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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Overview: Precipitation Characteristics and Sensitivities to the Environmental Conditions during GoAmazon2014/5 and ACRIDICON-CHUVA" *by* Luiz A. T. Machado et al.

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This study utilized field campaign data collected during GoAmazon 2014/5 and CHUVA-ACRIDICON, as well as satellite and S-band radar data, to give an overview of precipitation characteristic and corresponding thermodynamic conditions, and analyze the relationship between precipitation and several environmental conditions, including aerosol loading, land surface, etc. Contrast between the wet and dry season for these characteristics and relationship were emphatically discussed. Although there are numerous previous studies about the convection and precipitation in the Amazon, this is

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the first paper which summarizes such complex features about the precipitation and its seasonality in the Central Amazon using multiple comprehensive datasets. Overall, I found this work to be well-written and scientifically sound, and results in this work will aid to further understanding of cloud and precipitation systems in Amazon and potentially provide implications for modeling groups to improve GCM parameterization. I recommend this manuscript to be published after some minor revisions.

Specific Comments:

1. Page 3, Line 10: Could the authors provide reference for this statement? Additionally, I think it would be also helpful to add monthly rainfall in Figure 2 since SIPAM product is available in 2014 and 2015 whole year. In ECMWF reanalysis data and S-band radar rain rate derived by (Zhuang et al. 2017, JGRA), Sep is even drier than July and August.

2. Page 3, Line 15: It would be helpful to describe how CAPE was calculated either here or in the method section. Specifically, what is the initial condition of the parcel (surface based, mixed layer average, . . .)? The choice of initial parcel could affect the CAPE value very significantly, possibly the seasonality as well.

3. Page 7, Line 12: Is there a reason for only using 2014 wet-season disdrometer data to determine the Z-R relationship? Can the authors further speculate how much this approximation that the wet and dry seasons have same DSD could affect results? Such as Figure 1 and Figure 4, does the approximation make the difference between wet and dry season smaller or larger?

4. Page 9, Line 21-22: I feel that usage of “rain rate” and “rainfall” could be a little confusing here. By “This is the reason why the wet season has a maximum rain rate”, I think the authors actually mean the average daily rain rate but not the rain rate used in Line 15-16 for rain event. I feel it’s better to explicitly specify the average period and use something like “rain rate for precipitation event”, or just use symbol RR and R to discriminate them. Also check Line 34 in abstract and description in Figure 1.

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5. Page 9, Line 30-33: Similar conclusions about atmospheric instability and cloud fraction variations between wet and dry season were also discussed in some previous studies such as Zhuang et al. 2017.

6. Page 9, Line 31: Definition of bulk shear is not given. Is it surface to 6km bulk shear?

7. Page 12, Line 24-26: Is the comparison "clearer distinction" made between the dry and wet season or between 8km and above 8km in the dry season? Also, in conclusion section at Page 17, Line 28-29, "... more homogenous clouds above 8-km ...", does this contradict with "... higher correlation at approximately 8km" here? It seems to me the frequency of RhoHV<0.97 is higher above 8km, and that of RhoHV>0.97 is lower above 8km. Doesn't this mean the average RhoHV is smaller and the cloud becomes less homogenous above 8km?

8. Comparison between Figure 6c and 6f shows dry season has larger frequency in high RhoHV range (larger purple area) above melting layer and below 8 km, which means RhoHV is smaller and the cloud becomes less homogenous above 8km.

9. Page 14, Line 19-22: Discussions here are not very clear. What does "the variation ... is 25%" mean? What "difference" is "very consistent"?

10. Page 16, Line 2: "difference ... increase with the altitude ...". I don't find this statement to be true for Figure 11b.

11. Page 16, Line 20: Please provide statistical test for the linear relationship in Figure 10, especially 10c. In addition, solid rectangles and circles look very similar in Figure 10bc. Maybe use another marker such as "x" in Figure 10a.

12. Page 16, Line 30-31: Firstly, although dry season seems to have a stronger linear dependency between rainfall and elevation than the wet season, they still look very similar. Is this difference significance tested between all adjacent elevation groups? Similarly, it would be helpful to indicate if the difference passes the significance test between different surface types for a single season in Figure 8. Secondly, the conclusions

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here about the dependency of dry season rain rate on topography seem to valid at first. However, is this result independent from those in section 3.2.2 about surface type? If so, the authors need to indicate there is no specific relationship between surface type and topography. I also suggest adding a figure to show surface type and contoured elevation of the studied area.

13. Page 18, Line 21: Could the authors provide reference to the related studies?

14. Quality of some figures need to be improved. Specifically, e.g., sub-figures were not properly labelled, such as Figure 3-6 & 9; black lines around the figure should be removed, such as Figure 3&6; Figure 2, Maybe more details about the box plot can be given either in text, figure caption, or both. e.g. how is "outlier" defined and how to determine the length of whiskers?; text "wet" and "dry" are not all visible inside the Figure 6; Figure 10a is in different size with 10bc; some texts were not shown as subscripts, such as Nccn and Dm; etc.

15. I'm not sure how to interpret the unit (%) of occurrence frequency in Figure 5&6. If the CFAD was constructed the same way as (Yuter and Houze, 1995, Part II, MWR), shouldn't the unit be, for example, "% km-1 dBZ-1" for Figure 6ac.

Typos and Grammar Issues includes, but is not limited to:

Page 1, Line 28: "This is study" –> "This study"

Line 30: "instruments systems" –> "instrument systems"

Line 32: "have carefully been" –> "have been carefully"

Line 35: "While" cannot be used to start the sentence here

Page 2, Line 1: "as well" –> "as well as", "among" –> "between"

Line 2: "analyse" –> "analyzed"

Line 3: "is" –> "was"

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Line 7: “observe” –> “observed”, “dependence on” –> “dependence of”

Line 10: “cloud droplets number” –> “cloud droplet number”

Line 10-11: “revealed”, “exhibit” check tense consistency

Line 20: “sea -level” –> “sea level”

Page 3, Line 10: “Amazonas, For” –> “Amazonas. For”

Page 4, Line 20: “During” –> “during”

Page 6, Line 20: “present” –> “presents“

Line 25: “Section two” –> “Section 2”

Page 9, Line 16: “differences, the” –> “differences. The”

Page 10, Line 6: “Cloud Clusters and Rain Cells-Size Distribution” –> “Size Distribution of Cloud Clusters and Rain Cells”

Line 27: “diameter” –> “Diameter”

Page 11, Line 4: “present” –> “presented”

Line 17: “function” –> “ functions”

Page 14, Line 21: “few differences” –> “smaller differences”?

Page 15, Line 34: “difference” –> “different”

Page 17, Line 25: remove “Conversely, ”

Page 30, Figure 1: Label for x-axis should be “mmïĆđh-1” not “mm.h-1”. Also check other figures. Use “Sep” instead of “Sept”.

Page 32, Figure 3: “distributions between wet and dry seasons and the difference between dry . . .” –> “distributions during the wet and dry seasons and the difference between the dry . . .”

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Page 33, Figure 4: “t-statistic” –> “t-test”

Page 36, Figure 7: “radar S-band” –> “S-band radar”

Page 37, Figure 8: “t-student” –> “Student’s t-test”

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