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Comment on nhess-2021-400

Anonymous Referee #2

Referee comment on "Sensitivity of simulating Typhoon Haiyan (2013) using WRF: the role of cumulus convection, surface flux parameterizations, spectral nudging, and initial and boundary conditions" by Rafaela Jane Delfino et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-400-RC2>, 2022

Manuscript #: NHESS-2021-400

Title: Sensitivity of simulating Typhoon Haiyan (2013) using WRF: the role of cumulus convection, surface flux parameterizations, spectral nudging and initial and boundary conditions

Authors: Rafaela Jane Delfino, Gerry Bagtasa, Kevin Hodges, and Pier Luigi Vidale

Recommendation: Major Revision

General Comments:

The authors utilized WRF-ARW to simulate Typhoon Haiyan and investigate the role of cumulus convection (KF and TK schemes), surface flux parameterizations, spectral nudging, and initial and boundary conditions (ERA5 and EDA). They concluded that the TK scheme and spectral nudging improve track simulations with lower mean DPE than the other model configurations. On the other hand, KF scheme and varying the surface flux options improve the intensity.

This type of study will definitely be of a great addition to works that optimize a model's configuration of TC simulations in the Philippines, but in its current form is not yet ready for publication. Major parts of the paper should be rewritten due to the following **major concerns**:

1. (Line 55~Line 105, Line 125...) Although a future plan for conducting pseudo-global warming simulations was mentioned, WRF-ARW was used in the paper as a numerical weather prediction (NWP) model to simulate a weather event (TC Haiyan). However, the literature review (introduction) seems to interchange regional climate models (climatological simulations) with numerical weather prediction models (short-term weather events) resulting in mixed and improper citations of papers that use RCMs and NWPs. Event simulations are different from climatological runs. Although WRF and other NWPs can also be used as RCM, they are usually modified to efficiently work for climatological simulations (e.g. CLWRF, RegCM --RCM version of MM5, NHRCM – RCM version of JMA/MRI NHM). NHRCM, and not WRF, is the model used by Cruz et al., 2016 in Line 132.

The paper literature review should focus on studies that conduct TC short-term simulations using models (e.g. WRF, NHM) that are considered as NWP and not RCM. The

literature review also fell short in terms of discussing studies that tackle the other sensitivity parameters such as spectral nudging, surface flux, and ICBC. The reviewer hopes to see a clearer revised Introduction with an additional review on the said parameters.

2. The objective and analysis of this paper are very promising but the initial forcing is also very critical to consider it as a sensitivity analysis. Kindly clarify if the researchers downscaled only one mother domain (D1) for all D2 sensitivity runs? If not, then it will be inappropriate and difficult to compare the sensitivity of TC track and intensity to parameterizations if the initial forcing (D1) for each experiment have different model physics. This might explain the different (or larger differences of) values of intensities at $t=0$ in Figure 4. The reviewer strongly suggests to reconsider rerunning all simulations using only one D1 simulation as forcing to all D2 experiments.

With this 2nd major concern, it will be difficult to give meaningful comments on the results and discussions.

3. (Line 155-163, 166). Kindly provide supplementary materials for the results of the other domain configurations that led the authors to select the control run model setup. These supplementary materials are very important to justify the model setup of the control run.

Minor comments:

(Line 113): Correct the year "2012" to "2013".

(Line 125): Kindly reconsider "NWP" instead of "RCM".

There is no "Powers 2016" in the references.

(Line 132): Cruz et al., 2016 uses NHRCM and not WRF to make temperature and rainfall projections in the Philippines.

(Line 155-170): Kindly provide a table for your control run's model setup as indicated in this section. Make sure to clarify if you performed one-way or two-way nesting, specify the input forcing, temporal and spatial resolutions (dt,dx,dy,dz), model physics, and so on.

(Line 180): "These cumulus schemes are used because PAGASA uses KF ...". Does PAGASA also use TK? Does the writer mean "The KF cumulus scheme was used because ..."?

(Line 185): There is no Sun et al., 2019 in the references.

The discussion on TK is too short and vague. The author should also provide short discussion of the main output of the cited references. Same comment for Lines 194-195,

205.

(Line 206): Check repeating phrases in the sentence with "Charnock's (1995)".