# Impact of Data Assimilation on Simulation of Tropical Cyclone Aila with WRF-NMM Modeling System

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In recent years meso-scale models are extensively used for simulation of genesis, intensification and movement of tropical cyclones. In the present study, the state-of-the-art non-hydrostatic meso-scale model (NMM) core of Weather Research and Forecasting (WRF), (WRF-NMM) model, developed at National Center for Environmental Prediction (NCEP) is used to simulate the severe cyclonic storm (SCS) AILA formed over North Bay of Bengal and crossed West Bengal coast near Sagar Island on $25^{th}$ May 2009. The performance of the model as well as the impact of GTS and Doppler Weather Radar (DWR) data in the simulation of track and intensity of TC Aila is investigated. For this purpose, three set of experiments are carried out.

In the first experiment i.e. in control simulation, the WRF-NMM model is integrated up to 72hrs in a single domain with the horizontal resolution of 9 km and 51 vertical levels by taking the initial and lateral boundary conditions from Global Forecast System (GFS) analysis and forecast fields from NCEP. The result indicates a large initial positional error at the center of the storm. Hence, in order to improve the initial analysis fields for the model integration, an attempt has been made to initialize WRF-NMM model with the WRF-VAR system developed at National Center for Atmospheric Research (NCAR). In the second experiment, the impact of GTS data for the movement of the storm is investigated by incorporating the available conventional and non-conventional data sets over Indian region. Furthermore, as the system was developed near the coast and with the availability of Kolkata DWR data, the impact of DWR data is investigated in the third experiment.

A number of meteorological fields' viz. central pressure / pressure drop, winds, precipitation etc. are verified against observations / verification analysis. The vector displacement errors in track forecast are calculated for all the experiments and compared with observed track provided by the India Meteorological Department (IMD). Few diagnostic fields like reflectivity, heat flux, vertical velocity etc. are also calculated. The initial positional errors are reduced with data assimilation (DA) experiments. Also, the movement of the storm is better simulated with the DA experiments than the control simulation.