

# **Simulation of Monsoon Depressions over Indian Region using WRF- VAR analysis system: Impact of Background Error Statistics**

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## **Abstract**

In a variational data assimilation system, background error statistics (BES) spread the influence of the observations in space and filter analysis increments through dynamic balance or statistical relationships. In a data-sparse region such as the Bay of Bengal, BES play an important role in defining the location and structure of monsoon depressions (MDs). In this study, the Indian-region-specific BES have been computed for the Weather Research and Forecasting (WRF) three-dimensional variational data assimilation system. A comparative study using single observation tests is carried out using the computed BES and global BES within the WRF system. Both sets of BES are used in the assimilation cycles and forecast runs for simulating the meteorological features associated with the MDs. Numerical experiments have been conducted to assess the relative impact of various BES in the analysis and simulations of the MDs. The results show that use of regional BES in the assimilation cycle has a positive impact on the prediction of the location, propagation, and development of rainbands associated with the MDs. The track errors of MDs are smaller when domain specific BES are used in the assimilation cycle. Additional experiments have been conducted using data from the Interim European Centre for Medium-Range Weather Forecasts Re-Analysis (ERA- Interim) as initial and boundary conditions (IBCs) in the assimilation cycle. The results indicate that the use of domain dependent BES and high-resolution ERA-I data as IBCs further improved the initial conditions for the model leading to better forecasts of the MDs.