Evaluation of Radar Polarimetric Variables for Improved Quantitative Precipitation Estimates

M. Wiji Nur Huda ; Hanggar Ganara Mawandha ; Khafidzotun Ni'mah ; Chandra Setyawan ; Ngadisih Ngadisih ; 大石, 哲 ; Ramesh S. V.…

(Citation)
神戸大学都市安全研究センター研究報告,26:101-101

(Issue Date)
2022-03

(Resource Type)
departmental bulletin paper

(Version)
Version of Record

(JaLCDOI)
https://doi.org/10.24546/0100477434

(URL)
https://hdl.handle.net/20.500.14094/0100477434

神戸大学都市安全研究センター
研究報告，第26号，令和４年３月

Evaluation of Radar Polarimetric Variables for Improved Quantitative Precipitation Estimates

M. Wiji Nur Huda [1)]
Hanggar Ganara Mawandha [2)]
Khafidzotun Ni'mah [3)]
Chandra Setyawan [4)]
Ngadisih Ngadisih [5)]
Satoru Oishi [6)]
Ramesh S. V. Teegavarapu [7)]

Abstract: The selection of appropriate function forms linking the radar-based polarimetric variables and quantitative precipitation estimates (QPEs) is critical for the estimation of precipitation accurately. In this study, several functional forms using nonlinear optimization and artificial neural networks are evaluated. The polarimetric variables including radar reflectivity factor (ZH), differential reflectivity factor (ZDR), and specific differential propagation phase (KDP) values are obtained from an X-band multiparameter radar (XMPR) recently installed in a Yogyakarta region, Indonesia. The region experiences highly variable rainfall with mostly frontal rainfall events confined to December to March. Observed precipitation data available from a sparse rain network in this region is used for comparative evaluation of the rainfall rates. Rain gauge data for three years (2016-2018) are used for the assessment. Results from the analysis suggest that improved estimates of rainfall at finer temporal resolutions of 10 minutes can be obtained using functional forms developed with the optimization of polarimetric thresholds when adequate observed rainfall data and polarimetric variables are available. Furthermore, the use of the multiple linear, stepwise regression model and neural networks approach can measure the sensitivity of the functional forms used for rainfall rate estimates. Local models based on specific temporal windows (e.g., month or a season) can help improve the functional forms and therefore rainfall rate estimates.

Key words: quantitative precipitation estimation (QPE), X-band multiparameter radar, artificial neural network.

1. Published information

Huda. M. W N et al., Evaluation of Radar Polarimetric Variables for Improved Quantitative Precipitation Estimates, 7th International Conference on Science and Technology (ICST), (2021).

Authors: 1) M. Wiji Nur Huda, University of Gadjah Mada, 2) Hanggar Ganara Mawandha, University of Gadjah Mada, 3) Khafidzotun Ni'mah University of Gadjah Mada, 4) Chandra Setyawan, University of Gadjah Mada, 5) Ngadisih Ngadisih, University of Gadjah Mada, 6) Satoru Oishi, RCUSS, Kobe University 7), Ramesh S. V. Teegavarapu, Florida Atlantic University.