

Interactive comment on “Climate-mediated spatiotemporal variability in the terrestrial productivity across Europe” by X. Wu et al.

Anonymous Referee #1

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Wu et al. present an analysis of the interannual variability of crop yields and tree rings across Europe. They combine this analysis with remotely sensed data and surface meteorology to assess the drivers of the observed interannual variability in productivity. The authors report consistent spatio-temporal variability in crop yields and the related climate and remote sensing data, which will no doubt be interesting to the readership of Biogeosciences. Unfortunately they do not find any relationship with tree ring increments.

The study is well executed and the manuscript well written. My main bone of contention with the manuscript is that the analysis focuses entirely on crop yields, but the results are continuously referred to as terrestrial productivity, which is a very different thing. As the tree ring increments do not show any significant relationships, and the rest

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of the analysis only relates to locations where crops are present, the authors should replace all reference to ‘terrestrial productivity’ with ‘European crop yields’. I would also suggest removing the tree ring increment data from the manuscript as it does not contribute to the results and leads to a less focused manuscript.

Specific comments:

Abstract

Line 15: “[we observe an] increasing sensitivity of productivity to water availability in dry regions of Europe, which is likely attributable to the recently increased IAV of water availability in these regions” This sentence is confusing. Either the sensitivity of productivity to water availability is changing (so for a fixed IAV in water availability you get an increased IAV of productivity), or the IAV of productivity is changing because the IAV of water availability is changing. Of course both could be true, but I suspect the authors have shown the latter, not the former. Please clarify.

Page 17514: “Cox et al. 2000”. Cox et al., 2013 is a much better reference here.

Page 17514, Line 22: Richardson et al., 2007 might be a better citation here. Richardson, A. D., D. Y. Hollinger, J. D. Aber, S. V. Ollinger, and B. H. Braswell. 2007. Environmental variation is directly responsible for short- but not long-term variation in forest-atmosphere carbon exchange. *Global Change Biology* 13:788–803.

Page 17515, Line 9: “exert poorly understood, yet great effects on productivity,” consider rephrasing.

Page 17516, Line 14-22: This gap-filling could be quite problematic, and it is not clear why it is necessary. Surely linearly interpolating for large gaps (<30% could mean 10 years for some time series!) biases IAV low (if the interpolation is temporal, not spatial), and produces many years whose IAV does not correlate to IAV in climate. The authors’ claim that “Our evaluation showed that this gap filling exerts minor effects on crop yield IAV (data not shown)” is not convincing. I am sure the authors had a good reason to

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gap-fill but this needs to be better explained here, along with how the interpolation was done (temporal vs. spatial).

Page 17517, Line 23-24: Please explain the evaluation criteria more clearly. What is sample depth, and what is an expressed population signal.

Page 17517, Line 20: Were other alternatives to a cubic spline examined? Given the co-authors, I would have expected SSA to be a better option?

Page 17517, Line 25: Is the gridded TRI dataset species specific, and therefore limited in extent to the species range? Or were southern species TRI's used to generate a gridded dataset predicting TRI's in scandenavia? That would seem to not make a lot of sense. More details on the methodology used are needed in order to fully understand what was done here.

Page 17518, Line 3: ...to match the other...

Page 17520, Line 26: "The definition of growing season for NDVIs, GPPs and FA-PARs ...". Unnecessary to state this here?

Page 17521, Line 10: "with 1 yr lag during". Why is a 1 year lag assumed?

Page 17521, Line 18-19: "warm temperate arid zone" is stated twice. Typo?

Page 17522, Line 6: "the interannual sensitivity of the [interannual variability]". Please rephrase.

Page 17522 equation 1. Is this estimated for each proxy individually, or all proxies together? This is quite important, as this YIAV is later used throughout the text, but it is not clear how it is defined.

Page 17526, Line 15: The reason for a lack of correlation between TRI and IAV of any other proxy or driver could certainly be examined closer. Babst et al., 2013 show that TRI is consistent with IAV of GPP at eddy covariance sites, so why would it not be consistent with the Jung et al., GPP, which is based on eddy covariance sites. Is it that

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there is no correlation, or the analysis is not refined enough to detect the correlation (i.e. correct specification of temporal intervals)?

Page 17526, Line 17-23: This is not very suitable discussion, as by detrending the TRI data you eliminate this issue. Why was ring increment used instead of basal area increment? It is standard practice to use this conversion to correct for the effect of changes in tree size.

Page 17526, Line 29: Please rephrase "multi-perspectives"

Page 17528, Line 8: Again, Cox et al. 2013 is probably a better reference here.

Page 17528, Line 9: Specify exactly what metrics of productivity. The statement extrapolates to TRI, for example, which is not valid.

Page 17528, Line 12: "the terrestrial productivity in these regions is sensitive..." Crop productivity. Please correct all instances of the use of 'terrestrial productivity' to refer specifically to what is being studied.

Figure 1. The first sentence in the footer is repeated in the second. Please revise. This comment applies to many of the figure footers.

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