Polarimetric Radar Characteristics of Large Hail and Its Growth

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The Hail Size Discrimination Algorithm (HSDA), which operates within the operational hydrometeor classification algorithm (HCA), leverages the differences in the scattering characteristic of small, large, and giant hail to provide users with information more granular than the existing "rain/hail" classification in the HCA. Although the HSDA has shown skill at identifying regions of large and giant hail, it tends to be very sensitive to Z_{DR} miscalibration, and, since it works within the existing "rain/hail" classification in the HCA, it generally only identifies hail in regions of moderate to high Z_H. To provide additional lead time, we seek to identify the characteristics of large hail growth aloft. The presence of large hail growth aloft also may be used to inform users of enhanced possibilities of large hail occurring in limited concentrations (and, consequently, relatively low Z_H) owing to strong size sorting that may occur under and near the periphery of the updraft of intense convective storms. For example, areas of significantly reduced ρ_{hv} (e.g., $\rho_{hv} < 0.8$) and strongly negative Z_{DR} (e.g., Z_{DR} of -1 to -2 dB) have been observed near and above Z_{DR} columns within the mid-levels of giant-hail-producing supercells at least a couple of volume scans before large and giant hail is observed nearer the ground. Using polarimetric radar data from the operational WSR88D network and hail observations obtained by the Severe Hazards Analysis and Verification Experiment (SHAVE), we are examining the potential utility of such polarimetric signatures aloft for enhancing our ability to anticipate and detect large and giant hail within severe convective storms.

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