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Atmospheric Measurement Techniques Discussions

Interactive comment on "Analysis and evaluation of WRF microphysical schemes for deep moist convection over Southeastern South America (SESA) using microwave satellite observations and radiative transfer simulations" *by* Victoria Sol Galligani et al.

Anonymous Referee #2

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General comments: This study provides some interest analysis on the scattering properties of frozen particles in the WRF model simulations. The WRF simulations are converted to microwave brightness temperature with an equal mass habit approach, and compared with satellite observations. Three microphysics parameterizations and their sensitivity to different single scattering properties of frozen particles are investigated. I would recommend the manuscript for publication after the following comments are addressed.

Major comments: 1. Line 181-190: Is there any specific reason to select these three microphysics schemes? Or just randomly? Why are both the WSM6 and WDM6 schemes selected? This study targets on frozen particles. However, WSM6 and WDM6 use the same parameterization of frozen particles. The performance of WSM6 and WDM6 are consistent for most of the results shown in the manuscript. Is it necessary to include both of them?

2. Figure 7 and 8: As mentioned in Line 414-415, there are differences in the location of the observed and modelled cloud system. Is it representative to discuss the differences among simulations and observations? For example, the difference of IWP (graupel) between WSM6 and WDM6 are large for the transect in Fig. 7. However, the difference of graupel is small between WSM6 and WDM6 in Fig. 5. It will be more representative to use zonal/meridional means for comparison. And it will be interesting to see the relative contribution (sensitivity) of snow/graupel to the simulated brightness temperature in different microphysics schemes.

3. As one of the goals of this study is to evaluate the microphysics parameterizations, could the authors have more discussions about how to interpret/use these results in terms of evaluation? As shown in the manuscript, there are large uncertainties in distribution, mass, and scattering properties of frozen particles in different microphysics schemes. However, all the simulations produce comparable bright temperature to the observations. Can we conclude from this study which scheme produces more realistic frozen particles?

Minor comments: 1. Line 173 "the five hydrometeor categories": It depends on the selected microphysics scheme, for example, WSM3 does not provide five hydrometeor categories.

2. Line 204-207: It is not easy to follow. It will be helpful for reader to understand by providing the following information shown in Thompson et al. (2008): "the spherical and constant-density snow assumption is applied in models through the assumed mass-

diameter relation, usually with the power law." "The new scheme considers snow to be primarily composed of fractal-like aggregated crystals, which likely captures the vast majority of the actual snow mass reaching the earth's surface."

3. Line 237-238: THOM has more frozen particles than WSM6 and WDM6.

4. Line 244-246: Is there any reference?

5. Figure 6C: Please add legend.

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