

Review of “Morning boundary layer conditions for shallow to deep convective cloud evolution during the dry season in the Central Amazon” by A. Henkes et al. (R1)

I appreciate the efforts of the authors to address my comments, revise the manuscript and add a new section for statistical analysis of more cases during two cases. I'm ok that the authors decide to focus on case study and use a new section of statistical analysis for more cases to support their conclusion. However, in this case, I would suggest showing all individual cases throughout the analysis and focus on discussing their overall behavior as well as case-to-case variability in Section 3 (use lighter color and thinner lines to present individual cases, as well as more solid color and thicker lines for their means), instead of just means and standard deviations, as I don't think standard deviation of merely 4 cases makes sense enough. One important point concluded by the authors is that the shorter morning transition stage of ShDeep days (or delay growth of BL in ShCu days) is due to larger sensible heat flux in ShDeep days. However, I don't think this point is convincing enough as the SH difference at this stage is actually not significant before 8 LST in Fig. 4f, nor did it supported by the additional analysis in Fig. 11. This part should be more carefully discussed. In this version of revision, I still find a lot of long and awkward sentences, grammatic error, incorrect reference to Figures and numbers. I suggest the authors should check the manuscript more carefully again and improve the English writing. Besides these, I'm overall satisfied with the response addressing my other comments. My recommendation is a major revision.

Specific comments:

Line 1: “two dry season years” → “dry seasons of two years”

Line 5: “Atmosphere” → “Atmospheric”

Line 8-9: recommend revision: “decreased duration of ... is associated with ...”

Line 13-16: This sentence is too long and hard to understand, please rephrase. Also, I did not recall seeing an analysis for the impact of morning transition duration on convection strength and subcloud processes.

Line 26: “others” → “other”

Line 35: “between land-atmosphere” → “between land surface and atmosphere”

Line 52: add “convection” after “shallow to deep”

Line 52-53: suggested revision: “Comparing the days with ... to those with ...”

Line 61-63: do you mean shallow cumulus clouds and deep convective clouds represent 22.1% and 5.2% of the total cloud cover year round, respectively, while for the dry season, the numbers are reduced to 16.6% and 1.5%, respectively? In addition, why are these numbers so small? Are these fraction of total cloud cover or cloud frequencies?

Line 66-67: not sure what this means. Are you explaining the new criteria used in Tian et al. 2021? Please rephrase.

Line 76: what is attributed to enhanced shallow and deep convection? Or do you just mean during the diurnal cycle of convective BL in the dry season, the enhanced shallow and deep convection are related to increased humidity in the lower free troposphere.

Line 84: I think you mean “adopt” not “adapt”

Line 86: I recommend to delete “until the last stage when shallow clouds evolve to deep,” for clarity.

Line 130: please rephrase.

Line 131: do you mean “high aerosol concentration”?

Line 148: “allow estimating” → “estimates”

Line 150: “ and distant” → “which is”

Line 159: If this stage includes (1) the sunrise, then why it “occurs two hours after sunrise”?

Line 164: should it be “It corresponds to the occurrence of a cloudy mixing layer ...”?

Line 177: delete “day”

Line 180: “around 2km”? around or under?

Line 192: “former” → “latter”?

Line 193: “shallow-to-deep” → “shallow to deep”

Line 201: “allowed” → “allowed us”

Line 203: “significant number”? Do you mean “larger number”?

Line 217: “difference ... important”? consider use “apparent” or “larger”

Line 265: “stronger diurnal cycle” than what? “increase in” → “diurnal cycle of”

Line 266: “relatively” → “ is relatively”

Line 269: “overlap of these two zones”, what zones?

Line 280: should be “diurnal evolution of convective clouds”

Line 282: add “in ShDeep days” after “cloud cover”

Line 291: do you mean “as the cloud fraction difference between them increases”?

Line 295: should be “Fig. 4c” not “Fig. 4d”

Line 298: should be “Fig. 4d” not “Fig. 4c”

Line 307: should be “Fig. 4e” not “Fig. 4c”

Line 312: “surface”? or “surface warming”?

Line 320: I don't think the sensible heat flux in morning transition stage (I suppose it's ~ 6 to 8) show significant difference between the two regimes large enough to explain the delay of BL growth in ShCu days.

Line 324: I don't see sensible heat flux on ShCu days larger than that on ShDeep days in your Fig. 4f.

Line 334: "1.1°C and 2.3°C" are not "rates", please correct the units.

Line 336: I think you mean "than ShCu days" not "unlike ShCu days"

Line 339: "noon" for "ShDeep days", 15 LST for "ShCu days"

Line 340: "drop of 3°C" during?

Line 346: " on the order of -1.0" → "by about 1.0"

Line 356: I don't think there is a square root in the equation.

Line 363: "at the time the gust front ..."?

Line 374-375: I don't see a BL depth increase around 7.

Line 375 & 377: These numbers (240 and 290 W m⁻²) don't match with Fig. 4. In Fig. 4a, SW at 8:00 is nearly the same for two regimes, while in Fig. 4b, LW at 8:00 had a difference smaller than 20Wm⁻². How can the net radiation difference be 50W m⁻² here?

Line 386: "low-troposphere" → "lower troposphere"

Line 388: I think the BL depth for ShDeep days is only about 1800-1900m at 10 LST according to Fig. 6.

Line 392: "influence" → "can influence"

Line 395-396: please provide reference for this statement.

Line 403-405: sentence too long and hard to follow, please rephrase.

Line 414: where are these number (19 and 12 g kg⁻¹)from?

Line 438: "agreement" between what?

Line 439: which is later than which by how long?

Line 445: these numbers look incorrect for me when compare to Table 2 last column, please check

Line 447: these number also look incorrect, check

Line 450-451: suggested revision: "It indicates a positive ..."

Line 468: "focus" → "focuses"

Line 469: delete "significantly"

Line 472: "meteorology"? please indicate more specifically or just remove it.

Line 473: "large ... small" → "larger ... smaller"

Line 473: is there any particular reason to change the vertical range from 1km to 2km for IWV and VWS (Fig. 9 and 11). If not, please keep consistent.

Line 484: should be "Fig. 11d" not "Fig. 11c"

Line 488: I would suggest to test if there is a significant difference between ShCu and ShDeep for each pair of bars in Fig. 11.

Figure 8: please explain what the lowest cloud base data come from in the caption.