Microphysical features of typhoon and non-typhoon rainfall observed in Taiwan

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Abstract

Information about the raindrop size distribution (RSD) is vital for comprehending the precipitation microphysics, improving the rainfall estimation algorithms, and appraising the rainfall erosivity. Previous research has revealed that the RSD exhibits diversity with geographical location and weather type, which leads to the assessment of the region and weather-specific RSDs. Based on long-term (2004 to 2016) disdrometer measurements in northern Taiwan, this study attempts to demonstrate the RSD aspects of summer seasons that were bifurcated into two weather conditions, namely typhoon (TY) and non-typhoon (NTY) rainfall. The results show a higher concentration of small drops and a lower concentration of large-sized drops in TY compared to NTY rainfall, and this behavior persisted even after characterizing the RSDs into different rainfall rate classes. RSDs expressed in gamma parameters show higher mass-weighted mean diameter (Dm) and lower normalized intercept parameter (Nw) values in NTY than TY rainfall. Moreover, sorting these two weather conditions (TY and NTY rainfall) into stratiform and convective regimes revealed a larger Dm in NTY than in TY rainfall. The RSD empirical relations used in the valuation of rainfall rate (Z–R, Dm–R, and Nw–R) and rainfall kinetic energy (KE–R and KE–Dm) were enumerated for TY and NTY rainfall, and they exhibited profound diversity between these two weather conditions. Attributions of RSD variability between the TY and NTY rainfall to the thermodynamical and microphysical processes are elucidated with the aid of reanalysis, remote sensing, and ground-based data sets.

Key Word: Raindrop Size Distribution (RSD),Rainfall Erosivity, Microphysics