Assimilation of Multiple-Doppler Radar Data to Improve the Model Quantitative Precipitation Forecast
— A Case Study from 2008 SoWMEX IOP8

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ABSTRACT

The purpose of this study is to improve the model initial field and hence the quantitative precipitation forecast (QPF) by using multiple-Doppler radar observational data. The assimilation algorithm includes three major components: multiple-Doppler radar wind synthesis, thermodynamic retrieval, and moisture adjustment. A case during IOP8 of 2008 Southwest Monsoon Experiment (SoWMEX) is selected. The radar data in use are the reflectivity and radial wind of the CWB RCCG and RCKT radars, and the SPOL radar from NCAR. The three-dimensional winds, retrieved from the radars and sounding data, are utilized to calculate thermodynamic fields. The moisture field is also adjusted when certain criteria are satisfied. The computational platform employed for this study is the Weather Research and Forecasting (WRF) model.

Compared with the experiments without data assimilation, the assimilation technique developed in this study significantly improves the accuracy of the model rainfall forecast for about three hours. The results from a series of experiments indicate that the moisture adjustment is necessary. The use of multiple-Doppler radar data is also crucial, because a larger radar data coverage is expected to lead to better results. The proposed method can use relatively fewer computing resource and observational data within a shorter observational period to conduct short-term QPF. In the future, it is planned to apply this method for the forecast of precipitation in afternoon thundersstorms or tropical cyclones.

Key Words: Doppler radar, Quantitative precipitation estimation, SoWMEX