

Interactive comment on “Response of Net Primary Productivity of Zambezi teak forests to climate change along a rainfall gradient in Zambia” by Justine Ngoma et al.

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Thank you for your valuable comments. We incorporated suggestions from the reviewer and we also spent some time and efforts to improving the language in the revised version. We have attached a table under 'Fig 1 to Fig 4' where we have outlined our responses to the reviewer and the changes we made to the manuscript.

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2018-421>, 2018.

C1

Page 1 - Table 1: Responses to referee #1

Section of the paper	Comment from the referee #1	Author's response	Author's changes in manuscript
General comments covering all sections of the paper	The results are interesting but the discussion is rather terse and multiple English usage issues will make it necessary to make substantial improvements before I can recommend the manuscript be published. I find the modelling analysis as a whole to be described well but had a difficult time trying to realize what I had learned from the analysis beyond what was already known about applying models at local scales. Emphasizing the novelty of the study and improving the discussion are necessary steps.	We acknowledge the concerns raised by the reviewer	<ul style="list-style-type: none"> We improve the language in the revised version We improved the discussion and emphasized the novelty of the study.
Introduction	The introduction takes a rather conversational tone with rather obvious statements that don't need mentioning.	We acknowledge the concerns raised by the reviewer and we revised the introduction	The introduction was replaced with the new one. In this new introduction, we described in details about the Zambezi forests and included information on the forest extent, carbon storage, and deficiency in the existing literature.
Introduction	Baikiaea Plurijuga', small p	We revised the word 'Plurijuga'	We replaced capital 'P' with small 'p'
Materials and methods	A few too many significant digits in Table 1	We revised the values in table 1 to reduce the number of significant digits.	Rainfall values were rounded to whole numbers and temperature values were written to one decimal place.
Materials and methods	Page 7: why were these GCMS chosen	We acknowledge the concerns raised by the reviewer and we revised the paragraph	We provided the reasons in the manuscript for our choice of GCMS

Fig. 1. Page 1- Table 1 - Responses to referee #1

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Page 2 - Table 1 continues

Section of the paper	Comment from the referee #1	Author's response	Author's changes in manuscript
Results	Figure 3 is not convincing; this doesn't validate the model if that is the goal of this analysis	We acknowledge the concerns raised by the reviewer	Figure 3 was deleted from the revised manuscript
Results	Figure 7 is very hard to read. I recommend trying a different way to display the data.	We acknowledge the concerns raised by the reviewer and we displayed the data in a different way that is easier for the reader to understand.	<ul style="list-style-type: none"> This figure showed mean annual vegetation carbon stocks, LAI and NPP simulated with local and default soil and tree parameter values, and forcing the model with local and modelled climate data. In the manuscript, we only showed values simulated with a combination of default tree, default soil, and modelled climate data, and also a combination of local tree, local soil and local climate data. The results of the effects of each of these default tree parameters, default soil parameters, local tree, local soil parameters, local climate, and modelled climate data were taken to supplementary information (Figure S6). After the revisions, figure 7 in the old version became figure 6 in the revised manuscript.

Fig. 2. Page 2- Table 1 - Responses to referee #1

C3

Page 3- table 1 continues

Section of the paper	Comment from the referee #1	Author's response	Author's changes in manuscript
Discussion	I'm confused as to why 1.5 m soil depth is chosen if 'In the sites, trees access soil water down to more than 5 m depth according to the trees' rooting depth in the Zambezi teak forests'. This really doesn't make sense to me, even if your measurements suggest that 1.5 is the maximum depth at the sites, it is easy to underestimate rooting depth	We acknowledge the concerns raised by the reviewer and revised our argument after gaining more insight from literature on how rooting depth affect water uptake by plants.	We removed this argument from our discussion after gaining more insight from literature on how rooting depth affect water uptake by plants. Literature (For example Christoffersen et al. (2014)) indicates that water uptake by plants is dependent on different factors and rooting depth is just one them. However, there is no direct relationship between water uptake by plants and the rooting depth. So far, no study has been conducted in the Zambezi teak forests to determine the depth at which the trees take up water. The effect of rooting depth on water uptake by plants differs with locality and species (Christoffersen et al., 2014). Our previous studies (Ngoma et al., 2018a, b) reported different species composition at each of the three studied sites (Kabompo, Namwala and Sesheke), though some of them are common. Roots were only uprooted at the drier Sesheke site, indicating that the rooting depths of trees at the Kabompo and Namwala sites are not yet known. Thus, simulating tree growth using the default 1.5 m rooting depth was logical as we did not have full information on the rooting depth of trees at the other two sites (Kabompo and Namwala). However, we studied soil characteristics down to 1.5 m depth at all the three sites, giving us the needed soil information at all the sites. Thus, using the default and uniform 1.5 m rooting depth enabled us to easily compare results at the three sites.

References

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Fig. 3. Page 3- Table 1 - Responses to referee #1

C4

Page 4 - Table 1 continues

Section of the paper	Comment from the referee #1	Author's response	Author's changes in manuscript
Discussion	What does this mean 'This opens the novel concept to improve and validate LPJ-GUESS model'.	We adjusted this sentence to make it easier for the reader to understand	We clarified in the revised manuscript that the clear representation of carry-over effects in LPJ-GUESS model would improve model results. We therefore removed the sentence 'This opens the novel concept to improve and validate LPJ-GUESS model' from the revised manuscript.
Discussion	Please re-read the manuscript carefully for usage, for example 'As a results,' on page 17. And the next sentence, 'to what extent modelling results are realistically since'	The sentences were revised	<ul style="list-style-type: none"> The letter 's' was removed from the word 'results'. The correct word is 'result'. The sentence, 'to what extent modelling results are realistically since', was re-written as 'The reality of modelling results are therefore not certain since CO₂ enrichment experiments are lacking in the tropics'
Discussion	'Activity of photosynthetic enzymes also reduces (Farquhar et al., 1980)'. Lots of wording needs changes.	The sentence was revised	The sentence was re-written as 'Higher temperatures of above 31°C also reduce activities of photosynthetic enzymes'
Discussion	The Discussion was rather short. What sorts of uncertainties need to be reduced, what directed studies would improve results, what have we learned from this study?	We acknowledge the concerns raised by the reviewer and we revised the discussion	We expanded the discussion by including the uncertainties that need to be reduced and by recommending some studies that would improve results. We further highlighted the lessons learned from the study by emphasising the novelty of the study

Fig. 4. Page 4- Table 1 - Responses to referee #1