

Locally Adjusted Rainfall Estimation Using Specific Differential Phase for Korea

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Weather radars have become a popular tool for meteorological applications such as quantitative precipitation estimation (QPE) with high spatiotemporal resolution. Especially, in the last decade, QPE performance has been improved by introduction of dual polarization technology. As becoming able to measure the differential reflectivity, specific differential phase, and cross-correlation coefficient, reliability has been significantly improved compared to the conventional reflectivity-based method. Some of the polarimetric parameters have technical advantages that the specific differential phase is immune to radar calibration errors, attenuation in precipitation, and partial blockage of the radar beam, for example.

Though there have been many studies conducted around the world for quantitative rainfall estimation using dual-polarization radars, domestic applications are barely performed in Korea. Ministry of Land, Infrastructure and Transport (MOLIT) has installed and been operating two S-band dual-polarization radar at Mt. Biseul and Mt. Sobaek since June 2009 and November 2011, respectively. In this study, we evaluated a quantitative rainfall estimation algorithm using specific differential phase with parameters locally adjusted. As rain microphysical properties can vary with geographical change, adjustments of relations between radar variables versus rainfall rate for local area are needed. In addition to parameter adjustment, the specific differential phase retrieval as suggested by Lim et al. (2013) is done for a self-consistency-based method that distributes the total differential phase consistent with the reflectivity factor for the rain region. The evaluation results show that the quantitative rainfall estimation works well at capturing the high-frequency rainfall variations for the events analyzed herein. The rainfall estimation algorithm represents high simplicity with reasonable accuracy that this study would also provide a baseline product in Korea.