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Natural Hazards and Earth System Sciences
Discussions

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

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Dear Referee #2,

We would like to express our appreciation to you for the valuable comments that will improve the final manuscript. We tried to answer all the comments and hope they can satisfy you. All the suggested corrections will be integrated into the final manuscript version.

Comment 1: p289, line 23: Version of WRF is not specified. There are usually many changes in physical schemes for different version.

Response: The version of the WRF in this study is 3.3.1.

Comment 2: p291, line 9: What is meant by "categories"?

Response:

The "categories" referred to the simulations.

Comment 3: p291, line 17: Ho et al. (2002) âĂŤ> (Ho et al., 2002)

Response: Done.

Comment 4: p293, line 3: temperature âĂŤ> SST

Response: Done.

Comment 5: p293, line 6-9: I wonder if the control data (i.e., CFSR) represent a reliable SST field. Is there some reference? Also, what is the resolution of CFSR, compared with 10 km nested domain simulation? In Figure 3 - 8, the time series is for the nested domain averaged value?

Response:

There are many studies that show the reliability of CFSR data set such as Wang et al. (2011), Saha et al. (2010). Also the quality of the data set is available in the link below: http://rda.ucar.edu/#!pub/cfsr.html The CFSR data set has different data in different resolutions, but the study considered the one which has the nearest resolution (0.5 degree) to the WRF resolution (1 degree) in longitude and latitude.

For the Figure 3 to Figure 8: Yes they are averaged values.

Comment 6: p293, line 18: number 4 âĂŤ> number 5

Response: Done.

Comment 7: p294, line 2: Here, it seems that CFSR is used for evaluating the precipitation rate. As above, is the precipitation rate of CFSR reliable? There are also alternative precipitation data sets, such as TRMM Multi-satellite Precipitation Analysis (TMPA).

Response: There are many studies that show the reliability of CFSR data set such as Wang et al. (2011), Saha et al. (2010). Also the quality of the data set is available in the link below: http://rda.ucar.edu/#!pub/cfsr.html The study selected CFSR data set as control data for being consistent in comparison part for all considered parameters.

Comment 8: p294, line 6-8: It is hard to say simulation 5 and CFSR are close each other. Figure 6 shows a quite large discrepancy.

Response: As mentioned in the sentence "The results indicate that forecasts of precipitation rates before and after the typhoon are close to the control data", before and after the typhoon the amount of predicted values are closer to the CFSR values comparing with the values during typhoon.

Comment 9: p294, line 9: Does "wind speed" in this paper mean the maximum sustained wind speed of typhoon?

Response: Yes it is, and will be mentioned in the last version of the paper.

Comment 10: p294, line 21: I cannot find any information on the simulation period and/or simulation length for typhoon Noul and the other typhoons.

Response: The model was run for every four days.

Comment 11: p295, line 8: Does the best WRF simulation mean simulation #4?

Response: Yes. The simulation number 4 performed the best among the other simulations represnted in this study.

Comment 12: p295, line 10-14: I do not agree this. While sim#7 and #4 are in the range of CFSR, sim#8 significantly simulates a strong wind.

Response: The Authors think that changing the sentence as follow can satisfy you: According to the Fig. 8, the best suggested physics options for predicting typhoon intensity through this study (WRF) and also Sim 7 are nearly in the range of CFSR data set and the Sim 8 predicted stronger winds.

Comment 13: Figures: Time labels for Fig. 3-7 are not consistent. The quality of figures can be also improved.

Response: Time labels in all Figures are consistent except SST because of the availability of values in the model. Furthermore, all figures are original ones, but it will be tried to improve them.

Complementary explanations as follow can be added to the paper to clarify and illustrate the value of findings:

The spotlight of simulation 6 was the amount of temperature and moisture in the different atmospheric layers that were connected (Liu et al., 1997).This combination could predict SST satisfactorily comparing to the other groups in this paper. 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). Simulation number 4 for wind speed prediction is focusing on mixed phase and multiband efficiency along with the temperature and the turbulent kinetic energy played a significant role in forecasting wind speed. According to Draxl et al. (2010), turbulent kinetic energy can perform well in predicting wind speed.

With these changes all following references will be added to the last version of the paper:

Draxl, C., Hahmann, A. N., Pena Diaz, A., Nissen, J. N. & Giebel, G. 2010. Validation of boundary-layer winds from WRF mesoscale forecasts with applications to wind energy forecasting. 19th Symposium on Boundary Layers and Turbulence. Colorado. Li, X. 2013. Sensitivity of WRF simulated typhoon track and intensity over the Northwest Pacific Ocean to cumulus schemes. Science China Earth Sciences, 56, 270-281. Liu, Y., Zhang, D.-L. & Yau, M. 1997. A multiscale numerical study of Hurricane Andrew (1992). Part I: Explicit simulation and verification. Monthly Weather Review, 125, 3073-3093. Saha, S., Moorthi, S., Pan, H.-L., Wu, X., Wang, J., Nadiga, S., Tripp, P., Kistler, R., Woollen, J., Behringer, D., Liu, H., Stokes, D., Grumbine, R., Gayno, G., Wang, J., Hou, Y.-T., Chuang, H.-Y., Juang, H.-M. H., Sela, J., Iredell, M., Treadon, R., Kleist, D., Van Delst, P., Keyser, D., Derber, J., Ek, M., Meng, J., Wei, H., Yang, R., Lord, S., Van Den Dool, H., Kumar, A., Wang, W., Long, C., Chelliah, M., Xue, Y., Huang, B., Schemm, J.-K., Ebisuzaki, W., Lin, R., Xie, P., Chen, M., Zhou, S., Higgins, W., Zou, C.-Z., Liu, Q., Chen, Y., Han, Y., Cucurull, L., Reynolds, R. W., Rutledge, G. & Goldberg, M. 2010. NCEP Climate Forecast System Reanalysis (CFSR) 6-hourly Products, January 1979 to December 2010. Boulder, CO: Research Data Archive at the National Center for Atmospheric Research, Computational and Information Systems Laboratory.

Wang, W., Xie, P., Yoo, S.H., Xue, Y., Kumar, A., Wu, X. 2011. An assessment of the surface climate in the NCEP climate forecast system reanalysis. Climate Dynamic, 37,1601–1620. 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.

Please also note the supplement to this comment:
http://www.nat-hazards-earth-syst-sci-discuss.net/2/C1642/2014/nhessd-2-C1642-2014-supplement.pdf

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