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Atmospheric Chemistry and Physics Discussions

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.

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Review on "Microphysical variability of Amazonian deep convective cores observed by CloudSat and simulated by a multi-scale modeling framework" by Dodson et al

In this study the authors use CloudSat data to analyze aspects of the microphysical properties of convective clouds over the Amazon. They show using the DBZ distributions vs. Height space (CFAD) several interesting features of these clouds. They show that when slicing per cloud type, clearer structural information appears that could be interpreted as contribution from specific hydrometeors type. Moreover, comparing the CFAD properties day vs. night and dry vs. wet season they could show shifts in cloud dynamics and microphysics. On the second part of the paper they check if numerical

models can reproduce the CFAD properties. They compare two types of microphysical schemes and show that the two moment can produce results that are closer to the observations but still some of the main features are missing (such as the double arc shown in the observational part).

The first observational part of the paper reads well (less acronyms will make it even better) and it shows quite clearly the differences in the vertical hydrometeors distribution of convective cores, anvils and other clouds. The numerical modeling part is less clear and in my opinion does not stand on the same level of the first part. They start with a long discussion on why the models will fail before showing any results. Then they try to explain the dependency of the model results on updrafts comparing the two microphysical scheme.

Recommendations: (1) I would focus on the observational part making the paper clearer and shorter. The insights gained by the model experiments does not really explain the observations. The message that two moment microphysical scheme produces results that are more similar to the observations is interesting but then why not trying bin microphysics?

(2) One additional analysis that could make the paper clearer and enhance the papers importance is to try to slice the data per aerosol loading. Such analysis should be doable using aerosol information near the observed clouds from the MODIS Aqua. Both the area and the topic of the paper are ideal for such study. Changes in the aerosol loading should directly affect the hydrometeors distribution and therefore should be reflected in the CFAD space. Specifically, in higher aerosol loadings I predict that the convective cores will be taller controlled by stronger updrafts. The onset of precipitation will be delayed but once rain starts it might be stronger. The effect on the ice particle distribution with height would be extremely interesting.

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