michael L. Jurewicz, Sr., Michael Evans, and Christopher Gitro

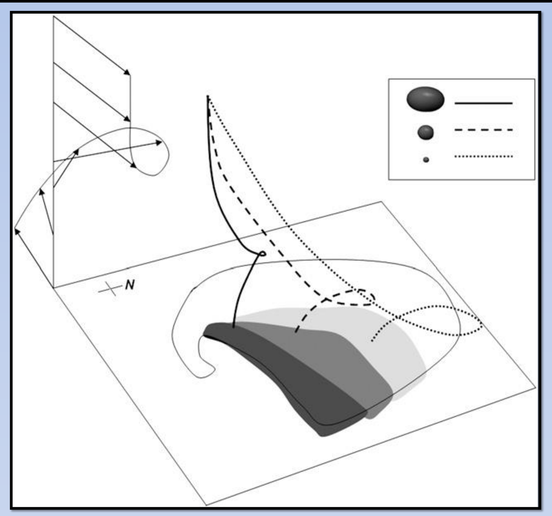
NOAA/National Weather Service

Binghamton, NY and Pleasant Hill, MO

Michael.Jurewicz@noaa.gov, Michael.Evans@noaa.gov, and Christopher.Gitro@noaa.gov

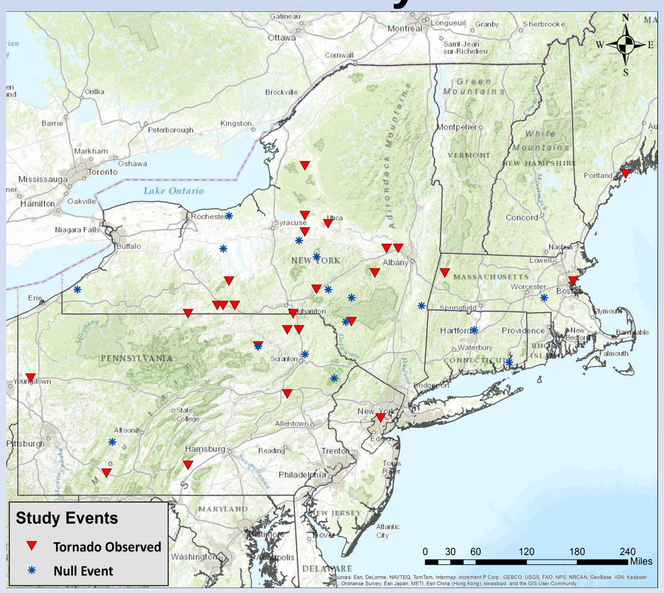
Initial Hypothesis / Research Progress

Prior research has shown that certain dual-polarization radar variables (differential reflectivity (Z_{DR}) and specific differential phase (K_{DP})) may provide important clues of impending tornadogenesis (see image below from Crowe, et al. 2012).



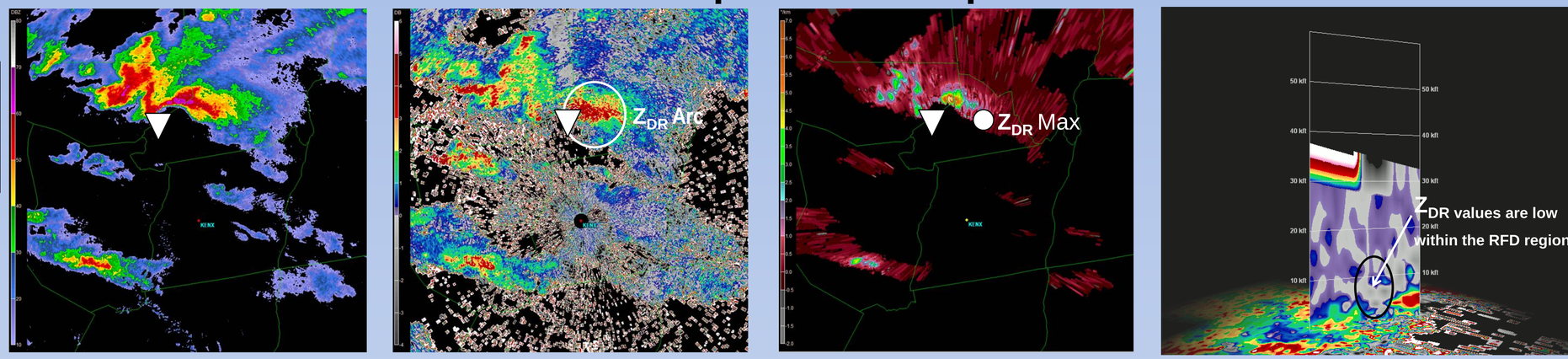
This image (Kumjian and Ryzhkov, 2009) demonstrates the concept of preferential size sorting within a supercell thunderstorm.

