Analyzing supercells and their attendant hazards using raw and bias-corrected S-Band differential reflectivity

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Differential reflectivity (Z_{DR}) is a radar moment defined as the logarithmic ratio of the reflectivity factors at horizontal and vertical polarization. This field provides researchers with information about the size and shape of scatterers, among other characteristics, and is an input into downstream products such as the Hydrometeor Classification Algorithm (HCA). However, hardware component variations and diurnal factors can introduce biases in the Z_{DR} field, affecting retrospective analyses of thunderstorms. To address these uncorrected biases, several methods examining the returns from external targets were developed. These include the comparison of measured Z_{DR} to the intrinsic values of light rain, dry snow, and clear-air bragg scatter with volume-by-volume statistics provided by the United States Weather Service Radar 1988 Doppler (WSR-88D) network. Part one of this presentation demonstrates the application of a weighted mean of these bias metrics to produce a "corrected" Z_{DR} field and new downstream algorithm outputs.

As part of an ongoing National Science Foundation grant developing a climatology and analysis dataset of supercell thunderstorms in the United States, both the raw and bias-corrected radar fields using the method described in part one are being used to examine the microphysical characteristics of these deadly thunderstorms. Part two of this presentation summarizes the work being performed as part of this grant and highlights the differences between the raw and bias-corrected fields in an examination of (1) drop size distributions prior to tornadogenesis, (2) the evolution of polarimetric fields prior to tornado dissipation, and (3) HCA accuracy of rain/hail classifications in environments supporting the production of giant hail (greater than 2 inches in diameter).

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