Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2021-230

Anonymous Referee #2

Referee comment on "Representation of the autoconversion from cloud to rain using a weighted ensemble approach: a case study using WRF v4.1.3" by Jinfang Yin et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2021-230-RC2, 2021

General

Cloud microphysical processes are key components in parameterizing precipitation in numerical models yet large uncertainties remain between different autoconversion schemes. By combining four autoconversion rates schemes through a weight mean approach, the authors propose an ensemble scheme to try to avoid limitations of individual scheme. The ensemble scheme is then incorporated into the Thompson scheme to simulate an extreme rainfall event over Southern China. The rainfall extreme, distribution (both temporal and spatial) and hydrometer content are then compared with simulation with the Berry and Reinhardt (1974) scheme. Results show improvements in the timing and space of rainfall peak. This manuscript is well written, and the topic of this manuscript fits the scope of GMD. I recommend acceptance for publication after returning to the authors for minor revision.

Major

The authors choose to compare simulation from EN with that from BR, I understand that it is partially because BR is used in the original Thompson scheme, but some results are kind of expected from Figure 2, for example, delayed rainfall peak. Did you compare the EN results with simulation using LD scheme?

I appreciate the efforts of combining different schemes, but the manuscript lacks descriptions and recommendations on how to adjust the weights in the EN when simulating clouds in different synoptic systems, for example, continental deep convection vs maritime drizzling stratocumulus. As the authors stated in Section 2 that each of the schemes spatializes in certain conditions. In the case demonstration, if you adjust the weights to giving more weightings to schemes that are more suitable for continental deep convection, will the results be closer to observations? It might be too much work to add in

this manuscript, but the EN scheme will be more practically valuable if the authors can propose a recommending framework to adjust the weights for different types of clouds.

Minor

Line 99-100: please rephase this sentence. Do you mean the Cotton (1972) scheme results in the peak cloud water content occur the earliest time, at the lowest cloud attitude but has *the lowest value* as compared with other schemes?

Line 119: remove *are*

Line 222-230: I do not get how the ensemble scheme can represent subgrid-scale cloud processes with integrating one or more of the schemes over any assumed CWC or Nc distributions like in Griffin and Larson, 2013. Any one of the four schemes itself cannot represent subgrid-scale processes.

Line 288: …it is convenient to *conduct* a launch simulation…

Line 321: what is 'ER'? please elaborate when you first introduce an abbreviation.

Figure 7: is there radar observations at Jiulong site to compare reflectivity in observation and simulations? Does the observed maximum reflectivity extend to the surface?