Natural Hazards
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Discussions

Interactive comment on "Assimilation of Himawari-8 Imager Radiance Data with the WRF-3DVAR system for the prediction of Typhoon Soulder" *by* Dongmei Xu et al.

Anonymous Referee #3

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Overview: In this manuscript, the authors have tried to attempt to see the effect of data assimilation of AHI data for Typhoon Soudelor by using WRF-3DVAR. Perhaps, this data assimilation method has been widely used by many typhoon researchers, but this AHI data assimilation would be novel because Himawari-8 satellite provides more segmentalized bands compared to previous MTSAT series. I could see the effect of this AHI data assimilation, but the forecasting time is too short, which is close to nowcasting. Different initial locations may cause these track errors. Furthermore, the intensity forecasts from both experiments show the same tendency. It may indicate this AHI assimilation is not effective in improving inner-core structures yet. Actually, I could see longer period simulation results rather than 18-h simulations results to see definite

improvement of AHI_assimilation. Finally, as I suggest many specific comments and editorial comments, the authors seriously consider the English proofreading or carefully review this manuscript before publication. Therefore, since there are some corrections before publication, I would give a major revision opinion. Nevertheless, I think this paper approach is nice.

Specific comments

Lines 119-123: The authors could make the section lists to show how this paper is comprised.

Lines 69-72 & 126-128: These sentences are repeated.

Lines 147-151: I am not sure why the authors put the location of the focuses or purposes in this paragraph? I guess, if the authors put this to Introduction, it would be much clearer than now.

Lines 147-149: How can we understand that these three moisture channels are sensitive to those levels? Please provide some evidence.

Lines 190-200: About re-intensification of Soudelor, I guess, the authors reference JTWC best track data, because there is no such a pattern in JMA best track data. Please specify this information.

Line 200: what the Taiwan channel? Does that mean channel effect? I guess there are some papers discussing that. Please cite some references.

Lines 202-203: as mentioned in General comments, the authors should clarify the best track information.

Section 3.1: Figure 2 needs to make the same period with Fig. 1, and the authors may highlight the specific period (color-shading) according to the purpose.

Line 218: "We use Arakawa C grid in the horizon with a 5 km grid distance." What is the Arakawa C-grid? I know this grid-structure, but people reading this paper without

any background of the WRF model, may not understand this grid-type. If the authors want to use this, please clarify what it is or compare this with other grid-type kinds such as A, B, D, E types (should discuss momentum conservation and other kinds).

Line 219: is this eta levels? Or sigma levels? And is this even vertical spacing?

Figure 4 appears earlier than Fig. 3; that is not critical, but its order should be sequential. Please rephrase the sentences or remove them.

Lines 224-225: are there references for the Dudia scheme?

Line 225: It is surprising that YSU PBL is Noh et al. 2003? By the way, the authors said WRFV3.9.1. About the above and this line, the authors should carefully look at the WRF website to cite more appropriate references for the parameterizations.

Sections 3.1 and 4.4 and Fig. 1: What the authors reference the best track data? In the body context and Fig. 1, there is no information on that.

Section 4.2: I wonder that OMB and OBA indicate the observation (Himawari-8) – background (what background? Where it comes from? And how the authors calculate the brightness temperature of the analytic brightness temperature. Please clarify the methods of how to get the brightness temperature of the background and analytic one. Please put the title of each figure (band-8 micron unit).

Lines 300-307: I understand the authors' purpose. But these sentences should be more clarified. Without any vertical profile, it could be mere speculation. Please provide the weighting functions of each band, and it could then be discussed. And, the authors mentioned "cloud", it would be water vapors. In other words, most people may think "cloud" as "just cloud". As you know, there are many species such as ice, overwater phase, water vapor, and so on.

Figure 8: I wonder whether this stdv is statistically significant or not?

Figure 9: I could see the improvement; however, why they fluctuate?

Lines 363-366: It would be better if the authors cite one reference, at least for this sentence. Figure 11a: The legend is wrong. Please revise that. I guess, the figure could be enlarged.

Lines: 36-39: "The predictability of these TCs is limited because it entails complex multi-scale dynamic interactions. These interactions include environmental airflows, TC vortex interactions, atmosphere-ocean interactions, and the effects of mesoscale and micro-convective scale, together with microphysics and atmospheric radiation." Is your idea? Or someone said? Please cite some works for supporting this sentence.

Lines 241-243: Perhaps, this sentence accounts for data assimilation, in which the observations should be independent with each other. Do the authors think a 20-km resolution is appropriate to avoid the dependency between observations? If the authors say "right", please suggest any reference or results for that; for example, two normal-distributions.

Editorial comments

Over the whole manuscript: Please avoid to use many times "so" as the conjunction. Overall, the author should make the consistency of using the acronym and its order before the publication. For example, Lines 17-20: "The assimilation of AHI was implemented with the framework of the mesoscale numerical model WRF and its three-dimensional variational assimilation system (3DVAR) for the analysis and prediction of typhoon "Soudelor" in the Pacific Typhoon season in 2015.". Perhaps, the authors should correct some words; "AHI" → "AHI data"; spell "WRF" out; "typhoon Soudelor" → "Typhoon Soudelor (2015)". I guess the authors could use WRF-3DVAR "mesoscale numerical model weather research and forecasting three-dimensional variational assimilation system (WRF-3DVAR) or else. And please thoroughly see your wording to reduce mistyping or mistake since this paper goes forever after publication.

Lines 20-21 and else somewhere: "AHI Imager data" "AHI data" since the authors already used this as the acronym above. Please correct this word in the manuscript.

Line 21: "...rapid intensify..." Do the authors mean "rapidly intensifying"?

Lines 20-22: This line gives me something awkward. Do you mean "the AHI data assimilation was effective to simulate rapidly intensifying TCs."?

Line 26: forecast → forecasts

Line 35: Please use a general expression "quick intensification" → "rapid intensification"; "exact forecast" → "forecasts"

Line 40: The authors do not use the "IC" acronym after this line. Please remove this.

Line 42: "...relatively limited" → "relatively insufficient compared to the land" or proper expression.

Line 46: "... now can" → "have adopted"

Line 47: remove "directly"

Lines 50-51: "improve NWP technique" → I am not sure the authors want to say "these data improve NWP technique"? what the authors mean NWP technique? Please suggest examples.

Line 52: "... contributions to forecast accuracy ..." → "contribution to improving the accuracy of the numerical model results", The authors should rephrase this sentence.

Line 58: "Besides, compared to geostationary satellites, they have higher resolutions (Li et al., 2017; Shen et al., 2015; Xu et al., 2013)." → "Besides, they have finer resolutions compared to geostationary satellites (Li et al., 2017; Shen et al., 2015; Xu et al., 2013).

Line 61: "quickly" → "rapidly"

Line 67: "supervising" → "observing"

Line 126: remove "(Japan Meteorological Agency)"

Lines 135: "satellite" → "satellite series"

Lines 190-191: The authors need to polish this sentence.

Line 193: "west by north" → "north-westwards"

Line 205: "its main body" → "tropical disturbance" or "tropical depression"

Line 220: "initial condition . . ." → "The initial condition and . . ."

Line 238-239: Please remove unnecessary acronyms such as "Ps", "RHs" which words are not used anymore.

Line 403: 2.6 m s-1

Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2020-120/nhess-2020-120-RC3-supplement.pdf

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2020-120, 2020.