An insight into the microphysical attributes of northwest Pacific tropical cyclones

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Abstract

Northwestern Pacific (NWP) tropical cyclones (TCs) impose a severe threat to the life and economy of the people living in East Asian countries. The microphysical features, mainly the raindrop size distributions (RSD) of TCs that improve the modeling simulation and rainfall estimation algorithms, are limited to case studies, and an extensive understanding of TCs' RSD is still scarce over the northwest Pacific. Here, we examine a comprehensive outlook on disparities in microphysical attributes of NWP TCs with radial distance and storm type, using sixteen years of disdrometer, ground-based radar, and reanalysis datasets in north Taiwan. We find that dominant stratiform precipitation in the inner rainbands leads to the occurrence of more bigger drops in the inner rainbands than the inner core and outer rainbands. Moreover, a decrease in mass-weighted mean diameter and rainfall rate with radial distance is associated with a reduction in moisture availability for various circumstances, and this association is deceptive in intense storms. Our findings give an insight into crucial processes governing microphysical inequalities in different regions of NWP TCs, with implications for the ground-based and remote-sensing rainfall estimation algorithms.

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