Precipitation Microphysics of Tropical Cyclones over the Western North Pacific Based on GPM DPR Observations

*Hao Huang\(^1\), Fengjiao Chen\(^2\)

1. Nanjing University, 2. Anhui Meteorological Information Centre

In this study, the microphysical structures and processes of tropical cyclone (TC) precipitation over the western North Pacific are analyzed using the measurements and products of the dual-frequency precipitation radar on board the Global Precipitation Measurement mission (GPM) satellite in 2014-2017. It is found that the microphysical structures and processes of TC precipitation show distinctive features in terms of different precipitation efficiency indices (PEIs), which is defined as the ratio of near surface rainfall rate to the liquid water path. Both convective and stratiform precipitating hydrometers with higher PEI tends to have larger mean mass-weighted mean diameter ($D_m$) near the surface. Clear decrease (increase) in $D_m$ and effective reflectivity factor ($Z_e$) towards the surface below the melting layer can be found for precipitating clouds with low (high) PEI. This mainly indicates the predominance of different microphysical processes for precipitation with different PEI values. According to the analysis of the changes of $D_m$ and $Z_e$ over a 2-km layer below the melting layer, it can be found that the main microphysical process for precipitation with larger PEI in TCs is collision-coalescence. However, the predominant process for convective and stratiform precipitating with low PEI is the breakup processes, especially for precipitation with relatively large $D_m$ values.

Keywords: tropical cyclone, GPM, microphysics