Sensitivity of PBL Schemes for the Simulation of Nor'westers Using ARW Model

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Nor'wester is the abbreviation of North-Western disturbance and also termed as 'Kal-Boishakhi' in Bangla. During the pre-monsoon season, it is very dominant among the natural hazards in Bangladesh and a lot of damages are caused by this short lived storm. In the present study, two Nor'westers which occurred on 5th May 2008 and 11th May 2009 in Bangladesh with squall wind of about 76 km/h and 72 km/h, respectively, are simulated using Advanced Research WRF (ARW) model version 3 with a focus to study the sensitivity of the parameterization of the Planetary Boundary Layer (PBL) schemes of ARW model version 3. The model was run in a single domain with horizontal resolution of 9 km grid using 6-hourly initial and boundary condition data from NCEP. WRF Single-Moment 3-class, Kain-Fritsch and Monin-Obukhov schemes were used for microphysics, cumulus and surface-layer options, respectively and also the Rapid Radiative Transfer Model (RRTM) and Dudhia schemes were used for long wave radiation and short wave radiation option, respectively. For boundary layer option, the model was run with all the four PBL schemes which are currently available, namely: Yonsei University (YSU) , Mellor-Yamada-Janjic (MYJ), Asymmetrical Convective Model version 2 (ACM2) and Medium Range Forecast (MRF) scheme along with no PBL separately. Some differences were found while analyzing and comparing model simulated outputs with the radar data and 3 hourly TRMM 3B42RT data. The purpose of this study is to find a suitable PBL scheme to improve the accuracy of forecasting of Nor'westers in this region.

Keywords: Nor'wester, PBL