Microphysical characteristics of precipitation over Korean Peninsula based on long-term GPM databases

*Choeng-lyong Lee[1], Geunhyeok Ryu[2], GyuWon Lee[1]

1. Center for Atmospheric REmote sensing, Kyungpook National University, 2. National Meteorological Satellite Center, Korea Meteorological Administration

Satellite observations from precipitation radar (PR) such as Global Precipitation Measurement (GPM) DPR (Dual Precipitation Radars composing Ku and Ka band) can be an excellent dataset for deriving optimized global precipitation map. In addition, GPM DPR have provided 3-dimension (3D) databases of attenuation corrected reflectivity (Z), mass weighted diameter (D_m), and normalized intercept parameter (N_w). Thus, seasonal characteristics of microphysical variables can be explored in Korean Peninsula. We investigate the seasonal properties of precipitation types based on long-term (2014 ~2018) rainfall data of GPM KuPR (Ku-band Precipitation Radar).

To investigate the microphysical characteristics of rainfall types, we classified the region as functions of precipitation types (e.g. stratiform, convective and shallow system) using the flag retrieved in classification module of GPM algorithm. After classification process, we generated the databases for observed and retrieved parameters of each rainfall type. Furthermore, the intercept parameter N_0 was derived from N_w to explain D_m-N_0 relationship of precipitation systems. Finally, we analyzed the microphysical characteristics of precipitation types based on 3D structures of parameters including Contoured Frequency by Altitude Diagram (CFAD) and vertical profiles.

In CFAD of convective systems, the echo top of reflectivity was higher in summer (above 15 km) than other systems. CFAD was broad at higher altitude (above 6 km). D_m (N_0) decreases (increases) at rain region (the altitude ranging 0~3 km) caused by break-up process. In stratiform, on the other hand, most of reflectivity were around 10~30 dBZ at the layer above 6 km. The mean vertical profiles of microphysical variable were constant in rain region, indicating the equilibrium between collision-coalescence and break-up. The seasonal mean reflectivity, D_m and N_0 of stratiform (convective) in rain region are 24.52~26.14 (32.42~36.24) dBZ, 1.21~1.25 (1.40~1.54) mm, and 59.78~82.27 (215.71~256.9) $m^{-3}mm^{-1}$, respectively.

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