

Geosci. Model Dev. Discuss., referee comment RC1
<https://doi.org/10.5194/gmd-2021-242-RC1>, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on gmd-2021-242

Anonymous Referee #1

Referee comment on "Determining the sensitive parameters of the Weather Research and Forecasting (WRF) model for the simulation of tropical cyclones in the Bay of Bengal using global sensitivity analysis and machine learning" by Harish Baki et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-242-RC1>, 2021

Review of "Determining the sensitive parameters of WRF model for the prediction of tropical cyclones in the Bay of Bengal using Global Sensitivity Analysis and Machine Learning" by Baki et al.

This study investigated the impacts of 24 tunable parameters in the Weather Research and Forecasting model on the simulations of tropical cyclones over the Bay of Bengal region. Three global sensitivity analysis methods were employed and compared. The parameter sensitivity results were found to be consistent across three methods for all the variables, and 8 out of the 24 parameters contribute 80%–90% to the overall sensitivity scores. Compared to default parameters, applying optimal parameters produced remarkable improvements in the simulated 10m wind speed, surface air temperature, surface air pressure, and precipitation predictions. I think the manuscript is well organized and the presentation is generally good. However, there are some aspects need to be improved before considering of publication.

Recommendation: Minor revision

Minor comments:

1. The word "prediction" is used in the title and in the main text extensively. Please note that the meanings of "prediction" and "simulation" are not exactly the same, and improved simulation with a better model does not always translate into increases in prediction skills. One good example was given by Liu et al. (2019), who showed that the parameters' impacts on simulation and prediction might be different. I understand that the topic of this study is "simulation", so I suggest replacing the word "prediction" by simulation in the title and in the text.

Liu et al. (2019): Validity of parameter optimization in improving MJO simulation and

prediction using the sub-seasonal to seasonal forecast model of Beijing Climate Center, Climate Dynamics, 52:3823–3843

2. Several literatures that are highly related to the selection of parameters are missing in the manuscript. For example, P6 - multiplier of entrainment mass flux rate, P4 - Von Karman constant, and P3 - scaling related to surface roughness, which are found to be important for tropical cyclone simulations in this study, were primarily identified by Yang et al. (2012) and Yang et al. (2017). These papers should be cited accordingly

Yang et al. (2012): Some issues in uncertainty quantification and parameter tuning: a case study of convective parameterization scheme in the WRF regional climate model, Atmos. Chem. Phys., 12:2409-2427

Yang et al. (2017): Sensitivity of Turbine-Height Wind Speeds to Parameters in Planetary Boundary-Layer and Surface-Layer Schemes in the Weather Research and Forecasting Model, Boundary-Layer Meteorology. 162:117–142

Specific comments:

1. Line 24, “.Singh et al. (2021a).”?

2. Line 25, “Singh et al. (2019) showed that present warming climate impacts on the ...”, please check the grammar.

3. Line 29, What does “VSCS” mean?

4. Line 50, “at once” -> “simultaneously”?

5. Line 108, “in question to”?

6. Line 395-402, the definition of P6 and the analyses about its impacts largely follows that of Yang et al. (2012), which should be added here. Meanwhile, it is not clear to me why suppressed convection (i.e. weakened consumption of CAPE or instability) leads to more “stable” stratiform clouds. Have the authors checked the vertical profiles of atmosphere temperature and moisture? One explainable for the changes in stratiform precipitation is the competition for moisture between convective and stratiform processes as indicated by Liu et al. 2018.

Liu et al. (2018): Combined impacts of convection and microphysics parameterizations on the simulations of precipitation and cloud properties over Asia, *Atmospheric Research*, 212:172-185