

Review of “Cloud Regimes Over the Amazon Basin: Perspectives From the GoAmazon2014/5 Campaign” by Scott E. Giangrande, Dié Wang, and David B. Mechem

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General Comments

I commend the authors for a well-written and interesting manuscript. There is nothing that really needs to be modified in terms of the general structure. One thing I think necessary is to provide a little more context for certain aspects of the study, such as the seasonality, diurnal cycle and the shallow-to-deep transition. For example, the definition of wet, dry and transition seasons should be put in a bit more context of the literature. Likewise the diurnal cycle. Your definitions may be very “GOAmazon centric”, I.e, the peculiarities of those 2 years. Also, you mention the shallow-to-deep transition in passing, but this is actually a huge area of study in modeling as well as theory and observations. And many of the shallow-to-deep transition studies are based on Central Amazon conditions. So I would include a little more context to indicate to the interested reader where they may explore more these important ideas.

Specific Comments.

Introduction

I think it is important to mention some of the previous work focusing on convection and surface atmosphere interactions as well as larger-scale forcing, such as WETAMC and TRMM-LBA. These studies provided data to examine another very important aspect of cloud development -- the inability of convective parameterizations to capture something resembling a shallow-to-deep transition (Betts and Jakob 2002a,b). And still to this day, the problem of the shallow-to-deep transition remains: what are the physical mechanisms (e.g., cold pool collisions, moisture preconditioning above the PBL, moisture flux convergence, etc...)? And do models, even with convection “resolved”, capture this transition in cloud development properly? There is a very large literature on this (Khairoutdinov, M., and D. Randall (2006), Hohenegger, C., and B. Stevens, (2013); Wu, C.-M., B. Stevens, and A. Arakawa, (2009). And many of these studies actually focus the Amazon. This would go well with what you state in Lines 24-28 and with many of the ideas you mention further on in the manuscript.

Line 34 Maybe write GCMs since otherwise it sounds like you are referring to a specific model called GCM.

Line 49-50 When you says “its” here you are referring to “changing nature of early transitions from dry and rainy seasons in the Amazon”. It’s a little bit awkward, maybe you might want to rephrase this.

Line 83 “include estimates of” sounds better to my ears.

Line 83 low- (surface to 3 km). This seems very deep to me. The PBL (over the forests nearby) is typically about 500 to 1000m, lower in the wet higher in the dry. Can you give a little justification for choosing these layers? From one of my student’s thesis and our paper (Lintner et al 2017), if you told me, I can only choose one variable that exercises the most control over deep precipitating convection in the Central Amazon, I would say 700 to 500mb in terms of specific humidity.

Line 87 You should specify how you calculate CAPE, using a reversible or a pseudo-adiabatic and do you consider virtual temperature of the environmental profile in the vertical instead of just temperature. These can, in some conditions, may a pretty big difference.

Line 95 I would say “Amazonia (SIPAM) radar located on south end of Manaus” since I think the military base would be considered in Manaus.

Line 103-4. I would disagree with this climatologically. The peak is typically around 2pm to 3pm, at least in terms of number of heaviest precipitation events. It rained much less frequently in Manaus around 12pm, and usually less intense. See Adams et al. (2013) and also Ludmila’s paper (Tanaka et al. 2016). As I noted above, you may want to give a bit more context in terms of diurnal and seasonal cycles since they do vary a bit from study to study. In Adams et al. 2013, and Lintner et al. 2017, as well as Adams et al 2015, we choose Jan-Apr as wet, May-June wet-to-dry transition, July-Sept dry and Oct-Dec as dry-to-wet.

Line 116 write “ A simple cloud-type classification”

Line 130-135. May give a little justification of these seasonal divisions.

Line 195 When you say the authors, you mean you? Maybe put “we” if that is what you mean.

Line 207-210. I am a bit surprised by this. I have found very little near surface humidity variability in the long-term Manaus sounding. And I imagine over the rainforest, even less so, humidity is essentially constant and high. Above the PBL, yes, there is where I think the important variability lies. The T3 site is an open pasture, I wonder if that accounts for lower atmo variability in water vapor. The Manaus sounding is fairly close to the river, so maybe that is responsible for the small variability in lower levels.

Line 225 Definitely, April is rainy, it rains all the time and June is a transition month, not much rain, but cloudy a lot of the time (best time to visit Manaus for a tourist).

Line 238 Yes, I would say this is true, and there is very little lightning in January to April. However, in Manaus, the locals call December “the lightning season”.

Line 276 “ as viewable by the current designations.” I think I know what you’re saying, but it sound odd.

Line 291. Large-scale w is a very tough variable to measure. Strong positive w is associated with the in-cloud convective motions, as would be the latent heat release; however, the surrounding large scale atmosphere maybe still or subsiding. Even if the atmosphere is perturbed by a gravity or Kelvin wave, w is very small. As just an average measure of vertical motions it is o.k., but I wouldn’t try to estimate variables like moisture flux convergence based on this estimate.

Line 345 - 355. These are really a critical ideas about the STD that has implications far beyond this study. So you might want to emphasize this point in your paper and consider a bit more of the literature even if just superficially.

Line 390 -394 Actually, see Figure 4 in Adams et al. 2015 that shows different behavior in the diurnal cycle of precipitable water vapor in and around Manaus.

Line 445-450 Yes, I would agree a lot of the convection in non-local forming most often to east of Manaus, and yes particularly during the transition and dry seasons.

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