# Error sources of radar snowfall estimaiton: Z-S relationships and vertical structure of snow storm

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Various error sources exist in quantitative estimation of snowfall by using weather radar. Reflectivity-Snowfall (Z-S) relationship which is one of error sources varies snowflake habit, density, and snow size distribution. Furthermore, a significant difference of radar reflectivity is shown with measuring heights. In this study, reflectivity from Micro Rain Radar (MRR) measurements and snowfall intensity measured with 10 minute interval are used to derive Z-S relationships for different snowflake habit. MRR is also used to investigate vertical structures of snow storm. The effects of Z-S relationship for different snowflake habits on snowfall estimation are examined by using X-band dual-polarization radar.

The photographs of snowflake are used to classify different snowflake habits. Contoured frequency-by-altitude diagrams (CFADs) of radar reflectivity and Doppler velocity for different snowflake habit are constructed from the MRR measurements. Measured reflectivity at lowest elevation angle is corrected using vertical profile of reflectivity. Derived Z-S relationships are considered for quantitative estimation of snowfall using X-band dual-polarization radar. Validation of snowfall estimation is performed using weighing gauges.