Estimation of shape parameter from C-band polarimetric radar measurements

*Ahoro ADACHI[1], Takahisa Kobayashi[2,1]

1. MRI, 2. CRIEPI

Studies have been shown that the rainfall intensity can be estimated from polarimetric radar data with higher accuracy than that from conventional single polarization radar because the former contains information on the raindrop size distribution (DSD). Adachi et al. (2015) proposed a method to estimate three parameters (N_0, D_0, μ) of the DSD from polarimetrtic radar data assuming a modified gamma distribution, in which they assume that the shape parameter (μ) is constant in a range profile. However, this assumption may not be satisfied if the radar is sampling mixed convective/stratiform echoes that simultaneously exist in a single profile.
Theoretically, μ can be estimated from ρ_{HV}. Indeed, Thurai et al. (2008) proposed a method to estimate μ from ρ_{HV} using a priori formula estimated from observations on the ground. However, in order to estimate μ with that method, it is necessary to obtain ρ_{HV} with quite high accuracy, and very long sampling time is needed to apply to radars to satisfy this condtion (e.g., Illingworth et al. 1991). The MRI C-band polarimetirc radar is equipped with solid-sate transmitters, and observation data with high accuracy can be obtained in a relatively short time. On the other hand, C-band is expected to have temperature dependency on ρ_{HV} measurements compared to radars operating at other frequencies. Therefore, simulations were performed for S, C, and X-bands to estimate μ from ρ_{HV}, and the results for C-band was compared with actual data.

Keywords: polarimetric radar, raindrop size distribution, shape parameter