Northeast Study Domain



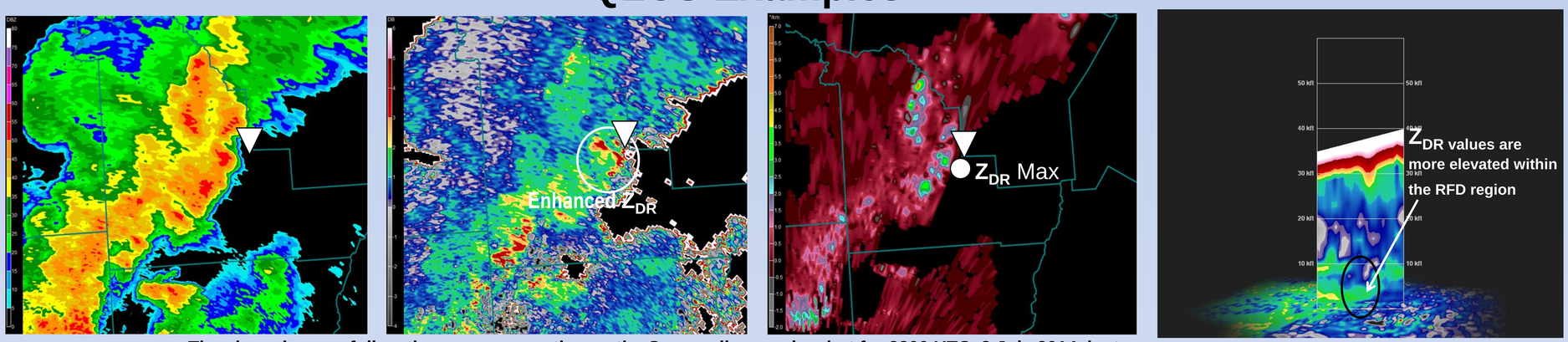
Latest Work / Northeast U.S. Results

Discrete Supercell Examples

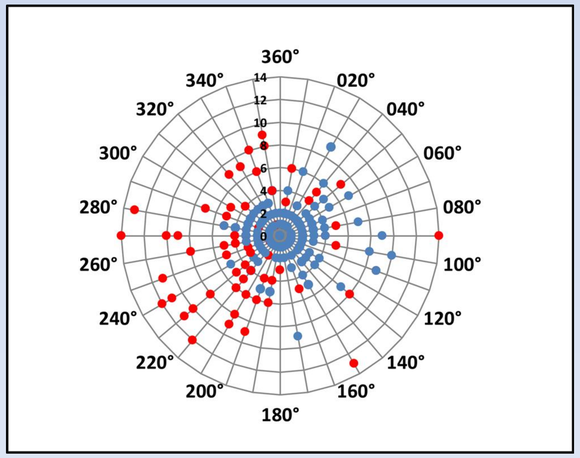


The above images from left to right (Z_H , Z_{DR} , K_{DP} , and Z_{DR} cross-section) are from 1928 UTC, 22 May 2014, just before an EF-3 tornado touched down near Albany, NY. Approximate positions of developing tornadic vortices are shown by white triangles.

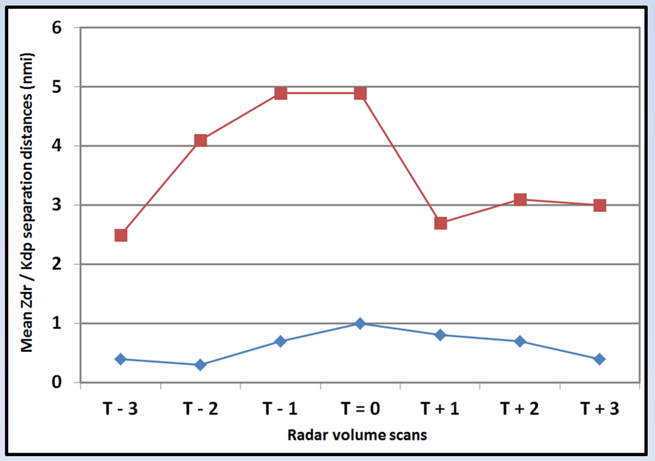
QLCS Examples



The above images follow the same convention as the Supercell examples, but for 2300 UTC, 8 July 2014, just before a fatal EF-2 tornado occurred.



This polar plot represents the relative positions of K_{DP} maxima (red dots for tornadic cases and blue dots for non-tornadic) versus Z_{DR} maxima (the center point).



This chart illustrates the link between drop size sorting and tornadogenesis.

Take Home Points

- **Prior research has shown that drop size sorting may be more likely to occur in tornadic vs. non-tornadic storms.**
- **This hypothesis was tested in the Northeastern U.S. from 2012-2014.**
- **In most tornadic events, K_{DP} maxima became separated from Z_{DR} maxima, while in non-tornadic events, little separation occurred.**
- **Z_{DR} behavior differences were also noted between tornadic supercells vs. QLCS.**
- ***These results could ultimately prove useful in the tornado warning process.***