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Interactive Comment

Interactive comment on "The efficiency of the WRF model for simulating typhoons" *by* T. Haghroosta et al.

T. Haghroosta et al.

haghroosta@hotmail.com

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Dear Karthik Balaguru,

Thank you for your valuable and bright comments. I replied to your comments as follow and I hope they can satisfy you.

Comment 1:

Line 5, page 293: Generally, when the TC is strong, one would expect more cooling of the ocean surface due to enhanced vertical mixing and upwelling. So I'm not sure why SST is over-predicted when the TC is stronger and vice versa.

Response:

The cooling effect occurs after passing a storm in the wake of the storm, and it is not the case in this part. In fact, this “over-prediction” is relative to the CFSR data set. Furthermore, the study results showed that when the storm was stronger the WRF model predicted SST values higher than their equivalent values by CFSR.

Comment 2:

Lines 10-20, page 293: The sensible heat flux at the air-sea interface, to the first order, depends on the wind speed and the air-sea temperature difference. On the other hand, the latent heat flux depends on the moisture difference at the air-sea interface and the wind speed. These heat fluxes, especially under the strong winds of a TC, are dominated by the wind speed. So I wonder why best estimates of latent and sensible heat fluxes occur in different simulations.

Response:

The oceanic LHF is heat energy released or absorbed by the ocean during a phase transition without a change in temperature such as water surface evaporation. SHF is heat energy transferred by conduction and convection at the atmosphere–ocean interface that creates a change in the system temperature (Clark, 2004).

In this study, the simulation number 5 could estimate both SHF and precipitation rate better than the other sets. This combination has considered convection, mass flux, and cloud effects. Furthermore, Li (2013) demonstrated that the KF cumulus parameterization could create the most severe vertical convection. On the other hand, the simulation number 1 has focused on the different water phases in clouds. Phase changing in the different layers can affect the amount of LHF (Zhu and Zhang, 2006).

Comment 3:

Correlation coefficients may be evaluated for statistical significance.

Response:

One of the most widely used statistical indicators in the literature a model performance is the coefficient of correlation (CC) (Jacovides and Kontoyiannis, 1995). Higher CC values show better performance of the model.

Comment 4:

What is the role of model resolution in the results obtained? Is there a possibility that the results obtained have a dependence on the model spatial resolution?

Response:

According to the Potty et al. (2012), the resolution of model domain can affect the prediction of typhoon intensity. The resolution of the model domains in this study (30 km, 10 km) was based on the existing facilities at the University Sains Malaysia and the storage space.

Comment 5:

Through this study, the authors advocate the use of a certain combination of physics schemes for simulation of TCs using the WRF model. However, unless physical justification is provided, it is hard to generalize these results.

Response:

This study tried to find best options for the considered parameters from thermodynamical point of view. The suggested schemes showed best results among other stated schemes in this study. Of course, these results might be case dependent, but they showed same results for all considered typhoons. Those examined schemes should be considered in the future studies to find more accurate results.

References:

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Zhu, T. & Zhang, D.-L. 2006. Numerical simulation of Hurricane Bonnie (1998). Part II: Sensitivity to varying cloud microphysical processes. Journal of the Atmospheric Sciences, 63, 109-126.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 287, 2014.