NHESS-2020-397
Authors' Responses to Prof. G. T.-J. Chen (Community Comment)
Date: 5 August 2021

Title: Evaluation of Mei-yu Heavy-Rainfall Quantitative Precipitation Forecasts in Taiwan by A Cloud-Resolving Model for Three Seasons of 2012–2014
Authors: C.-C. Wang, P.-Y. Chuang, C.-S. Chang, K. Tsuboki, S.-Y. Huang, and G.-C. Leu

1. Overall comments:

The purpose of this paper in to assess the skill of the 2.5 km CReSS in predicting mei-yu rainfall, to evaluate the model QPFs for larger and extreme events, as well as to understand the QPF strength of CReSS. The paper is well written and the results are of academic and application values. The paper can be accepted to be published in "Natural Hazards and Earth System Sciences". Some comments and suggestions are as follows:

Reply:
The positive view and constructive comments from Prof. G. T.-J. Chen (community comment) are deeply appreciated, and the paper has been revised according to the comments from all reviewers and the community. In the revised manuscript (color-coded version), the changes made in response to Reviewer 1, Reviewer 2, Prof. Chen, and by ourselves (mostly minor changes in English) are marked in red, blue, green, and orange, respectively. A point-by-point response to each of the comments from this reviewer are given below following their order. In each point, how and where the revision is made in the text is also specified.

2. Specific comments:

1. In the Abstract, 2nd paragraph, "… the TSs are shown to be higher and the model more skillful in predicting larger events …". The plausible physical explanations are needed.

Reply: In the revision, the third paragraph is merged with the second one in the abstract to offer a plausible physical explanation for the improved skill in heavy-rainfall QPFs by the CRM with a higher resolution, along the lines as suggested (L25).

2. In the Abstract, 3rd paragraph, "The strength of the model lies mainly in the topographic rainfall in Taiwan rather than migratory events that are less

predictable". The plausible physical explanations are needed.

Reply: In the revision, this sentence is reworded to "With the convection and terrain better resolved, the strength of the model is found to lie mainly in the topographic rainfall in Taiwan rather than …" to offer the physical explanations more clearly, as suggested (L24-26).

3. Section 3.1, 2nd paragraph, "…, the TSs are higher and the skill better for larger events than smaller ones". The plausible physical explanations are needed.

Reply: Here in Section 3.1, the phenomenon of higher TSs (better skill in model QPFs) for larger events is first demonstrated in Fig. 4, and is referred to as the positive dependency of model QPF skill on event magnitude (i.e., rainfall amount). The plausible physical explanations are explored and discussed in Section 4, and we note this in Section 3.2 clearly, along the lines as suggested (L280).

4. Section 3.1, 3rd paragraph, "…, the model is more capable to produce hits toward the rainfall maxima,…". The plausible physical explanations are needed.

Reply: The plausible physical explanations are explored and discussed in Section 4, and we note this in Section 3.2 clearly, along the lines as suggested (L280). Please also see our reply to point #3 above.

5. Section 3.1, 4th paragraph, "…the model also produces higher POD and SR for larger events compared to smaller ones…". The plausible physical explanations are needed.

Reply: The plausible physical explanations are explored and discussed in Section 4, and we note this in Section 3.2 clearly, along the lines as suggested (L280). Please see our reply to points #3 and #4 above.

6. Chapter 5, 3rd paragraph, "…the 2.5-km CReSS is more skillful in predicting the larger mei-yu events in Taiwan within 2 days,…" The plausible physical explanations are needed.

Reply: In this paper, a plausible physical explanation for the improved skill in heavy-rainfall QPFs by the CRM with a higher resolution is mainly investigated and discussed in Section 4 through examples. In the revision, various places in both Section 4 and later

sections are modified to make our findings in this regard more clearly to the readers, as suggested (L328-329; L401-402; L412; L484-485; L487).