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Discussions
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Interactive comment on "Numerical rainfall simulation with different spatial and temporal evenness by using WRF multi-physics ensembles" *by* Jiyang Tian et al.

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We thanks for the comments from Professor Zhang and the comments may help to improve the readability of the paper. The explaination to the comments is showed below point-by-point: 1.Since each storm is 24 hours, it is assumed the authors initialize the model at the start of the storm. It would be informative to indicate when the model was initialized. This would also let the readers know how any approaches to spin-up (if any) was dealt with. Reply: In this paper, the start time of the storm can be seen in Table 2. Due to a spin-up period of 6 hours is needed to develop the smaller scale convective features, the start of the model integration is 6 h earlier than the storm start time and the end time of the model integration is consistent with the storm end time. 2.It is important

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to let the readers know the timescale for integration step of WRF model. Reply: The WRF developers recommend a timestep in seconds of 6×dx (in km), where dx is the grid spacing. The integration step of WRF used in this study follows exactly the '6×dx' rule and the integration step is 6s for innermost domain. 3.It seems that the model may produce some insignificant precipitation (less than 0.1 mm/hr). Could you explain it? Reply:As Professor Zhang mentioned, the threshold is 0.1mm/hr and the insignificant precipitation (less than 0.1 mm/h) is regarded as no rain. 4.Why do you choose 40 vertical layers with 1 km horizontal resolution? Could you give some details on the number of vertical layers used in the study? Reply:It is a good comment. The vertical layers between 25 and 55 are commonly used in WRF model. I think Professor Zhang may consider that the vertical layers may have effect on the performance of WRF model. However, it needs to do a lot of experiment to find the optimal number of layers. Qie et al. (2014) simulated the storm event occurred in Beijing, which is near the study area in the manuscript. The inner domain is 2-km and the vertical layers are set to be only 27. Aligo et al. (2009) indicated that the QPF forecasts cannot be always improved by adding the vertical layers with 4-km horizontal resolution in American Midwest. In my opinion, it is an interesting issue to investigate the combinations of the vertical layers and the horizontal resolution, but this is not the main concern of this study. We hope to obtain meaningful conclusions in further study. The two references are followed: Aligo E.A., Gallus W.A., Segal M., 2009. On the impact of WRF model vertical grid resolution on Midwest summer rainfall forecasts. Weather Forecast. 24, 575-594. Qie X., Zhu R., Yuan T., Wu X., Li W., Liu D., 2014. Application of total-lightning data assimilation in a mesoscale convective system based on the WRF model. Atmos. Res. s145–146, 255-266. 5.If it is possible, more data would be better to firm the conclusion. Reply: The conclusion of the study can provide a reference for the ensemble rainfall simulation in semi-humid and semi-arid areas of China. As the paper mentioned in section 6 "conclusion", more strom events should be investigated and simulated. More studies will be carried out in the study sites for further research.

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