Biogeosciences Discuss., 12, C1493–C1499, 2015
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Biogeosciences Discussions
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Interactive comment on "Identifying climatic drivers of tropical forest dynamics" *by* M. Aubry-Kientz et al.

Anonymous Referee #2

Received and published: 21 April 2015

The manuscript entitled "Identifying climatic drivers of tropical forest dynamics" authored by Aubry-Kientz et al. assess the impact of climatic drivers on tropical forests. The data used by the authors are rather unique for the tropics (growth and mortality data every two years plus functional trait data) and allow asking questions that are very timely for current discussions (namely the effect of inter-annual climate variation). In general, I found the manuscript very interesting and relevant, and adding to our current knowledge. However, I have several comments that need to be addressed properly.

Specific comments

P3146, L1-6: I think that these two sentences need to be better link. In the first sentence you talk about the importance of looking at the impact of climatic drivers on tropical forest dynamics, and in the second one you explain the approach used. But

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you do not say that the approach used allows you to deal with the issue being raised in the first sentence. Just adding something like “to look at these we used ...”

P3146, L15-18: this is a weak sentence for an introduction because the reader is not interested in the specific case of French Guyana, the reader is interested in knowing how common climate seasonality is in the tropics. Then you can argue (somewhere in the introduction) why French Guayana is a good place to look into this.

P3146, L19-22: I do not agree completely with the statement done in this sentence. Yes, there are studies looking at the effect of seasonality on tree growth rates but I think that most of these studies focus on smaller individuals and not on trees >10 cm in diameter.

P3147, L9-13: the sentence starting with “Besides exceptional. . ..” is too complicated, and needs revision. I also think that the work of the Clarck & Clarck should be cited in here (as they have been working on inter-annual variation of growth).

P3147, L17 and P3147, L20: new ideas are presented in these sentences that are not well connected with the previous ones. I do not see the need to use the models and their advantages to link functional traits with the effect of seasonality on growth and mortality rates. I think it is better if the authors write a new paragraph focussing on functional traits, and why they are relevant to the issues being raised. The models and their advantages can be included later on in the text; I would say when the questions/hypothesis are presented. Something like “the approach taken is . . ..”.

P3147, L26 to P3148,L21: here you provide the effect of several climatic variables (several measures of drought, rainfall, temperature) on tree growth and mortality. I would mention these variables in the first sentence, and try to keep this as short as possible. For example, the description of REW and the specific results found when using REW are too much details for me. I would go for the more general picture.

P3148,L29: here you can mention the advantages of having a modelling approach.

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P3149, L18: indicate to how many species the 20340 trees belong. This is important because in section 2.1.2 you indicate that you had functional trait data for 335 species, less than half of the species found in the area (700 species).

P3150, L2: the 335 species for which you had functional trait data, what percentage of the 20340 individuals do they represent? Or in other words, what did you do with the species for which you did not have functional trait data? How were they included in the analyses?

P3151, L11: can you indicate how the "past growth" is taking into account very briefly? Is it the growth rate of the previous year? Or of the two previous years? How do you define this?

P3153, section 2.5: did you also check for collinearity among functional traits? For example, height and diameter are very much related to each other.

P3153,L22-25: the relevance of wood density should go in the introduction, not here. You can use the arguments presented here in the paragraph focussing and justifying the importance of incorporating functional traits.

P3153, L12: what percentage of the inertia is explained by the second and third axes?

P3155, L11-13: not clear why Aover was not included in the model and precipitation was included even when it did not have any effect on growth. Please explain the reasoning behind this decision.

P3155,L13-14: here you said that Pre had an effect on growth and mortality but in Table 3 no effect of precipitation is shown. Which of the two is correct?

P3155,L13: how come maximum growth rate increases with DBHmax and decreases with Hmax when DBHmax and Hmax are highly correlated?

P3156,L9: how come WDmax???

P3156,L17: it is only here that I realized that you have used Bayesian algorithms. This

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is for sure related to lack of experience with the modelling approach that you have taken but it may help to be a bit more explicit about this in the methods.

P3156, first paragraph of discussion: I think that the main and more general findings are here but I think that this paragraph could be stronger. Start with a sentence indicating the question that you are addressing (not just focussing in French Guyana), then report the main findings, and then finished up with the advantages of the method used and related issues.

P3156, discussion in general: I think that you have covered properly two of the three climatic variables included in your model, namely temperature and water stress (or drought). What about precipitation? Or is this being covered by the section "water saturation"? If this is the case, then make this more explicit.

P3157,L25-28: please rewrite these sentences, they are not clear because you mixed your results (without providing them explicitly) with the results of the through-fall experiment. Please also indicate what reduction in rainfall you see in the driest season in your database.

