

1.Abstruct

Ice pellets (IP) and Freezing rain (FZ) occurred on 29 January 2016 in the Kanto region of Japan. This event was observed by the MACS-POL (MRI advanced C-band solid-state polarimetric radar) and 2DVD (2D-video distrometer) and recorded by several meteorological observatories (e.g., Mito; 60km NE from MRI) and some mountains.

We focused on the reason of Z_{DR} increment at refreezing level, and the dynamical characteristics to determine refreezing.

MACS-POL detected the refreezing from completely or partially melted snowflakes by ρ_{hv} (correlation coefficient) and Z_{DR} (differential reflectivity). On the other hand, 2DVD monitored two microphysical characteristics (Wet/Dry) of IP. It suggests that the increase in Z_{DR} corresponds to the slight flatness of wet IP.

VAD (Velocity Azimuth Display) analysis using doppler velocity of MACS-POL suggested that the refreezing corresponded to the downward wind area by enhanced convergence of the melting layer.



2.Data at MRI

MACS-POL Ze, Ve, Z_{DR} , ρ_{hv} , K_{DP} , (Φ_{DP}) ···· [Normal/MTI] Parameter 5370 MHz (C-band) Frequency GaAs Power FET (solid state) Transmitters Peak Power 3.5 kW Antenna diameter 4 m (beam width 0.7°) 4 rpm (max 10 rpm) Antenna speed Range gate spacing 150 m $624 / 780 \text{ Hz} (EL < 8^{\circ}) \quad 936 / 1170 \text{ Hz} (EL > = 8^{\circ})$ PRF $1 \ \mu s (R < 20 \text{ km}), 129 \ \mu s (R > 20 \text{ km}) (EL < 8^{\circ})$ Pulse width 4 min, RHI $\times 2$, PPI $\times 13$ Scan sequence (0.5°, 1°, 1.5°, 2.1°, 2.8°, 3.6°, 4.8°, 0.5°, 6.8°, 8°, 10.4°, 14°, 18°)

2D-Video-Distrometer (2DVD)

Diameter, Velocity, Oblateness, Shape, … Parameter

Sounding (47646 Tateno)

Parameter

Temperature, Relative humidity, Wind, …

Reference

• Kumjian et al. 2013: A dual-polarization radar signature of hydrometeor refreezing in winter storms. J. Appl. Meteor. Climatol., 52, 2549-2566.

• Nagumo and Fujiyoshi 2015: Microphysical properties of slow-falling and fast-falling ice pellets formed by freezing associated with evaporative cooling. *Mon. Wea. Rev.*, **143**, 4376-4392.

Polarimetric Characteristics and Microphysical Structure of a Freezing Rain and Ice Pellet Event in the Kanto Area on 29 January 2016 Nobuhiro Nagumo, A. Adachi, and H. Yamauchi

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• Slow falling IP \longrightarrow Dry IP

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Downward wind across melting layer toward sub-freezing zone ($Ze_{melting} > \sim 20 \text{ dBZ}$)