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Interactive comment on "Species composition and forest structure explain the temperature sensitivity patterns of productivity in temperate forests" *by* Friedrich J. Bohn et al.

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I am sorry for being late. The manuscript uses an innovative modelling approach to assess the temperature sensitivity of above ground wood production. It is generally well written but there are quite a number of minor fixed that still need to be carried out. I have two major concerns that can be addressed in a thorough minor revision:

1) I think your "climate scenarios" are actually rather a "climate sensitivity test". Even though many things can be scenarios in the wider sense in the narrow sense, a scenario usually refers to an internally consistent projection while your scenarios systematically explore change temperature but do not adjust precip and radiation accordingly.

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This may lead to physically inconsistent "climates" because under a given temperature pathway it might be impossible to get a certain precip or radiation behavior. Related to that, you should possibly also discuss that your approach basically ignores transient responses and time lags longer than a year that influence forests. So i think this "sensitivity test" aspect should be carved out more clearly. The title actually is fine but some of the other sections give the impression this is rather a scenario study.

2) I think, even though refering to central European, temperate forests, you are not putting enough emphasis on the interpretation of the results from a forest management perspective. However, your target variable "above ground wood production" as well as the stand densities, species choices etc. are subject to forest management and species mixing etc. are important elements of EU silvicultural strategies. I think the discussion of the influence of forest management on your results and their implications for forest management should be strengthened.

P1L1: Either "Observational studies discovered that" or "Observations show that..."

P1L4: "increase productivity the most"

P1L6: unclear: "within the forest structure" ==> don't you simply mean "within the forest given the environmental conditions of each..."?

P1L8: "cover a wide range of possible"

P1L11 and also L14: "increasing OmegaAWP" it sounds weird that an optimum can be increased or have "large values". Maybe I am too picky and I do not have a good alternative... maybe ask a native speaker...

P1L15: "heterogenity is associated with a positive"

P1L14-16: This sounds like quite a contradiction: for young forests low diversity and low height spread make the forest react positively to temperature while for older forests this is not the case. Could you add one sentence of explanation here and discuss potential implications for forest management in the discussion? This would mean foresters

should go for even aged, mono-species stands during establishment and then bring in other species later? or keep the canopy closed with one species while having other species in the undergrowth for some time?

P1L19: I have the feeling you are using "forest growth", "wood production" and "forest productivity" interchangeably. While this can be correct in some instances I wonder whether all the references you cite here actually refer to forest growth or rather productivity.

P1L21-P2L2: I think this sentence is imprecise. the observed changes in productivity are not the primary reason for discussing the compensation of co2. it is rather the overall high carbon stocks and sequestration rates (even without changes) that matter for this discussion. I see what you want to say but I think it is a bit too condensed here....

P2L3-9: I think this section should also mention the influence of other factors, at least briefly... Especially since you say that "productivity is influenced by several factors" in the first sentence of this paragraph...

P2L18/19: “rarely include properties related to both species composition. . .”

P2L22: “forests stands were available, it would”

P2L23.: “option to such field experiments is”

P2L26: "simulating 30 year time slices of a range of different future climates for 135..."

P2L27: “analyzed”

P2L29: “a large number”

P2L30: “species compositions”

Figure 1: I would delete the “. . .” in each box as your study does not cover more climate variables nor more stand structural or composition related variables. In the

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caption, I would precise: “overview of drivers influencing forest forest productivity in this study” and also clearly state that only temperature is varied in a “temperature sensitivity analysis” or so.

P3L3: “2017). The forest factory generates 370,170. . . and allows to estimate”

P4L2: How to get from the 15 stem size distributions and 256 mixtures to the 370,170 stands?

P4L3/4: At some point you should give the latin names of the species to allow international readers to check which species you mean. . .

P4L6: I wonder how you can actually represent complex mixtures on a 400m^2 plot. This could be covered by one large beech tree? I think you need to discuss the implications of choosing this patch size. Or do you upscale to the ha or so?