P3158,L1-2: I do not understand this statement because you have 20 years of data that include some strong dry events and that should allow you to see long-term effects of drought events. So what other factors explain the positive relation between Aunder and mortality? What about a negative effect of water saturation on mortality rates? What about topography in your study area? See also comments below.

P3158, section on water saturation: I think that this is an interesting paragraph, with convincing arguments. But I wonder why are you putting so much emphasis on water saturation (measured by Aover, I guess but it is never stated in this section) as it is not selected as a climatic variable and therefore, it is not included in the final model of mortality (Table 5). This variable is also orthogonal to Aunder, so you cannot translate the results with Aunder to Aover. So I think that you need to revise this paragraph and check how you can incorporate the main points being made in the previous paragraph.

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Maybe you can explain in this way the unexpected results of mortality and Aunder.

P3158,L10-13: please rewrite as the way it is written is too complicated. Say first that on average half of the trees die standing and half fall over. And then talk about how this ratio varies with precipitation. In figure 2 the relation between tree-fall mortality proportion and precipitation is not significant and in the text you say that the relation is significant. Which one is corrent?

P3159, L8-13: I think that this is a very important aspect and contribution of your work. I would make it a separate paragraph and expand it more (to highlight the implications of your results).

P3158,L20: what you do mean with the “time dimension”?

P3159, L20: change to “Current climate predictions suggest (or indicate) that drought will become longer and stronger.....”

P3159,L22-23: but are we not aware already about the potential impact of climate change on forest dynamics? I would say that we are aware of it, so the concluding sentence of your work should be something else. Need of more information? Other similar studies? Relevance of the approach used?

Table 1: can you indicate which of the traits belong to the categories you have provided (leaf and stem ecomomics and life history)? Use m as units for Hmax as it is more standard to use m rather than dm.

Table 2: say explicitly in the table that the values presented in column RANGE are values over two years. Otherwise some of the values do not make sense (e.g., precipitation). There are too many decimals in some of the variables (e.g., cloud cover, daily mean temperature).

Table 3: include “demographic parameter”

Table 4: I would refer to this table earlier in the text as it does include several of the

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hypothesis that you are discussing.

Table 5: what is “DoptDBHmax”, “KWD”? And what is the role of foliar composition on growth rates?

Figure 1. Also mentioned that you are plotting years in the plot. And do the location of the years in the biplot make sense? Are years to the left of the first axis drier years than years on the bottom of the second axis? And by the way, I count here 10 double years but in the other figures I only see 9 points. Why the difference?

Figure 2: indicate the test being used for the analysis. Is this a correlation or a regression? None of the p-values are significant based on the r2 provided but you only state this for the relation between standing mortality proportion and Aunder.

Figure 3: I like these graphs very much. It would help if they would be larger as they are hardly readable at this moment.

Technical corrections

P3146, L 1: change to “climate change”

P3146 L 25: change “estimator” to “proxy”

P3147, L1: start a new paragraph with the sentence “At another time scale. . .” because you are here focusing on another type of climate events

P3150,L7: change “playback” for “payback”

P3151, L23: change “are computed” to “were computed”

P3152, L23-27. This sentence is extremely long. You can make 2-3 sentences out of it to increase clarity.

P3153, L2: write in full MCMC algorithm

P3153,L14-15: change to “Two main hypothesis were tested using interactions effects (Table 4). Therefore, you can erase the last sentence of the paragraph.

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P3154: I would not use subsections in section 3.1 (i.e., 3.1.1,3.1.2, 3.1.3). The section is not long for subsections to be needed,. The first sentence can also be removed, the information is repetitive. P3154,L17: change to “climate variables”

P3155,L4: erase “together”, not needed

P3155,L7: change to “. . . finally included ONLY temperature, which had a . . .. . . when it was included alone in the growth model”.

P3155,L10-13: please divide this long sentence in at least two sentences

P3155, L22: maybe worth mentioning what Herault et al. 2012 found. Otherwise the sentence does not make sense.

P3157,L24: not clear what “field observations” you are referring here. Please rephrase.

Appendix A and Appendix B. Make sure that these appendices are cited in the text. I did not check it but I thought that Appendix 2 was not really used/described in the text. And therefore, it is strange that figure 3 comes before other figures that are referred to in the text.

Figures and Tables: not sure about the policy of the journal but figures and tables are not numbered in the order in which they are cited in the text (e.g., table is cited before table 2 or 3 have been referred to). The authors always say “(see Figure X/Table X)”. Is this required by the journal? I would say that (FigureX) is the standard.

Figures and Tables: not all tables and figures are cited in the result section, only in the discussion

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Interactive comment on Biogeosciences Discuss., 12, 3145, 2015.