

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2022-377

Anonymous Referee #2

Referee comment on "A modeling study of an extreme rainfall event along the northern coast of Taiwan on 2 June 2017" by Chung-Chieh Wang et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-377-RC2>, 2022

Authors designed 5 cloud model runs to simulate and discuss an extreme rainfall event along the northern coast of Taiwan on 2 June 2017. The 24-h rainfall maximum along the northern coast is well simulated (541 mm) in the F1 experiment (1-km run) as compared with the rain gauge observation (645 mm). Analyses on mei-yu frontal movement and the roles of frontal disturbance are valuable. There are some major comments about the model experiments. I would suggest authors to modify the paper according to my comments to make the manuscript more complete and solid. *The paper could be publishable in Atmospheric Chemistry and Physics with major revisions.*

Major comments:

- In the S3 experiment (3-km experiment), the surface front arrived at northern Taiwan too early, by about 9 h. Authors state that this situation is acceptable for the third day simulation. However, the arrival time error of surface front is too large (~ 9h). It means that model failed to simulate the large-scale/mesoscale weather patterns in real atmosphere (including circulations, radiation, thermodynamic processes and etc.). Thus, it is not acceptable to use the simulation of S3 to analyze the frontal characteristics. Also, one important question is that: if the authors know that there are great errors for the third-day simulation, why do author use the third-day simulation to analyze the front/frontal rainband characteristics? I strongly suggest that authors compare model simulated 24-h rainfall accumulation and rain gauge observation from CWB by presenting the same time period during 1600 UTC 1 June to 1600 UTC 2 June

(0000-2400 LST 2 June) [Figs. 6 and 9b].

- To test and clarify the role played by the topography on the mei-yu front, authors remove topography of Taiwan (and northern Taiwan) in S3 experiment, referring to S3-NT and S3-NNT experiments. Since the frontal arrival time error is about 9 h, it is not appropriate to use S3, S3-NT, and S3-NNT experiments (3-km experiments) to discuss the interactions between mei-yu frontal system and topography over Taiwan. Instead, authors should use F1 experiment (1-km experiment; the best simulation of frontal arrival time and propagation speed in this manuscript) as the CTRL run and design the sensitivity tests of topography based on F1 experiment (e.g., F1-NT and F1-NNT).

Minor comments:

- Line 219-221: "This is because without the terrain, the near-surface (and low-level) southwesterly winds can blow across the flattened island without the blocking effect (Figs. 7g-i)," should be "... (Figs. 7g-i)."
- Line 275: delete "say,"
- Section 7 (Line 380-383) and Figure 1b: For the "NNT" (remove northern Taiwan) run, do authors remove Datun Mountain only in the model or both Datun Mountain and Linkou Plateau? Please specify.

Please also note the supplement to this comment:

<https://acp.copernicus.org/preprints/acp-2022-377/acp-2022-377-RC2-supplement.pdf>