DATA ASSIMILATION OF UPPER AIR OBSERVATIONS IN THE SIMULATION OF THUNDERSTORM EVENTS USING WRF MODEL OVER METRO MANILA

ABSTRACT

A thunderstorm is a convective system that is frequently observed in tropical countries like the Philippines. Thunderstorms bring numerous weather-related hazards like heavy rains, flash floods, hail, lightning, strong downdrafts, and in a rare case, tornadoes. Metro Manila, a highly urbanized and densely populated megacity, is one of the areas in the country affected by this convective system. Metro Manila is geographycally located in southwest Luzon, making it more vulnerable to thunderstorms activities during the southwest monsoon season (June to September). Local thunderstorm activities are mainly characterized by late afternoon rainfall. Heavy rainshowers from thunderstorms aggravated by aging drainage system, increasing population, and congested roads causes disruption of business and brings discomfort to the people in the region. In recent years, studies were done in detecting and forecasting these convective events using different statistical and dynamical approach. The use of numerical models with high spatio-temporal resolution to simulate and understand the behavior of these convective system became common however, there still lies large uncertainties. The general objective of this study is to investigate the effect of assimilating upper air observation data on the thunderstorm simulation over Metro Manila. The Weather Research and Forecast (WRF) mesoscale model will be used to simulate the thunderstorms over Metro Manila using the initial boundary data from the Global Forecasting System (GFS). Upper air observations such as wind profiler and radiosonde will be used to nudge the model initialization. Assimilated model outputs will then be evaluated to assess the performance change of the model. Also, the outputs from the model will be compared to radar images of thunderstorm events to evaluate the spatio-temporal characteristics of the thunderstorm simulations. Lastly, the study will discuss the operationality of data assimilation in forecasting of thunderstorm activities in Metro Manila.