Review of Biscaro et al. 2020 ACP
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Recommendation: Minor Revisions

General Comments:

      The authors present an innovative study with respect to our understanding the diurnal cycle of precipitation events with respect to the previous night´s environmental conditions for the Central Amazon. These types of studies should prove useful in understanding the dynamic/thermodynamic conditions that lead to days with or without a shallow-to-deep convective transition.   The study is thorough and straightforward and takes advantage of the diverse datasets available from the GOAmazon campaign. Even in regions with much less instrumental measurements, this type of study should be easily replicable.

      I think one weakness of the study is its very limited scope and literature review presented. The authors should include other studies on the shallow-to-deep transition in the Amazon as well as other tropical regions.   The diurnal cycle and the shallow-to-deep convective transition are, unlike other tropical regions, intrinsically tied. And even more importantly, they should reference some of the vast number of recent studies of convective parameterization and modeling, in general, that attempt to address the difficulties of therefore temporal evolution from shallow to deeper cumulus.   The authors can contact me directly for my large collection of articles on this theme.

 Also, this manuscript was in bad need of proofreading. I found numerous grammatical errors as well as odd sentences or usage of the English language.   Below, I have made many corrections and offered suggestions for improving the text.

Minor Comments:
Abstract
Line 10 Write "Local observations of cloud occurrence,..."
Line 12 Write "... in the Central Amazon ..."
                    Amazonas will not mean much to readers.
Line 12 Write "This is accomplished by evaluating atmospheric properties during nocturnal periods from the days prior to rainfall and non-raining events."
Line 17   Write " large mesoscale circulations"
  unless you want to specify meso-beta scale circulation and that is what you mean by "large mesoscale"

Line 19 Write "...representations in tropical regions..."

Line 20.   There are a lot more recent studies studies with respect to convection in models, many focusing on the parameterization and model resolution (i.e., convection-resolving GCMs) as well as the traditional problem which strongly motivated Betts work in the Amazon, that is, the poor representation of the shallow-to-deep convection. You should cite these more recent works to be complete.

Line 21. You should give some detail with respect to the observational studies carried out to look at convection in the Central Amazon over the years. For example, our GPS observations of the diurnal

cycle (see figures 2 and 4 from Adams et al. 2013) is a unique observation technique reference.   Also, Ludmila´s paper should be included (Tanaka et al. 2014) with respect to work on the diurnal cycle.

Line 24 Write "... model issues in the tropics ..."

Line 25 Also related to my comment on Line 20, your category a) is closely tied to the problem of proper representation of the shallow-to-deep convective transition. It just happens to be the nature of central Amazon convection that the shallow-to-deep transition is intrinsically linked to the morning-to-afternoon evolution of deep convection. This is not true of all tropical regions, particularly those where topography or proximity the the ocean plays an important role in convective cloud development. Given that research on convective parameterizations which perform well with respect to this transition is a very important line of research, I suggest tying this study more clearly to that issue specifically.

Line 26 This sentence is odd.   Propensity is not really the appropriate work. Also you have "feedbacks on the general circulation" no "to".

Line 30-31 Include our work Adams et al. 2015.   It was the world´s first GPS dense network in an equatorial region to study convection, pre-GOAmazon and was strongly motivated by the studies of Betts and Jakobs 2002 and Khairoudinov and Randall 2006.   See Adams et al. 2017 for more general references on shallow-to-deep convection research which you should cite to make this open this study to a broader audience.

Line 33-35. This sentence is unclear. Can you specify what you mean by "the differences in the convective scale driven by the large-scale circulation should be considered in convection parametrization schemes"?   Also, the "dynamical, microphysical, and environmental differences" between organized and isolated convection, are you referring to the conditions which help to organize convective into MCS? And these must be properly represented in the models and the parameterization must be able to respond properly to the factors?   Clarify this idea.

Line 44 Change Amazonas to the Central Amazon.
Amazonas is a state, not a region.

Line 81 2pm maxima is also consistent with Tanaka et al. 2014 and Adams et al. 2013.

Line 85 Write "To understand what controls convection ..."

Line 88 "which comprise separate 24-hour events." is a bit confusing language. I don´t think it is necessary to include the "24-hours".

