Global Drop Size Distribution observed by GPM/DPR

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This study investigated the drop size distribution (DSD) observed by the Dual-frequency Precipitation Radar (DPR) onboard the Global Precipitation Measurement (GPM) core satellite, which makes the world’s first dual-frequency precipitation observations by space-borne radar. The accumulated DPR data allows us to investigate the climatological feature of global DSD. This study focuses on the characteristics of DSD and its relationship with large-scale precipitation characteristics.

A mass-weighted mean diameter (Dm) as a DSD parameter which are estimated based on dual-frequency information derived from GPM/DPR are analyzed with seasonal variations and precipitation characteristics. The positive relationship between mean values of precipitation rate and Dm was generally seen. However, Dm has evident contrast between land and oceans; Dm was larger over land than over the oceans.

DSD shows seasonal variation in some regions with variations of precipitation rate (e.g. Asian monsoon regions and the Amazon over land). Focusing on oceans, the anomalies seem to be more systematic in Dm than R, especially in June-July-August (JJA) and December- January-February (DJF), especially over the midlatitude oceans. Dm in the winter season over the mid-latitude ocean is larger than that in the summer season in both the Northern and Southern hemispheres.

Further investigation was conducted focusing on the North Pacific Ocean where the seasonal difference of Dm between JJA and DJF was significant. Seasonal variation of precipitation rate was not statistically significant while that of Dm was significant, which suggested that another factor would related to the variability of Dm. We investigated the precipitation top height and stratiform ratio which characterize precipitation. It was shown that precipitation top height was lower in DJF than JJA over subtropics and mid-latitudes. Stratiform ratio was higher in DJF than in JJA over mid-latitudes while it was lower in DJF than in JJA over subtropical regions.

Results suggested that differences of Dm are associated with those of precipitation regimes. As for JJA, organized system related to the Baiu over mid-latitudes and tropical storms over subtropical regions often occur. In terms of the DJF, storm tracks are formed and extratropical frontal systems are dominant in boreal winter season while the shallow precipitation systems under the trade wind circulation was seen over the subtropical regions.

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