Geophysical Research Abstracts
Vol. 19, EGU2017-4321-1, 2017
EGU General Assembly 2017

Challenges associated with the prediction of tropical storms in the Bay of Bengal when using the WRF model

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Accuracy in predicting tropical cyclones over low lying coastal regions is pivotal for understanding storm tracks and their subsequent impacts. The present study highlights the challenges in predicting the Bay of Bengal (BOB) cyclone "AILA" (during 23rd to 25th May 2009) using the Weather Research and Forecast model, Advanced research core module (WRF-ARW). The model configuration uses a two-way interactive nested domain with 10 km resolution over BOB. Its initial and boundary conditions are driven from the NCEP FNL operational global analysis data at every 6 hours. A total of 74 sensitivity experiments were conducted to test the following factors and levels: a) parametrization schemes: two microphysics and two cumulus physics schemes used to select appropriate combination over study region, b) model domain:including/excluding Himalayas, c) vertical resolution: eight various increasing/decreasing vertical levels have been carried out to evaluate the storm track dependencies on these factors, d) domain size: and increasing (decreasing) the grid points of model domain in east-west direction shows that approximately 50-100 km track difference for every two points. Our results show that, the experiments including the Himalayas provide a better representation of cyclone track and speed. In order to reduce the computational time required to do such tremendous amount of experiment, we hypothesize to use statistical tools of experimental design which can involve all the factors that determine the cyclone tracks. A proper experimental design might provide unbiased results and also we might need less number of experiments.