

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-87

Anonymous Referee #1

Referee comment on "Morning boundary layer conditions for shallow to deep convective cloud evolution during the dry season in the central Amazon" by Alice Henkes et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-87-RC1>, 2021

This manuscript provides a comprehensive study contrasting meteorological variables between shallow and shallow-to-deep convection transition cases, with a focus on boundary layer processes, using the GoAmazon field campaign data collected during the dry season (IOP2) of 2014. Some results are overall consistent with previous studies. However, there are two major issues for this study, one is new findings are not clearly presented and discussed, and the other one is the very small sample size. And the overall writing and English should also be improved. My recommendation is a rejection but I encourage a re-submission after these issues are addressed.

- After reading through the manuscript, one major issue is that I'm confused about what's new findings in this study. Many mechanisms related to BL processes and development are either well taught in university textbook or discussed in previous studies. Mechanisms or results unique to this study should be clearly discussed in either results or discussion section.
- A big limitation of this study is the very small sample. With only four samples for each category, it's very hard to convince the readers that the average profile and the standard deviation capture the whole picture. The large error bars in many figures render many differences between two categories insignificant and thus some statements related to comparisons are not backed up by the figures. The authors argue that their samples show certain variations and are consistent with previous studies. To me, however, a few samples being consistent with previous studies (Line 403-405) cannot be used to justify why they are not using a larger sample when they can. I understand the GoAmazon only has very limited data in the IOP period for dry season, however, as far as I know, the main difference between IOP2 and non-IOP periods is only the additional 10:30 sounding, which only affects the results of Figure 2 and part of Figure 3. Thus, I think data of two whole dry seasons during GoAmazon should be utilized. On the other hand, the criteria for selecting ShCu and ShDeep can be modified as well to incorporate more samples. For example, shallow convection that did not directly pass over the site cannot be observed by ARSCL, but it can be shown in S-band radar. Also, it's also not clearly explained why the authors only focus on the dry season.
- Although the focus is different, some of the composite analysis results are actually

quite very similar to Zhuang et al. 2017, eg. part of Figure 2-5. This point should be mentioned and explained specifically why presenting these similar results about shallow-deep difference are necessary for understanding the boundary layer processes. In addition, similarity, difference, and new findings regarding to the results of this study compared to Zhuang et al. 2017 should also be discussed more clearly.

- The overall writing should be improved. There are many unclear sentences and I list some of them below as well as some minor comments.

Line 8: I don't think the vertical wind shear presented here qualified as "intense".

Line 24: convection -> convective

Line 25: central or Central? Please be consistent throughout the paper, including the title.

Line 79-80: This sentence should either be split or reorganized. "The vegetation cover (...) nearby the intersection ..." does not make sense.

Line 83: do you mean "meteorological variables at near-surface level"?

Line 84-85: what is "conditional rain rate"? and what does "threshold" here mean for rainfall?

Line 92-94: what is the difference between three BL candidates?

Line 133-134: The ARSCL cloud top and Are these criteria need to be met simultaneously or only one is OK?

Line 150: profile -> profiles

Line 151: times -> time

Line 155-170: Why discuss temperature in between humidity variables. If there is no particular reason, I think the discussions of moisture profile should be placed together.

Line 183-184: "12m/s" and "10m/s" do not matched what's shown in Figure 2d.

Line 190-191: This sentence is hard to understand. I suggest split and rewrite to make it clearer.

Line 194: what produces a lower LCL and CIN. Please rewrite this sentence as well.

Line 208: it is convective clouds that reduce solar radiation not precipitation.

Line 208-210: This statement is not clear.

Line 220: Fig. 4c -> Fig. 4d

Line 241: These differences are not statistically significant due to the very large errorbar.

Line 282: what does the plus-minus sign mean here? Is it standard deviation or confidence interval.

Line 383: "different nighttime and environment"?

Line 386: Please correct this sentence "2 m specific moisture, such as warm air temperature". Also, the term should be specific humidity not moisture.

Figure 1e: why is there no deep convection observed?

Figure 2: in the second row, x axis range should be narrowed down to better shown the difference.