

***Interactive comment on* “Summarizing the state of the terrestrial biosphere in few dimensions” by Guido Kraemer et al.**

Anonymous Referee #1

Received and published: 16 September 2019

I appreciated reading the discussion paper Summarizing the state of the terrestrial biosphere in few dimensions by Guido Kraemer and colleagues. The paper presents an approach for summarizing key variables on the terrestrial biosphere into fewer independent components using established multi-variate methods. They exemplify their approach by showing several trajectories across space and time and by highlighting some major anomalies visible in their data.

While the work is well presented and scientifically sound, I have some major concerns regarding the publication of the manuscript in its current form:

1) The authors state that the first two components explain large parts of the variance and that the ‘knee’ is reached with the second component. However, inspecting Figure 1a, it seems that the ‘knee’ is reached with the third component, which still explains

9% of the variance. I was a little confused that the third component was disregarded throughout the whole manuscript, without giving a strong justification. Figure 2b indicates that the third component might be strongly connected to albedo. I encourage the authors to either expand their analysis to also include the third component, or to give a very strong argument for its exclusion. As it stands now, the decision to only inspect the first two components is very subjective.

2) I am missing a strong discussion/conclusion on how the manuscript advances scientific progress. Putting it into simple terms, the authors apply PCA – a widely used and established method – to a set of existing data sets. As such, it is not really a novel methodological development, but rather a demonstration of what could be done with global datasets as provided through the Earth System Data Lab. While this is not a deal-breaker per sé, the authors could greatly advance their manuscript by explaining how this approach can be used by other scientists, that is how it will advance the science of the terrestrial biosphere.

3) Many of the results are buried in the Appendix but never picked-up in the main text. In fact, Figure A1, B1, D1 and C1 were never referenced in the main text. The authors thus present many results in the Appendix that are not discussed in the main manuscript and thus the reader is left alone with her own interpretation. As some of the results are quite crucial for evaluating the method (e.g., the errors presented in B1), I strongly encourage the authors to thoroughly discuss them in their manuscript.

4) The writing needs improvement for turning this already good manuscript into an excellent manuscript. For example, the authors often describe their figures, instead of the results (Figure X shows. . .). It would be much more interesting to read about the main result instead (A influences B (Figure X)). I am sure the senior authors of this manuscript can do a great job in revising the manuscript to make it more accessible and exciting for the reader.

5) There are some wording and spelling/grammar issues, some of which listened be-

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low:

L. 16: Suggest removing 'the' before 'global'.

L. 27: Spring is not a phenological event. Could use onset of bud-flush or similar.

L. 74: Not clear how standardization accounts for differences in scales. What scales? Spatial? Temporal?

L. 138: The breakpoint detection comes out of the blue. Why is this done? What was the rationale behind? This needs a decent introduction.

L. 142: Same as above. The term hysteresis is never introduced before, but then explained in the results section (L. 239). As a reader, I would love to hear the details upfront, instead of reading about them in the results/discussion.

L. 148: Maybe include an example figure here, instead of referencing to the results already.

L. 151: 'We see that...' is not a good opener. Directly describe the result, be precise and upfront (e.g., The first two components explained 73% of the variance (Figure 1a))

L. 160: What is the pre-imaging problem? Please do not assume that the reader reads up the details in the reference provided. Either avoid naming it or give a brief description.

L. 162: Again, not the best opener. The first sentence of a paragraph should summarize the main point of the paragraph (topic sentence), allowing the reader to skim through the manuscript. This sentence just describes where the reader can find a result, but nothing about the result itself.

L. 164: Odd formulation (two times related).

L. 174ff: his paragraph actually described the indicators used and does not discuss the results. This could go into the methods description or should be more clearly related

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to the actual results. Figure 2: What are 'some points'? How were they chosen?

L. 139: As said before, this is rather introduction than results/discussion. I would have very much appreciated reading this in the introduction.

L. 258: rephrase: . . . and can therefore be interpreted. . .

L. 282: Again, put the result in the spotlight, not the figure showing the result.

L. 305: Occur instead of occurring.

L. 312: Move 'especially' after 'showed'.

L. 313: Repeats methods.

L. 320: Why did you calculate the trends from the full data? Would it have been better to use the growing season as well to facilitate comparison? Please give a reasoning why you do it differently.

L. 324: Something odd with the sentence starting with 'Inside. . .'.

L. 327: Remove 'a' before 'browning'.

L. 349: The breakpoints are actually never shown, nor discussed. The conclusion is thus not really based on data here.

L. 352: in, not 'ina'.

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2019-307>, 2019.

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