Quantitative Interpretation of Polarimetric Radar Observations of Hail

James Klinman, Andrew Detwiler, David Delene, Pat Kennedy, Ivan Arias, V. Chandrasekar, Aaron Bansemer, and Andy Heymsfield

We are undertaking a comprehensive analysis of a large volume of airborne *in situ* hail data and corresponding polarimetric radar data from more than two dozen research flights conducted during more than a dozen different field campaigns. The *in situ* hail observations were obtained during research flights of the South Dakota School of Mines and Technology armored T-28. The radar observations are from the S-band polarimetric CSU-CHILL radar and the NCAR Spol radar. In the past qualitative comparisons have been made between observed dominant hydrometeor types and the observed polarimetric radar parameters Z_h, Z_{dr}, LDR, $\hat{}$ hv, and K_{dp}. These comparisons have been used to develop radar-dominant hydrometeor identification schemes based on these parameters. In our present work, we are doing quantitative backscatter calculations based on the detailed aircraft-observed hail size distribution. Non-spherical hail particle shapes will be accounted for. These results will improve our ability to compute integral microphysical properties of storm volumes such as hail number and mass concentrations, and hail kinetic energy and kinetic energy flux, based on observed polarimetric radar signatures aloft. We will illustrate our research plans by presenting an example analysis of hail observations in a large convective storm.