

Interactive comment on “Microphysical variability of Amazonian deep convective cores observed by CloudSat and simulated by a multi-scale modeling framework” by J. Brant Dodson et al.

Anonymous Referee #1

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Please see the supplement for the complete review. The summary and major items are included below.

Summary: The authors use the Amazon as a testbed for assessing the internal structure of deep convection observed by CloudSat. Deep convective cores are shown, through a “double arc” structure in CFADS, to be composed of either highly reflective graupel and hail or weakly reflective snow. Cloud structure is contrasted between day/night and wet season/dry season to modest effect. The authors then compare their CloudSat results with those from two SP-CAM runs. These simulations are conducted with different versions of the model which results in the simulations of differing

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cloud structure between the simulations themselves and between the simulations and CloudSat. The authors report new results, but these are incremental. There are several aspects of the paper that need improvement: 1) the “double arc” is not plainly obvious yet the authors make a point of discussing it at length; 2) the analysis of the simulations seems to lack an obvious direction. I would recommend acceptance if the issues below are addressed.

Primary items:

- 1) The “double arc” is not especially obvious in any of the panels of Fig. 3. It took me quite a while to fully recognize what structure the authors were talking about and to convince myself that it was not just a result of the contour intervals used. I’m not sure what the remedy is for this, but the double arc structure needs to be made clearer through either some enhancement of the figure, a schematic, or particularly lucid writing.
- 2) I don’t understand why the authors feel they can ignore graupel in SPV4. The model seems to include graupel to the same degree that it includes any physical species. It seems to be just as much a part of the precipitating ice category as snow.
- 3) I don’t think you have shown sufficient evidence to draw the conclusion you do on Line 285 (even if we all hope that this conclusion is true). Figure 6-9 show only that SPV5 behaves more logically. We do not know how the real world binned variables (reflectivity, SWC, etc) depend on Wmax. And, I’m not sure I agree that the SPV5 CFAD is more like the CloudSat CFAD than the SPV4 CFAD; they share more characteristics with each other than they do with CloudSat. Perhaps you could add the difference between the CloudSat CFAD mean and those from both model runs to Fig. 5d. Or maybe you could compare the variance at each level.

Please also note the supplement to this comment:
<https://www.atmos-chem-phys-discuss.net/acp-2017-864/acp-2017-864-RC1->

C2

supplement.pdf

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-864>, 2017.