Raindrop Size Distribution

Raindrop size distribution, DSD, is a critical microphysical parameter in the atmospheric science and cloud physics field. DSD varies with the intensity and type of rain. The different forms of DSDs are highlighted below:

Exponential model- (Testik & Ana, 2007)

The exponential model comprises of two parameters: a slope parameter and concentration parameter N0. This model is better than M-P DSD since the latter is only equivalent to the exponential model with a fixed N0.

Gamma model- (Testik & Ana, 2007)

Gamma DSD is applied with a normalized parameter NW, whose value is equal to the intercept parameters (, m, and N0) of exponential DSD with the same median volume diameter, D0, and water content. Its advantage is that parameters D0 and NW have specific physical significance.

Log-normal model- (Joss & Encori, 1978)

In this model, NT refers to the total number of concentration, the standard deviation and mean of the Gaussian distribution. This model assumes that DSD parameters can be defined as random variables from a multivariate Gaussian distribution.

Marshall and Palmer (M-P) model- (Rahman 2017)

M-P model is a single DSD parameter model with a slope parameter. This model was widely used in the last 50 years in radar-rain estimation and bulk-scheme rain parameterization. This model considers a fixed N0 value and those experimental uncertainties are greater than the differences in rainfall bulk characteristics such as radar or intensity reflectivity factor, between the corresponding simpler exponential model and resulting gamma models. The assumed form of DSD is important for remote rainfall sensing using weather radars (Jameson & Kostinski, 2001). It is not possible to estimate Gamma DSDs independently using radar observations; thus, they might not be useful in rainfall microphysical observations using the High-Speed Optical Disdrometer M-P DSD is better for measuring moderate rainfall intensity condition.

Works Cited

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