Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

MIS29-16 Room:203 Time:May 24 14:45-15:00

Vertical wind and hydrometeor characteristics measurement in and around melting layer by the EAR and polarization lidar

YAMAMOTO, Masayuki[1*], ABO, Makoto[2], SHIBATA, Yasukuni[2], HASHIGUCHI, Hiroyuki[1], YAMAMOTO, Mamoru[1], FUKAO, Shoichiro[3]

[1]RISH, Kyoto University, [2]Tokyo Metropolitan University, [3]Fukui University of Technology

Simultaneous measurement of vertical air velocity (W), particle fall velocity, and hydrometeor phase was carried out using a 47-MHz wind profiling radar and a polarization lidar installed at Sumatra, Indonesia (0.2S, 100.32E, 865 m MSL) in December 2008. The 47-MHz wind profiling radar, referred to as the Equatorial Atmosphere Radar (EAR), measured W and reflectivity-weighted particle fall velocity relative to the air (Vz) simultaneously. The lidar measured linear depolization ratio (LDR), which is an indicator of hydrometeor sphericity. A stratiform precipitation case on 8 December 2008 and that on 16 December 2008 were compared to describe differences of W, Vz, and LDR.

Surface rainfall intensity was greater than 2 mm/h in the 16 December case, while raindrops evaporated until they reached to the ground in the 8 December case. Upward W above the melting level was greater than 0.2 m/s in the 16 December case, while it was weak (less than 0.1 m/s) or absent in the 8 December case. Vz of 1.6 m/s at 300 m above the 0 degC altitude (5.2 km MSL) in the 16 December case was greater than the 8 December case (1.3 m/s). The thickness of melting layer in the 16 December case (900 m) was greater than the 8 December case (300 m). Because Vz is an indicator of particle size, the results suggests that the size growth of hydrometeors under the presence of upward W contributed to the formation of thick melting layer in the 16 December case. Owing to complex interfaces of water-coated ice crystal branches, LDR at the melting level increased 0.17-0.20 in the two cases. Lidar dark band was also observed in the two cases.

Vz of raindrops in the 16 December case (7.0-7.5 m/s) was greater than that in the 8 December case (3.7-3.9 m/s) due to larger sized raindrops in the 16 December case. LDR of raindrops in the 8 December case was less than 0.01, while it was up to 0.10 in the 16 December case. A possible reason for the LDR difference is discussed.

Keywords: Equatorial Atmosphere Radar, lidar, precipitation, melting layer