

Spatial Measurement Quality of Ground-Based Weather Radar Using Surrounding Terrain with Open-Source Radar Library

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ABSTRACT

Meteorological weather radar is widely recognized as an accurate tool for severe rainstorm studies and monitoring due to its high spatial and temporal resolution. However, radar data obtained from measurements in mountainous areas pose challenges because of beam obstruction and the presence of non-meteorological reflection signals in the measurement values. Therefore, it is necessary to analyze the data at each measurement angle to ensure the quality of the spatial data before usage. Open-source radar libraries have been developed in Python, such as Wradlib, Py-ART, and Py-rad, which can be used to analyze the radar beams with Digital Elevation Model (DEM). This research aims to develop a process to simulate the motion of the radar beam at each elevation angle, using ground weather radar data from the C-band frequency of Thai Meteorological Department. Considering DEM data from GTOPO30, a DEM data processing procedure was developed in GIS to import into the model in the Wradlib open-source library in Python. Radar stations in mountainous areas in northern Thailand, including Chiang Rai Station, Nan Station, and Lamphun Station, were analyzed to evaluate the quality of radar measurements at each elevation angle. In addition, an export process was developed for analysis in the GIS system. Using the results of the terrain characteristics analysis that obscured the beam of the station, the case study of relocation decision of Khao Khieo Radar Station and Prachinburi Radar Station was also analyzed in this study.

Keywords: GIS, Weather Radar, Radar Beam Blockage, Opensource Code Radar Library, DEM