# Simulation of track and intensity of the Bay of Bengal cyclones using NCAR mesoscale model

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## Abstract

The Bay of Bengal is potentially energetic for the development of cyclonic storms and accounts for about 7% of the global annual total number of storms. These storms, in particular, the post monsoon cyclones that cross east coast of India or Bangladesh are highly devastating. Timely and reasonably accurate prediction of these storms can reduce loss of human lives and damage to properties. As far as single model forecast is concerned, high resolution nonhydrostatic mesoscale models could possibly be most useful in prediction of these storms. In the present study, the performance of the mesoscale model MM5 is evaluated towards simulation of severe cyclonic storms over the Bay of Bengal during the period 1995-1999. The model is customized for simulation of the Bay of Bengal cyclones through extensive sensitivity studies on parameterization of physical processes and dynamical aspects like nonhydrostatic dynamics and resolution. The initial condition of the model is improved with insertion of synthetic vortex in the large scale NCEP/NCAR reanalysis. All eight severe cyclonic storms that affected east coast of India and Bangladesh during this period are simulated at least up to the landfall of the storm.

The performance of the model is evaluated towards prediction of track and intensity of the storms. The intensity of the storm is examined in terms of pressure drop, strength of surface wind and rainfall associated with the storm. The accuracy / error in track prediction are presented in terms of vector displacement errors compared to the observed track of the storms as reported by India Meteorological Department (IMD). The

forecast skill of the model is also tested against the forecast difficulty level (FDL) in this basin and with the forecast errors in operational limited area model.

The intensity of the storms both in terms of central mean sea level pressure and maximum strength of surface wind is simulated reasonably well by the model. Intensity of these storms is better simulated in case the storm is initialized at less intense stage and has relatively longer path over the ocean. Sharp dissipation of the storm, particularly in explosively deepening cyclones are not so well captured by the model.

The magnitude and distribution of 24 hours accumulated rainfall associated with these storms are also well simulated by the model. Even the location of precipitation maxima is well captured. The magnitude of precipitation is slightly under predicted in some cases and is due to delayed landfall of the storm.

The track of the storms simulated by the model is found to follow the observed track (with a few exceptions) and track forecast errors indicate reasonably good accuracy of the model in this respect. Though, in general, the model simulation shows delayed landfall of the storm initialized at relatively more intense stage, the location of landfall is well simulated by the model.