

ON THE ESTIMATION OF PRECIPITATION RATE BY A NEW
METHOD OF ANALYSIS OF METEOROLOGICAL RADAR
ECHOES (2) (ABSTRACT)

Mitsuo HOSHIYAMA¹, Masahiko HATANAKA², Akira NISHITSUJI²
and Makoto WADA³

¹*Research Institute for Electronic Science, Hokkaido University,
Kita-12, Nishi-6, Kita-ku, Sapporo 060*

²*Faculty of Engineering Muroran Institute of Technology, 27-1, Mizumoto-cho, Muroran 050*

³*National Institute of Polar Research, 9-10, Kaga 1-chome, Itabashi-ku, Tokyo 173*

At Syowa Station, microwave radar echo data from clouds and precipitation have been accumulated. We have studied how to estimate precipitation rate using observed radar echoes. In this abstract, we report how to evaluate some physical characteristics of precipitation particles, which are important to analyze radar echoes.

(1) Temperature of precipitation particles at each altitude: We are able to use temperature data at each altitude, obtained by radiosonde at Syowa Station. But the temperature is usually different from that of precipitation particles. In case of dense particles falling at high speed, this difference tends to increase. In the opposite case, it is considered that particle and air temperatures are equal. In the latter case, characteristics of a precipitation particle are determined by temperature around the particle.

(2) Water volume content of precipitation particles: There is an empirical relation between water volume content of snow-flakes (P_w) and particle density (ρ), $\rho = \sqrt{P_w}$. On the other hand, the relation between the density and snow-flake characteristics had been established using various snow-flake observation data. Using these relations and observed temperatures at each altitude, we are able to estimate the water volume content of the particles at each altitude.

(3) Falling speed of the precipitation particles: Falling speed, which depends on snow-flake density, is important to evaluate the amount of precipitation, too. It is said that 90% of precipitation particles in the Antarctic are classified as graupel. The characteristics of graupel particles are that the ranges of their density, radius and falling speed are 0.04–0.16 g/cm³, 0.1–0.25 cm and 1.0–2.75 m/s, respectively.

We will continue to study the remaining characteristics of precipitation particles, particularly side-distribution function. After that, we will try to analyze observed radar echo data to evaluate precipitation.

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