Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC2
https://doi.org/10.5194/gmd-2020-439-RC2, 2021
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Comment on gmd-2020-439

Anonymous Referee #2

Referee comment on "Simulation study of a Squall line hailstorm using High-Resolution GRAPES-Meso with a modified Double-Moment Microphysics scheme" by Zhe Li et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2020-439-RC2, 2021

General comments

This manuscript described a GRAPES-meso simulation of a hail-producing storm using a double-moment microphysics scheme. The results are compared with radar and surface observations. Some routine analysis/comparison were done and it was concluded that the model was able to simulate the case reasonably well. Overall, the scientific merit of the study is pretty poor since it does not provide new knowledge or understanding in terms of either the scheme or storm evolution/characteristics. There is no quantitative comparison at all. Actually, the position of simulated storm is displaced north by 200 km and weaker (Fig. 4). Probably due to this displacement, simulated hail occurred mostly over the water. but there is no discussion about this at all.

For the scheme description part, those equations are simply presented without any justification and references. What are the physical reasoning behind to use those empirical parameters? What are the size distribution function assumed? How does the scheme differ from other schemes?

Without comprehensive/quantitative comparison with available observations (e.g., hail

size, accumulated rainfall, among others), it is hard to be convinced the simulation well captured the storm. The study would benefit if another simulation using a different microphysics scheme can be conducted and contrasted. Finally, a detailed observational analysis and diagnosis of the storm itself, including its evolution, might be worth further investigation.

Specific comments

References to the observational and modeling effort of hail storm in the introduction is rather limited and some of them might be outdated.

Do the radar observations indicate any hints of the dry/wet growth of hail?

Note that the model calculated radar reflectivity might be significantly biased without proper consideration of hail properties.

For the cross section analysis, it would be nice to choose one perpendicular to the squall line.