Evaluation of a Polarimetric Attenuation Correction Algorithm for NASA D3R Observations during the IFloodS Field Campaign

Haonan Chen* and V. Chandrasekar
1373 Campus Delivery, Colorado State University, Fort Collins, USA.
*haonan.chen@colostate.edu

As a joint Earth-observing mission between NASA and the Japan Aerospace Exploration Agency (JAXA), the Global Precipitation Measurement (GPM) Core Observatory was launched on February 27th, 2014. The GPM sensors can cover most of the globe, and improve precipitation observations at higher latitude, compared to the Tropical Rainfall Measuring Mission (TRMM). As an indispensable part of all precipitation satellite missions, Ground Validation (GV) is critical for demonstration and evaluation of space-based precipitation data products. As part of the GV activities, a ground-based Dual-frequency Dual-polarization Doppler Radar (D3R) was developed. D3R is operating at the nominal frequencies of Ku and Ka band to match the operating frequencies of space-based GPM Dual-frequency Precipitation Radar (DPR).

It is well known that, for any quantitative applications based on reflectivity (Z) and differential reflectivity (Z_{dr}) at higher frequencies (i.e., higher than S-band), radar observations should be corrected for attenuation due to propagation in precipitation. Since the work done by Hitschfeld and Bordan (Hitschfeld and Bordan, *J. Meteor.*, **11**, 1954, pp. 58-67), many attenuation correction algorithms have been proposed and applied to radar observations at C and X band. However, the investigation and implementation of attenuation correction methodologies at Ku or Ka band are relatively rare. In this paper, we develop and evaluate a polarimetric attenuation correction algorithm for D3R Ku/Ka-band dual-frequency observations.

The relations among various polarimetric variables are derived based upon scattering simulations using rain drop size distribution (DSD) data collected by several Parsivel disdrometers deployed during the NASA GPM field campaigns. The scattering simulations are performed at Ku and Ka band frequencies. In this study, we will evaluate the attenuation correction methodology using D3R observations collected during the NASA Iowa Flood Studies (IFloodS) field experiment. In addition, the attenuation corrected D3R observations will be compared with measurements from the NASA S-band dual-POLarization (NPOL) radar, as well as the simulation results based on DSD data.