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Raindrop Size Distributions of Convective Rain in Different Rainbands Associated with Typhoon Fitow (2013)

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Previous studies on raindrop size distribution (RSD) focused mainly on the types of convective and stratiform rains, although it may be different in the convective rain associated with different tropical cyclone rainbands. In this study, the RSDs associated with several distinct rainbands in Typhoon Fitow (2013) were observed and analyzed by focusing on the evolution of the RSD. The RSD observation was conducted at Shibo station of Shanghai during 6-7 October 2013 and the heavy rainfall event resulted from three outer rainbands and a coastal-front-like rainband. An improved method is proposed to classify the rain types in tropical cyclones.
It is found that the convective rain in the outer rainband has higher drop concentration and greater rain rate, whereas the coastal-front-like convective rain has larger mass-weighted mean diameter with a monotonous increase in raindrop concentrations at all drop sizes with the increasing rain rate. In contrast, the outer-rainband convective rain first has high concentration of small raindrop ($\sim$1 mm) at lower rain rate, and then the size of these small raindrops grows, leading to the increase of the rain rate, although the mean raindrop concentration remains nearly unchanged. As the large raindrop breaks up, the concentration of smaller raindrop (<0.7 mm) increases sharply and the increasing rate of midsize raindrop is the fastest at high rain rate. This study suggests the requirements of variable Z-R relationship for quantitative precipitation estimation (QPE) in different rain region from TC center and different microphysical parameterization scheme for TC model from other meso-scale weather model in the future.