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Linking Ice-Phase Microphysics to Raindrop Characteristics, and Extreme Rainfall in a Deep Convection Event in Eastern China

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In this study, we examine the evolution of ice-phase microphysics [polarimetric radar signatures and identified graupel and hail (GH) (hereafter, GH) distributions] and raindrop characteristics [drop size distribution (DSD) and rainfall intensity] in a extreme rainfall produced by convection during the Meiyu period in Eastern China. The results showed in the convection, strong updraft favored the lifting of raindrops to the mixed-phase region to form abundant supercooled liquid water and GH. Meanwhile, raindrop characteristics are found to be deeply affected by the GH distribution condition, heavy rainfall (rain rate > 20 $\mathrm{mm\,h^{-1}}$) is basically contributed by convective samples with GH identified aloft. As GH height rises, number concentration and mean size of raindrops increase accordingly, leading to the growth of rainfall intensity. Extreme rainfall (rain rate > 100 $\mathrm{mm\,h^{-1}}$) is majorly induced by deep convection with hail or widespread (over 10 km level) graupel, melting of the abundant highly-rimed particles plays a dominant role in generating high concentration raindrops. By revealing the link between GH distribution conditions and raindrop characteristics, the study helps to understand the specific role of ice-phase processes to the formation of low-level raindrops in deep convection.

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