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

Raindrop Size Distribution and Rain Characteristics during the extreme events in the Tropical coastal station Thumba

Kiran Kumar N.V.P.,*(1) and Lavanya S(1), (2)
(1) Space Physics Laboratory, Vikram Sarabhai Space Centre, Thiruvananthapuram, Kerala-695022, India, e-mail: kirannvp@gmail.com
(2) University of Kerala, Thiruvananthapuram, Kerala-695034, India;
e-mail: lavanyas@hotmail.com

Drop size distributions observed by surface based disdrometer and vertical pointing micro rain radar during June and August 2018 extreme events over the coastal station Thumba are used to diagnose rain characteristics during intensive rainfall episodes. Rain integral parameters like Rainfall rates R, mass weighted median volume diameters Dm, reflectivity Z, drop size distributions (DSDs), and gamma DSD parameters were derived and compared between the micro rain radar and surface based disdrometer. Accumulated rainfall observed by disdrometer is in good agreement with the co-located tipping bucket measurements. Over a 4-day period (14 August 2018 to 17 August 2018), these extreme events generated 150 mm of rain. There exist a distinct DSD in two extreme rainfall events. Rainfall was characterized by a large number of small- to medium-sized raindrops (diameters smaller than 1.5 mm) resulting in small values of Z (40 dBZ), and D_m (<2.5 mm). The disdrometer-derived Z–R relationships reflect how unusual the DSDs were during these extreme events. These data sets were stratified based on rainfall rate and results show that the extreme event DSD exhibit significant variation in the DSD compared to non-extreme events. The big drops are almost absent in extreme DSD, whereas the small and medium sized drops are larger in number than they are in non-extreme rain. The vertical profiles of DSD observed using MRR shows an interesting feature. The retrieved DSD profiles are divided into classified into (convective, transition and stratiform), based on classification scheme, to examine salient microphysical characteristics and the vertical variability of DSD in extreme events. DSD parameters estimated using gamma fit method revealed that these extreme events are dominated by small to medium size rain drops. The vertical extent of these extreme events is shallow in nature. From the observed vertical variation of DSD parameters and the median volume diameter various microphysical processes like drop sorting, coalescence, evaporation and breakup were assessed.