

## Composite Map of X-band Polarimetric Radar Parameters and Rainfall Amounts in the Tokyo Metropolitan Area

KIM, Dong-Soon<sup>1\*</sup>, Masayuki Maki<sup>1</sup>, Takeshi Maesaka<sup>1</sup>, Shyuichi Tsuchiya<sup>2</sup>

<sup>1</sup>National Research Institute for Earth Science and Disaster Prevention, Tsukuba, Japan, <sup>2</sup>National Institute for Land and Infrastructure Management, Tsukuba, Japan

Due to severe rainfall attenuation, all the X-band radars in the network suffered a loss of received signal power. In severe cases, signal extinction occurred in the area behind a strong precipitation area; signal extinction area being defined herein as an area where the backscattered signal is below the receiver noise level. The present study examines the accuracy of composite polarimetric parameters ( $Z_H$ ,  $Z_{DR}$ , and  $K_{DR}$ ) and rainrate (RR) from an X-band polarimetric radar network situated in the Tokyo Metropolitan area.

The case analyzed is one of localized convective precipitation that was observed on 28 Sep. 2010 by 4 X-band polarimetric radars (EBN, KSR, SAT, and SYK), a 2-dimensional video disdrometer (2DVD), a Joss-Waldvogel type disdrometer, and a surface rain gauge network. When the precipitation system passed over the disdrometer sites, a peak rain rate of  $88.9 \text{ mm h}^{-1}$  was observed. Four X-band radars which compose the radar network successfully compensated each other for the signal extinction and provided composite maps of the polarimetric radar parameters and the rain rate. Validations of the polarimetric parameters and rain rate of the composite map were done by inter-comparisons of four X-band radars. Validations were also made by comparing radar parameters with those calculated from disdrometers. The results of the inter-comparisons show reasonably good agreement. The results of the validations of composite  $Z_H$ ,  $Z_{DR}$ , and  $K_{DR}$  and RR with disdrometers show good agreement; the normalized biases (correlation) of those parameters were 3.9 % (0.92), 21.3 % (0.82), -2.18 % (0.94), and 1.35 % (0.90), respectively.

It is concluded that a network of radars is essential when X-band polarimetric radar is used for heavy rainfall observations. Composite polarimetric radar parameters can provide useful information, not only for hydrology applications but also for micro-physical studies. However, the radar composite 10 minute rainfall amounts obtained were about 22 % smaller than surface rain gauge data. The possible reasons are discussed.

Keywords: X-band Polarimetric Radar, Composite Map, Rainfall amounts, Signal extinction area