

Accepted Manuscript

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PII: S0169-8095(17)30415-5
DOI: doi: [10.1016/j.atmosres.2017.04.026](https://doi.org/10.1016/j.atmosres.2017.04.026)
Reference: ATMOS 3939
To appear in: *Atmospheric Research*
Received date: 10 November 2015
Revised date: 17 January 2017
Accepted date: 12 April 2017



Please cite this article as: Preeti Gunwani, Manju Mohan , Sensitivity of WRF model estimates to various PBL parameterizations in different climatic zones over India. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Atmos(2016), doi: [10.1016/j.atmosres.2017.04.026](https://doi.org/10.1016/j.atmosres.2017.04.026)

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Sensitivity of WRF model estimates to various PBL parameterizations in different climatic zones over India

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Abstract

In the present work sensitivity of Weather Research Forecasting (WRF) Model has been carried out using five Planetary Boundary Layer (PBL) schemes – Yonsei University Scheme (YSU), Mellor-Yamada-Janjić scheme (MYJ), Aymmetric Convective Model version 2 (ACM2), Quasi Normal Scale Elimination scheme (QNSE), Mellor-Yamada-Nakanishi-Niino scheme (MYNN) in different climatic zones over India namely Tropical, Temperate and Arid for surface meteorological parameters, upper air variables and planetary boundary layer height during summer and winter season. The model outputs have been compared with observations through standard statistical measures. The aim is to study the relative performance of these schemes, selecting the best option climatic zone-wise and thereby minimizing uncertainty in model predictions. WRF model performance evaluation shows better agreement for temperature and relative humidity compared to wind speed. Overall for India, ACM2, QNSE show good performance for temperature and relative humidity whereas ACM2, MYNN show better performance for wind speed though these may vary for different climatic zones. Geopotential height and wind over 850hPa is well simulated by ACM2 and MYNN over India. For PBL height ACM2, MYNN and MYJ works best for Chennai, New Delhi and Kolkata respectively during summer period. However, for winter period MYJ works best for Chennai while, QNSE works best for New Delhi and Kolkata. Considering all meteorological parameters together, it is seen that for arid zone ACM2, QNSE and MYJ schemes work reasonably well. For temperate zone, ACM2, QNSE and MYNN schemes

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