

## ***Interactive comment on “Land–atmosphere interactions in the tropics” by Pierre Gentine et al.***

### **Anonymous Referee #1**

Received and published: 17 March 2019

#### General comments:

The authors present a nice review of a topic that has not been properly reviewed before - the specific range of land-atmosphere interactions in the tropics. Most published work including reviews have focused on the subtropics and summertime mid-latitudes. This is a welcome addition to the literature. The topic will draw a diverse readership with different interests and expertise.

The authors need to be sure they are not jumping in at too technical a level or assuming too much foreknowledge of the readers. Also, the paper could use more homogenization in style and level of detail - it is clear that different authors wrote different parts. It needs to be made more even throughout.

In Sec 3.2 and later in Sec 5 the problem that LSMs have representing water stress and GPP should explicitly mention root access to groundwater / shallow water tables

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in tropical lowlands and plains - a process that is not present in most models with their very shallow soils. This is hinted at, but there should be explicit statement regarding the link between tropical phenology and hydrology.

Specific comments:

L133: A comma after "initiation"

L195-196: The equivalence drawn between turbulent carbon fluxes and GPP needs a little explaining for non-expert readers.

L242: The work of Tawfik and colleagues (10.1002/2013GL057984, 10.1175/JHM-D-14-0117.1, 10.1175/JHM-D-14-0118.1) is highly germane here as well.

Figure 1: Please give the date and time of the image (a la Fig 14), and the domain (lon and lat range) - also a scale superimposed on the figure would be helpful to understand the size of the clouds.

L250-259: I suggest this paragraph be reordered, grouping the density/buoyancy processes (thermals, radiative destabilization, cold pools) and references first, and then the dynamically forced vertical motions (circulations, wave activity).

L260-268: Propagating convection should also be mentioned here - I am thinking of work by Nieto-Ferreira and Rickenbach, for instance.

L277: A glitch in the citation software for the Lintner reference.

Figure 3 is not referenced anywhere - please remove.

L326: "Section XX".

L338: Remove reference to Figures 4-8 - they do not correspond exactly to what is said in this sentence, and they get referenced properly later.

Figure 4: Need to explain that it is  $\lambda * P$  that is shown, not P.

Figures 5-10: These can be made easier to read. Please confine the zonal range to

95°W-165°E, stack the maps in 4 rows, instead of 2x2, so they are not so distorted, include the units prominently in caption, not just hidden in the Y axis label of panel e. Also, this paper clearly defines Tropics as within 15° latitude of the equator, but these maps stop around 12° - why?

L374: This is misleading - the plot appears to have a steady annual cycle of precipitation because of the meridional averaging. There is in fact locally distinct seasonalities in precipitation in most locations - a point that is mentioned later. Please note here the effect of the meridional averaging.

L405: I find the reference to "moist static energy flux" here and in Fig 10 to be clumsy. I know what the authors are trying to say. To my mind, MSE naturally includes the "gz" term. So this statement seems to include orographic forcing (upslope flows) which I believe is not the intention here as this is all locally calculated neglecting horizontal motions over terrain.

L428: This should be Fig 11, not Fig 3.

L430-432: As phrased, this is not a sentence.

Discussion of Fig 12: It is a nice figure, but it is not clear that moisture stress is essentially VPD - this can be clarified in the text. In fact, the whole discussion (L434 onward) is a bit circular and muddled - it could be said much more clearly and more succinctly.

L479-480: The first reference should be to Dawson (1993; 10.1007/BF00317442) - his work was seminal.

L484-486: Don't need to cite the same paper for each phrase. There are several places where the same references are repeated unnecessarily, sentence by sentence.

L502: Change "one" to "two".

Figure 13 would benefit from a schematic diagram that illustrates the contrasts between wet and dry seasons.

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L567: Change "inspired in" to "inspired by".

L580: "aerosol" -> "aerosols"

L588: Change "is clear" to "are clear".

L605: "out-weight" -> "outweigh"

L624: Change "i.e. Manaus" to "e.g., from Manaus".

L625: "lighting" -> "lightning"

L647: Section number should be 4.1.

Figure 14: Again, a scale would be a helpful addition.

Sec 4.1.1: This is a complete departure in style from the tone of the rest of the paper. The rest of the paper provides synopses and literature reviews on the various topics, but this is a singular specific conceptual model presented in detail and in vacuo. Spracken et al. (2012; 10.1038/nature11390), Makarieva et al (2013; 10.1175/JHM-D-12-0190.1) and Gimeno (2014; 10.1002/2014WR015477) come to mind as relevant publications on this topic that could provide context - there are certainly others. But this section needs to be made to fit better with the rest of the manuscript.

Figure 15: The blue line looks about the same color as the black line - needs to be more distinct. And what is the dashed black line that cuts the corner around about  $x_c$ ?

Sec 4.1.3: There is other relevant literature that informs this topic, e.g., Dirmeyer et al. (10.1175/JHM557.1; 10.1016/j.jhydrol.2008.11.016; 10.1175/JHM-D-13-053.1), Keys et al. (2012; 10.5194/bg-9-733-2012), Hoyos et al. (2018; 10.1007/s00382-017-3653-6), to name a few. This section is relatively weak and terse compared to others - there is more than can be said for such a review.

Figure 17 cited out of order, after Fig 18 - and the second occurrence of the word

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"continental" can be removed from the caption.

L790: "west" -> "wet"

L806: "researches" -> "research"

L873-: This is new material not discussed earlier - in fact, this mention of climate change responses seems tacked on as a means to exit the paper. It should probably be covered in the core of the manuscript if it is to be mentioned here.

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