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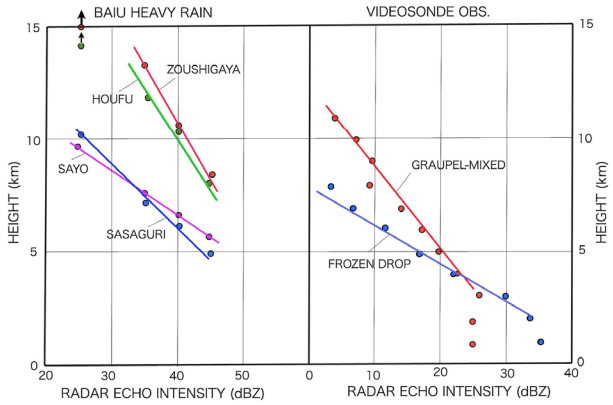

Figure 1

Figure 1. Radar data from Japanese heavy rain events is compared to videosonde data from East and Southeast Asian, heavy-rain producing clouds. Left: For each Japanese heavy rain event, the highest altitude reached by each radar echo intensity is plotted. Right: Videosonde particle concentration data were converted to equivalent radar echo intensities of the purpose comparison. Mean heights are presented for Graupel/ Mixed Regime videosonde flights and Frozen-Drop Regime flights.

- During summer, disturbed weather brings frequent bouts of heavy rain to Japan in two types of cloud systems, one with high lightning activity and other with low lightning frequency. Five heavy rain cases in 2008-2009 were selected for this study: High lightning events (Hofu and Zoshigaya) and weak lightning events (Sasaguri, Dazaifu, and Sayo). To find the bases for this difference, data were compared with videosonde data from various cloud systems across East and Southeast Asia.
- On average, in the Graupel-Mixed group, compared to the Frozen Drop group, radar echo intensity decreased with height less strongly. In the high-lightning-activity, heavy-rain events (Hofu, Zoshigaya), compared to the low-lightning-activity, heavy rain events (Sasaguri, Sayo), high radar echo extended to substantially higher altitude and decreased with height somewhat less strongly.
- The difference in lapse rates suggests a difference in precipitation particle distributions; that is, in weak lapse rate clouds (high lightning), graupel dominate while in a steep lapse rate clouds (low lightning), frozen drops dominate.
- The main reason for the weakness of electrical activity in frozen-drop-dominated clouds is probably that the concentration of ice crystals is too low to support much riming electrification.