Line 88-90 Do you want to say "controls during nocturnal periods that may initiate or stifle precipitation", given that stifling precipitation is as important.

Line 92 Write "diurnal cloud cycle", cycling sounds strange.

Line 95   Write "result in including precipitation in the observations"

Line 109 Write "No intra-seasonal variability is observed in these distributions, however, the ENSO event of 2015 is..."

Line 112 This Kelvin wave study and shallow-to-deep transition study of Serra et al. 2020 has now been published so you can cite it. See references below.

Line 116 See also Figure 4 (Adams et al. 2015) for water vapor convergence reflective of low-level circulation in near-river sites.

Line 118 Write "surroundings"
Line 119 Write "...from the Brookhaven National Laboratory has shown that..."
Line 131   Write "from a distance"

Line 132 Write "..., however, these upper-level clouds ..."

Line 134 Write "...these images have been extended..."
        axes is plural, not singular
 Line 136   I would write "reveals", "presents" sounds strange in English.

Line 140 Write "These near-surface, shallow clouds..."

Line 144   I would write "During the transition to rainy conditions ...."

Write 161 Write "...events, therefore, reduced..."

4.1.2 Radiosonde analysis
In this section, you need to be very clear how you are calculating CAPE. The values of CAPE are critically dependent on the parcel you lift as well as the thermodynamic process, reversible or pseudo-adiabatic.   Using surface value of temperature and humidity can bias the values. Using virtual temperature as opposed to regular temperature can likewise affect CAPE values. More typically, CAPE calculations are based on some mixing/averaging of near-surface values, say, for example lowest 50mb. So please clarify this issue for the readers.

Line 185 Have you check the nature of the parcel you are lifting?
Convective cloud energy consumption results from vigorous deep convection, not from shallow to mid-level cumulus depths. Lower near-surface temperatures and drier near-surface conditions would also lead to lower CAPE. Another issue is if the sounding rises through cloudy air. This is not representative of larger, grid-scale (~50km) conditions and may appear to have a warmer/wetter trajectory than what is really representative of thermodyamic conditions on the larger-scale.

Line 212 Write "...dry season composites are much drier than those of the wet season."

Line 215   From all of my years of research and my field campaigns in the Amazon, I would definitely argued for wv profile control on convective outbreaks, to a first-order approximation. See Lintner et al. 2017 and literature referenced for a GCM comparison of GOAmazon wv profiles.

Line 220"A higher (lower) cloud cover"   You need to be careful here.   You probably mean "greater/lesser". As stated one may think of cloud elevation which also impacts in different ways earth´s albedo.

Line 229 "... have approximately the..."

Line 233 Write "The flux analysis..."

Line 236   Write "...and, therefore, surface heating ...

Line 295 Do you mean "Also, the following features are correlated:..."?

Line 300 Write "... , nor did we analyze moisture advection, instead we focus on a large-mesoscale cloud analysis in the next section."
As I noted above, you should use the meteorological terminology for large-mesoscale; i.e, meso-beta scale

Line 317 Write "The differences among the two transition modes in the wet season are related to the terrain. The regions in the north and southwest of the domain, that presents the main differences, are areas where there the dominant wind flow (from northeast) are lifted over areas where the terrain elevation increases (Figure 13)."

Line 328 Write "... identify the differences found between seasons and transitions therein."

Line 339 Write "convective characteristics have approximately the...

Line 345-347.   Yes, agreed. Convection is more intense when it occurs in the drier season.

Line 350. What is curious is that regardless of dry versus wet season or intense vs less intense, the shallow-to-deep transition time scale is the same ~4 hours. See (Adams et al 2013, 2017)

Line 358 I think it is clearly to say "... cloud development is a direct effect of the locally forced vertical motions." that is, clouds are strongly tied to local bouyant vertical flows.

Line 363 Write "...that the local-scale, nocturnal, vertical motion ..."

Line 392-398   This summary is exactly why I make the argument for expanding your literature review and making sure you tie this "diurnal evolution" to the more general problem of replicating properly the STD transition in the tropics with model convective parameterizations. Even for cloud-resolving models or LES models, the microphysical parameterizations may be responsible (e.g., cold pool formation) for properly representing the STD transtion.

References

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