The Rainfall Estimation Using the X-band Radar Data during SoWMEX/TiMREX

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ABSTRACT

In Taiwan, the Mei-yu fronts in May and June and the typhoons in summer and early fall often induce strong southwesterly flows and consequent heavy rainfall, resulting in severe disasters. Therefore, the accuracy of quantitative precipitation estimation and forecast is of great importance.

Weather surveillance radars provide observational data at fine temporal and spatial resolutions; moreover, dual polarimetric radars offer parameters such as reflectivity (Z), differential reflectivity (Z_{DR}), differential phase (Φ_{DP}), specific differential phase (K_{DP}) and copolar correlation coefficient (ρ_{hv}). In recent decades, a number of rainfall estimation algorithms utilizing these polarimetric parameters, e.g. R(Z), R(Z,Z_{DR}) and R(K_{DP}), are applied to dual polarimetric radars with different wavelengths and perform well in accuracy.

This study mainly exploit the polarimetric data (Z, Z_{DR} and K_{DP}) of the NCU's mobile X-band polarimetric radar (TEAM-R) during SoWMEX/TiMREX to estimate rainfall. These polarmetric rainfull estimates then were compared with measurement from disdrometers (2DVD and JWD) and the CWB's automatic rain gauges. The suitability of the quantitative precipitation estimates retrieved from the X-band polarimetric radar in southern Taiwan was evaluated.

The data on June 14, 2008 (during IOP-8) were analyzed. In rainfall estimation, R(K_{DP}) is shown to perform better than R(Z), but the errors utilizing R(K_{DP}) increase as the target distance gets larger and the terrain gets higher. The higher the used data is, the larger the variability between the radar and the rain gauge (or disdrometer) can be. According to former studies, the acceptable range of errors in rainfall estimation is approximately 15~20%. For this reason, TEAM-R's data in a range within 20 kilometers are acceptable. In addition, R(Z,Z_{DR}) usually overestimates the rainfall due to insufficient correction for the attenuation of Z_{DR}.