

Interactive comment on “Detecting impacts of extreme events with ecological in-situ monitoring networks” by Miguel D. Mahecha et al.

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Overall comments:

This manuscript addresses how the size and distribution of an observational network impacts the ability to detect the occurrence of extreme events. This is a highly relevant topic, which has not been given sufficient analysis in light of the expected changes in the underlying distributions of these events due to climate change. Thus the manuscript is timely and important.

I do have a few concerns on the methodology, both from questions about the actual analysis and a few suggestions that might help increase the utility of the analysis for a broader readership. I suspect that many of my concerns about the actual analysis can be addressed by clarifications within the text.

C1

For example, I wonder how the impact of the event is actually determined. How does the event intensity, geographic extent and duration relate to the rank? I can imagine more intense events of small geographic extent having a more significant impact than larger extent, longer duration, less intense events. Also, given the carbon and water emphasis of the introduction, the physiological impacts could be significantly different. This should be commented on at some point.

Specifically in Figure 5, does the top line in each subplot represent the same case? So does the middle point in duration, extent and impact lead to the middle of the rank? How would a long, large geographic extent with less ‘impact’ appear on the rank?

Assuming that the rank and impact aren’t a simple linear relationship, this makes me wonder about the scaling analysis with respect to rank. While the analysis itself is interesting, I expect that the detection probability with respect to impact might be more useful to the broader community. If the rank and impact are related, you should state that relationship (same for geographic extent and duration).

It would also be useful to place some of the discussion within the general discussion on how extreme events are classified (i.e. exceedence probabilities, etc.). There is some discussion of the 2003 Europe and the 2012 US drought/heat wave events, it would be interesting to see where these actual events appear in the rank/impact plots of the analysis for perspective given the media/scientific coverage of these events.

More related to the actual analysis, I wonder about the ‘clustering’ in the PCA space. Why choose an arbitrary mesh and not apply an actual clustering algorithm? What’s the benefit of using the PCA approach rather than a normalized/standardized approach on the time series? The benefit stated is with respect to the smaller magnitudes in some bioregions (e.g. semi-arid), but this could be addressed through a proper standardization and the general probability thresholds in the pixel. You could then use a spatial/temporal clustering algorithm that could address the local/regional issue you discuss. To be clear, I’m not suggesting you do that analysis, but some discussion on

C2

why this is necessarily better would be useful for context given the simplicity of that more traditional approach.

What is the role of the underlying resolution (spatial and temporal) of the data on the detection/clustering algorithm. Given the emphasis of the manuscript on the development of the method, these would seem to be important considerations.

In summary, I find the approach interesting and potentially informative, but I think the manuscript needs additional details on the methodology and some more real world applications to illustrate these benefits and help make the authors case on the significance.

There are a number of minor comments/textual issues that should be addressed as well (page/line number):

2/13. Why is satellite capitalized?

2/25. Why is eddy covariance in quotes?

3/6. 'may be A relevant contribution'

3/15. Why is Fraction of Absorbed PAR in quotes?

4/10. Tower sites

4/24. Delete 'also'

What if different extreme events are occurring at the same time in different regions, are they classified as the same event with a larger extent?

9/24: is event size in terms of impact? How is this determined?

10/4: 'largest' in what sense? I could imagine some networks sizes being better at getting largest impact, but perhaps different for largest extent or duration.

Figure 5: how does the FAPAR impact relate to the magnitude of the FAPAR data? Compared to some transformed (zero mean/unit variance) version of the data, it seems

C3

unlikely that 4 orders of magnitude of FAPAR impact (Figure 5b) are all 'extreme'

10/14-16: This would be helpful above prior to the discussion of the figure.

Figures 5 and 6 should have consistent units (e.g. km^2). Figure 6 caption should include description of solid and dashed lines.

13/3: delete one of the 'each'

13/12: Firstly doesn't need to be capitalized

15/1: 'Ameriflux and NEON'

15/16: 'they are not an effective means'

Caption of Figure A2: fore should be for

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