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Real-time Radar Rainfall Estimation in Debris Flow Potential Areas

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Landslides and debris flows were the widespread and damaging disasters of Taiwan's slopeland in typhoon. In order to reduce the losses, an early warning system on slopeland disaster is necessary. Most convenient and common method of the debris flow warning system is to monitor rainfall wherever the rainfall estimated is over the rainfall threshold. In the past, the rainfall estimation of debris flow potential area was calculated by an interpolation method, for example the inverse-distance, squared weighting, Kriging or other methods, derived from surrounding rain gauges. The interpolation method is easy to apply but may not be representative of the true spatial distribution, in addition, the rainfall gauges often produce error due to severe wind and large amount of rainfall in the typhoon period.

In this research, a new rainfall monitoring radar system QPESUMS is applied to assess the precipitation in debris flow stream. QPESUMS is composed of quantitative precipitation estimation and forecast (QPE/QPF) techniques with analysis of the radar reflectivity data in 10 min time interval and 1.3 km spatial resolution. The QPESUMS's estimating model is correction using records of ground rainfall station to determine the spatial properties of location and weighting for each grid. Three rainfall interpretation methods, the interpolation by Kriging, the radar by QPESUMS, and the surrounding typical rainfall gauge of the debris-flow stream, are applied to two debris-flow events in typhoon Mindulle, 2004 and typhoon Haitang, 2005 to evaluate the performance of those methods. The results show that the radar rainfall estimation by QPESUMS can provide an effective way and a more reasonable rainfall estimate method for monitoring the rainfall for the rainfall threshold of the debris flow potential area.