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# Retrieval of Raindrop Size Distribution Parameters by Combining Rainfall Rate and Electromagnetic Wave Attenuation Data

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Rain attenuation of down-link radio wave signals of satellite Superbird C (144oE in orbit) and surface rainfall data are used to estimate the parameter of exponential raindrop size distribution (DSD) at Koto Tabang (KT), west Sumatera, Indonesia. Rainfall rate and temperature during rain event are measured by an optical rain gauge (ORG). The effect of rain type on path length estimation is first examined using Simple Attenuation Model (SAM) and the ITU-R. Mie extinction efficiency is calculated by assuming raindrop shape being a spherical. Result shows that taking 5 km as a constant equivalent path length for stratiform rain at KT is generally acceptable in which the model-generated attenuation has been found to closely follow the measured attenuation. For deep and shallow convective rains, the equivalent path length varies, i.e., 5-4 km and 3-2 km, respectively. Combination of specific rain attenuation and rainfall rate successfully estimated the DSD parameters of stratiform rain with steady intensity, indicated by small difference between the parameter derived from rain attenuation and that from 2D-Video Disdrometer (2DVD). For deep convective rain with a short duration, the result also showed a good agreement with the 2DVD. Low performance of the method was observed for stratiform with strong rain intensity fluctuation and for shallow convective rain, indicated by high discrepancy with the 2DVD data. This phenomenon was probably due to the bias in estimating the specific rain attenuation. The bias can be caused by a constant path length assumption throughout the rain.

Keywords: Raindrop size distribution, Rainfall rate, Rain attenuation