1.2 ICE MICROPHYSICAL RETRIEVALS USING POLARIMETRIC RADAR DATA

A.RYZHKOV[1], A.MURPHY [1], G.MCFARQUHAR [1]

[1] Cooperative Institute for Mesoscale Meteorological Studies,
University of Oklahoma, USA
alexander.ryzhkov@noaa.gov

A novel polarimetric radar method for size distribution retrievals of ice and estimation of ice water content (IWC) has been developed. The technique is based on the combination of three radar variables: radar reflectivity Z, differential reflectivity Z_{DR} (or reflectivity difference Z_{DP}), and specific differential phase K_{DP}. The latter plays a particularly important role because it is proportional to the first moment of size distribution in ice and, therefore, is very sensitive to ice particles of small sizes. It is demonstrated that the estimates of the mean volume diameter D_m, total concentration N_t, and IWC of ice particles obtained from Z and the ratio of Z_{DP} and K_{DP} are robust with respect to the diversity of ice habits, their shapes, orientations, density, and size distributions.

It is instrumental to use new methodologies for processing and displaying polarimetric radar data such as quasi-vertical profiles (QVP) and columnar vertical profiles (CVP) to ensure appropriate quality of the K_{DP} and Z_{DP} measurements for reliable retrievals.

Preliminary testing of the suggested technique using the WSR-88D radar data collected in hurricanes Irene, Harvey, and Irma reveals extreme concentrations of very small ice with significant IWC that is almost an order of magnitude higher than the one estimated from conventional Z IWC relations. Comparisons of the radar-retrieved size distribution parameters of ice with their in situ aircraft measurements in a midlatitude MCS show good agreement between the two.