URSI AP-RASC 2019, New Delhi, India, 09 - 15 March 2019

Comparison between DSD parameters from GPM and Ground Based Disdrometer at Kolkata

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Precipitation is an important component in the water and energy cycle, playing an important role in many areas such as hydrology, meteorology and climatology. A long term and global data of raindrop size distribution (DSD) is required to understand the precipitation climatology and its role in climate change. The Global Precipitation Measurement Mission (GPM) can provide the parameters of the DSD globally[1]. The measurements of reflectivity (Z) profile by dual-frequency Precipitation Radar (DPR) of GPM satellite at Ku (13.6 GHz) and Ka-band (35.5 GHz) are used to retrieve drop size distribution on the ground for the present location Kolkata, India (22º34’N, 88º22’E). An impact type Joss, Waldvogel disdrometer (JWD, Distromet RD-80), is operated at the Institute of Radio Physics and Electronics to measure rain DSDs at ground. The DSD from disdrometer has been used to calculate reflectivity at the two frequency of GPM. The reflectivities at ground from disdrometer and GPM are compared for five different rain rate (RR) classes namely:(i) 1 mm/h <RR<=10 mm/h, (ii) 10 mm/h <RR<=20 mm/h, (ii) 20 mm/h <RR<=30 mm/h, (iv) 30 mm/h <RR<=40mm/h, and(v) 40 mm/h <RR<=50 mm/h. The Z values from GPM and disdrometer show good correspondence in the five rain rate classes. Figure 1(a) shows the Z values from GPM and disdrometer at the Ku-band for all the rain rate classes. The GPM data show somewhat underestimation of Z values from the disdrometer. DPR provided reflectivities at two frequencies are used to calculate the gamma parameters to retrieve the DSD from GPM observations. The DSDs from GPM and disdrometer show a good overall matching which is indicated in Figure 1(b) for the rain rate class 20 mm/h <RR<=30 mm/h. It can be noted that double peak in the disdrometer measured DSD is not shown in DSD from GPM (Figure 1(b)). The mass weighted mean drop diameter (Dm) and intercept parameters from GPM and disdrometer also show a good correlation for all the rain rate classes. The present technique will be used to obtain a three-dimensional picture of DSDs over the present location under varying raining condition. The comparison between GPM and disdrometer data shows the usefulness of GPM observations on global as well as regional scale.

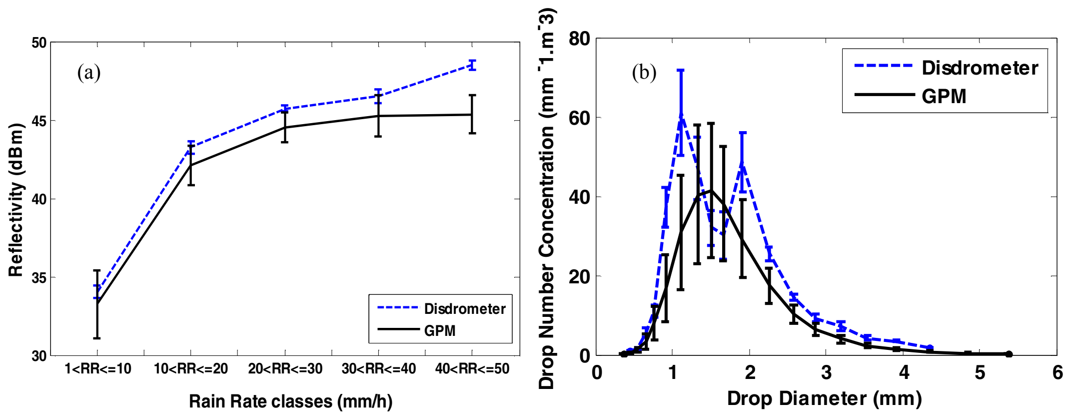

Figure 1. (a) Radar reflectivity from GPM and disdrometer for 5 rain rate classesat Ku-band, and (b) comparison of DSD from two instruments for rain rate class of 20 mm/h <RR<=30 mm/h.

1. T. Iguchi, S. Seto, R. Meneghini, N. Yoshida, J. Awaka and T. Kubota, 2010. “GPM/DPR level-2 algorithm theoretical basis document,” *NASA Goddard Space Flight Center, Greenbelt, MD, USA, Tech. Rep*., December 2010.