

Interactive comment on “Mesoscale processes for super heavy rainfall of Typhoon Morakot (2009) over Southern Taiwan” by C.-Y. Lin et al.

Anonymous Referee #3

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Recommendation: Major revision
General comments: 1. This study explores the mechanisms causing the record-breaking rainfall in southern Taiwan during the passage of Typhoon Morakot (2009). There are at least two published papers (Ge et al. in Atmospheric Science Letter and Hong et al. in Geophysical Research Letter both in 2010) addressing this extreme event. The findings of the present study are quite similar to what were presented in Hong et al., which explored the multiscale nature of Typhoon Morakot and pointed out the importance of the convergence of monsoon southwesterly and northwesterly of typhoon circulation over the Taiwan Strait west of Taiwan, and the topographic lifting effect. To appeal to the readers, the present study needs to bring in insight that is beyond what these two papers already provided. 2. The title of present study pinpoints what are missing in these two papers: mesoscale processes. However, the present study did not really explore the mesoscale processes that were
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embedded in Typhoon Morakot and led to the record-breaking rainfall. Instead, the approach is more like a synoptic-scale analysis. A mesoscale process study can be done by either a detailed radar data analysis or a high-resolution model simulation, or a combination of the two. Present study did not take any of the two approaches. Instead, it relied on the 0.5 by 0.5 degree data of the NCEP GFS and did a 10-km resolution simulation using WRF. It is then not surprising that the present study did not succeed in revealing the nature of mesoscale processes at convection scales. As noted in the manuscript, the continuously heavy rainfall on 8-9 August was the major reason for the disaster. The mesoscale processes leading to this continuous heavy rainfall should be the major focal point of present study according to the manuscript title. 3. A help from professional English editor is desperately needed to improve the writing. Numerous typos and grammatical errors in the present manuscript make it difficult to read.

Specific comments: 1. The introduction is too long. It contains too much non-essential information. For example, there is no need to show photos of Xiaolin village. On the contrary, the summary is too brief. 2. The arrangement of figures should be arranged to match the discussion. Discussion often jumps from figure to figure. For example, Figure 1e was not discussed until Section 4. This practice makes it difficult to follow the authors' discussion. 3. What was done in the present study so that the model was able to simulate more realistic rainfall amount than Ge et al. did? Many similar modeling studies on Typhoon Morakot had been presented in recent conferences. They all reported similar rainfall distribution and amount as shown in Figure 1e. 4. It is doubtful that a model simulation with 10-km resolution is able to simulate realistic mesoscale processes in convection scales. The model seems to be used like a downscaling tool in this study, not for dynamical processes. But the 10-km resolution is not high enough to provide the very detailed structure of the typhoon and rainfall distribution. 5. Some details about the simulation should be discussed. For example, how was the case simulated? Was the model run starting from 0000UTC 06 for four days? How was the typhoon track simulated? 6. It is better to scale typhoon strength according to the category scheme that is commonly used in the international meteorological community,

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although the CWB of Taiwan has its own unique scheme (i.e., strong, intermediate, and light). 7. The 3-D figures presented in Figure 4 are difficult to comprehend. Why was the 550 contour chosen? It does not reveal 3-D structure clearly. A combination of few cross sections may be more informative than the present 3-D figures. 8. The topographic lifting effect was not really demonstrated in the manuscript.

Technical comments: 1. The manuscript contains too many typos and grammatical errors to be listed one by one in this review. Please seek for professional help in English writing. 2. It should be A-Li Shan, not "A-Li Shan Mountain". Shan is mountain in Mandarin. 3. Line 16, page 1: It should be "ever recorded", not "ever". 4. Line 15, page 6: The rainfall did not last for 4 days during 2-6 August. It occurred on and off. 5. Line 11, page 11: The blockage of the flow by the mountain cannot be seen clearly in figure 4e. 6. Figure 3b is redundant since it is not really discussed. Figure 3a alone is enough to reveal the loose structure of Typhoon Morakot and should be shown and discussed at the beginning. 7. Figure 1b can be removed. There is no need to show the auto rain gauge distribution. The box shown in figure 1b can be marked in Figure 1d. Simulated rainfall should not be shown in Figure 1e because it is not discussed until Section 4. Table 1 can be removed without harm since the comparison with previous typhoons is not an issue here.

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