Analysis of Spatial Bias of Precipitation Estimated from Weather Radar Data During Storm Dissipation with Geographic Information System in Central Thailand

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ABSTRACT

Meteorological weather radar is an important tool and plays a vital role in the study of weather and weather forecasting. Radar is used to estimate spatial rainfall and is particularly useful in areas without ground rain measuring stations. However, it has been found that the rainfall estimates from weather radar often deviate from the rainfall measured by ground stations. The variation of such bias depends on many factors, such as the Z-R relationship, terrain characteristics, rain group characteristics, seasonality, etc. Additionally, the management of radar data for analysis is complicated because it requires the development of programs in computer languages, which limits the use of weather radar data in spatial analysis. This research uses weather radar data from the Meteorological Department of Thailand, specifically the C-band system in the central area of Thailand affected by Typhoon Sentin during the 2018 rainy season. The preliminary data were processed with an open-source radar library, and then the spatial bias values from the Z-R relationship were compared using three equations: 1. Marshall-Palmer ($Z=200R^{1.6}$), 2. Rosenfeld Tropical ($Z=250R^{1.2}$), and 3. WSR-88D Convective ($Z=300R^{1.4}$), to compare with the ground precipitation data in each hourly time period. The procedure for processing and analyzing spatial bias data using geographic information system (GIS) software will be proposed. Furthermore, the spatial bias correction was tested by the spatial estimation method in each time period. The distribution of rain groups will also be analyzed by spatial statistical methods, classifying the characteristics of rain groups according to the level of rain intensity and analyzing the distribution of severe rainfall clusters in the area over time. This research will be useful for processing radar data in GIS work and can serve as a model for rainfall analysis in watershed areas.

Keywords: Ground-based weather radar, Z-R Relationship, Spatial Bias, Spatial Statistics, Thailand