P4L6: “space limits”

P4L8: You should discuss in detail why you think the year 2007 in Hainich is representative of temperate climatic conditions! I think you make two dangerous assumptions: 1) Hainich is somehow representative for “temperate climates” (it certainly is but only to a certain degree. . . and 2) the 2007 climate is somehow representative of the overall Hainich climate. . .

P4L10: “2.2 Forest productivity. . .”

P4L11-22: This is from FORMIND, right? You could say that. . .

P4L15: “by the photosynthesis-limiting. . .”

P4L17/18: I read this as if Rm was both maintenance respiration and allocation to non-woody tissues?

P4L23: I would introduce a new subheading here about the “climate sensitivity”

P4L25: “separated” The methods description should be in the past tense

Figure2: You should explain once more all the variables shown on the plots in the caption, AWP and MAT are not explained currently.

P5L1: unclear: do you include co2 and nitrogen in the model but keep them constant or are they not included at all? You should discuss that co2 will matter in a 2°C warmer world. . .

P6L6: Do you have any reference or argumentation to support using BA as a proxy for LAI? I could imagine this only works until canopy closure?

P6L13: “maximum forest height”

P7L1-2: Is “10.2015” the right citation format?

P7L5: Why Gaussian? Any deeper reasons or simply because it is the default?

P7L8: the heading is unclear. “benefit the most” ==>from what?

P7L18-19: I wonder if the mean is the appropriate measure here given that the distributions are so skewed (figure b1)?

P7L28: This has to be carefully discussed. It seems to be obvious that the species choice will have the strongest influence.

Figure 3: maybe explain somewhere (can be in the main text) how to interpret the scale from 0-1 of the omegaAWP

P8L12: “analysed how”

P8L12: Maybe recap here that AWP is your expression of productivity.

P9L1: “specific value combination of forest properties” ==> rephrase

P9L5/6 & 12-14: Certainly analyzing all possible combinations of species and structures etc as done in the Forest Factory approach is valuable but this approach will also generate a huge number of stands which are highly unrealistic and that will never be found in reality. So the discussion could be more balanced here highlighting that you

also produce quite a lot of “non-sense” forests as well.

P9L10: “FORMIND”

P10L2-3: This sentence needs to be rewritten for clarity

P10L11: RCP2.6

P10L15-28: I had the feeling this section needs to be rewritten for clarity and logical connection to the preceding sections.

P11L3-12: Also here maybe some rewriting is needed to better link the paragraph to the rest of the discussion.

P13L5: I find the conclusions too short and too close to the results. The conclusion in my view should clarify: Why do your results matter? What do we learn?

P13L12: I find the supporting material organized in a complicated way. Can you not provide the text plus the associated figures and then another piece of text etc. The online material is not meant to be read as one text but one should find things quickly.

Figure A2: I am pretty sure you are showing the annual precipitation sum and not the “mean” here.

P15L4/5: I do not understand this: it seems mean (1.5%) is outside of the interquartile range?

Figure A3: hec should be ha

P16l5: “the first plot” ==>not very precise. Do you mean plot 3a)? Then also include small letters in the plots!

P16L6: I would always refer to omegaAWP and not introduce any other terms such as suitability etc. it is getting too complicated. . .

Figure A4: To me it looks like You are overestimating SI MAT quite systematically but you never really discuss this?

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P17L6: sentence misses a verb

Figure b3: I wonder why there are so distinct patterns of values with y=0 and also x=-100 in panel a and y=-8 (or so) and x=-100. Is this an artifact?

P18L2: “in some simulated”

P18L7: “we calculate a mean. . .”

Figure B5: panel “b)” is missing the “b)”

Figure B6: The layout of this figure makes it very hard to see which color overlays the other. . . so do most “brownish” species rather follow the green line or the dark blue for the left-side of the bell-shaped lines in panel a)?

Figure B7: Is nowhere referred to in the text. What is the unit of the y-axis?

Figure B8: The SIMAT values are so small, is that correct?

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