Improvement of Monsoon Depression Forecast with Assimilation of Indian DWR Data using WRF- 3DVAR Analysis System

A. Routray**,** U. C. Mohanty, Krishna K. Osuri, and S. Kiran Prasad, 2013**:**

Abstract

An attempt is made to evaluate the impact of Doppler Weather Radar (DWR) radial velocity and reflectivity in Weather Research and Forecasting (WRF)-3D variational data assimilation (3DVAR) system for prediction of Bay of Bengal (BoB) monsoon depressions (MDs). Few numerical experiments are carried out to examine the individual
impact of the DWR radial velocity and the reflectivity as well as collectively along with Global Telecommunication System (GTS) observations over the Indian monsoon region. The averaged 12 and 24 h forecast errors for wind, temperature and moisture at different pressure levels are analyzed. This evidently explains that the assimilation of radial velocity and reflectivity collectively enhanced the performance of the WRF-3DVARsystem over the Indian region. After identifying the optimal combination of DWR data, this study has also investigated the impact of assimilation of Indian DWR radial velocity and reflectivity data on simulation of the four different summer MDs that occurred over BoB. For this study, three numerical experiments (control no assimilation, with GTS and GTS along with DWR) are carried out to evaluate the impact of DWR data on simulation of MDs. The results of the study indicate that the assimilation of DWR data has a positive impact on the prediction of the location, propagation and development of rain bands associated with the MDs. The simulated meteorological parameters and tracks of the MDs are reasonably improved after assimilation of DWR observations as compared to the other experiments. The root mean square errors (RMSE) of wind fields at different pressure levels, equitable skill score and frequency bias are significantly improved in the assimilation experiments mainly in DWR assimilation experiment for all MD cases. The mean Vector Displacement Errors (VDEs) are significantly decreased due to the assimilation of DWR observations as compared to the CNTL and 3DV_GTS experiments. The study clearly suggests that the performance of the model simulation for the intense convective system which influences the large scale monsoonal flow is significantly improved after assimilation of the Indian DWR data from even one coastal locale within the MDs track.