Impact of Parameterization Schemes and 3DVAR Data Assimilation for Simulation of Heavy Rainfall Events along West Coast of India with WRF Modeling System

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Abstract

An attempt is made to evaluate the performance of different combination of physical parameterization schemes in Weather Research and Forecasting (WRF) and assess the impact of three dimensional variational (3DVAR) data assimilation system on the simulation of heavy rainfall events. For this purpose, WRF modeling system with a domain having 30 km horizontal grid resolution is used to study the two distinct monsoon heavy rainfall events occurred over the west coast of India. For sensitivity study, a series of six numerical experiments were performed with two PBL, and three Cumulus (CU) schemes for each case. An additional experiment with best combination of parameterization schemes obtained from sensitivity experiments was carried out to evaluate the model performance in simulating the heavy rainfall events with improved initial condition through 3DVAR data assimilation system in WRF model. It is found that the combination of Yonsei University (YSU) PBL physics and Betts-Miller-Janjic (BMJ) convection scheme(Y-BM) give consistently better results as compared to the other combinations for the simulated heavy rainfall events. The initial condition of the model is improved after the inclusion of additional observational data using the 3DVAR technique. The resulting reanalysis and the model simulations are able to reproduce the structure of convective organization as well as prominent synoptic features associated with heavy rainfall events