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A Methodology for Estimating the Parameters of a Gamma Raindrop Size Distribution Model from Polarimetric Radar Measurements at Attenuating Frequency Based on the Self-Consistency Principle.

Ahoro Adachi (1), Takahisa Kobayashi (2,1), Hiroshi Yamauchi (3,1)

(1) Meteorological Research Institute, Tsukuba, Japan (aadachi@mri-jma.go.jp), (2) Central Research Institute of Electric Power Industry, Abiko, Japan (kobay@mri-jma.go.jp), (3) Japan Meteorological Agency, Tokyo, Japan (h-yamauchi@met.kishou.go.jp)

A method for estimating three parameters of a gamma raindrop size distribution model from polarimetric radar at attenuating frequency was developed. The algorithm was developed based on the self-consistency principle but was expanded to take into account the attenuation effect by describing the interrelation between polarimetric measurements along the range profile. It does not require any assumptions of relationship among DSD parameters and/or simplifications of relationship between the axis ratio and diameter of raindrops, which were used in previous studies. Moreover, the proposed algorithm needs no external reference data such as 2DVD measurements for attenuation corrections because it retrieves the co-polar and differential specific attenuation from interrelation among the polarimetric measurements.

The performance of this algorithm was evaluated by comparison with optical disdrometers and a weighing precipitation gauge. The evaluation of the algorithm showed fairly good agreement between the retrieved three DSD parameters of raindrops and both reflectivity and differential reflectivity with those obtained by surface measurements irrespective of convective and stratiform precipitation conditions. Moreover, the algorithm demonstrated significant improvement in performance for rainfall rate estimation compared with rates estimated using the so-called Z–R relationship. Results also showed that the algorithm has better accuracy and comparable precision of rainfall rate with those estimated from the specific differential phase.