

Biogeosciences Discuss., referee comment RC2  
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## **Comment on bg-2022-115**

Anonymous Referee #2

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Referee comment on "Tropical cyclones facilitate recovery of forest leaf area from dry spells in East Asia" by Yi-Ying Chen and Sebastiaan Luyssaert, Biogeosciences Discuss., <https://doi.org/10.5194/bg-2022-115-RC2>, 2022

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### **General comments:**

The authors present an analysis regarding how the leaf area index of east Asian forests are affected by cyclones. Changes in LAI are analyzed along the storm tracks of 20 years of tropical cyclones. The authors find that more often than not, the positive impacts of precipitation on LAI outway the negative impacts of cyclone wind.

Overall I think there are some interesting results from this study and it seems like the analysis has been carefully done.

I do have many issues with how certain studies are cited (see line comments), so I think the attribution of findings needs to be done far more carefully. This is my main criticism of the study, so I hope if there is a revised manuscript, that the attribution of citations will not have so many large mistakes.

Also, it might be a bit contrived to state that it is surprising that cyclones could benefit LAI

by increased rainfall. Cyclones bring rainfall over a larger area than the area where they deliver high wind speeds. But this is not a big issue, as it is good to quantify these things. I would argue that the title is a bit too broad and assertive of the occasional positive precipitation effect on LAI. We should keep in mind that this is an analysis focused on the (satellite estimated) LAI of East Asian forests, but that there are several other important other aspects relating to forest response to cyclones that this study does not address (e.g. tree mortality and damage, branchfall, landslides, floods, etc). In my opinion, and even in light of these results, the current title overstates the importance of precipitation on forest responses to cyclones.

### **Specific comments:**

\* Mha (mega hectares?) is not easy to interpret as a unit. I suggest the authors convert this to km<sup>2</sup>.

\* A lot of unnecessary acronyms are used, which make the MS more difficult to read. Given the looser length requirements of Biogeosciences, I suggest using as few acronyms as possible.

\* Some of the sentences are overly long. Reducing these run-on sentences would help.

\* A figure, or alteration to one of the existing figures, would be useful for the reader to understand where forests currently exist in the region.

\* It is unclear how much of a buffer was applied to the central track of each storm for

selecting which pixel locations were affected by cyclones.

\* Minor methodological question: How were pixel locations dealt with that received multiple cyclones within the same year?

\* Kudos to the authors for adhering to policies regarding open data and reproducible code. One comment is that the git repository for the code linked on Zenodo is exceptionally large at nearly one GB. Perhaps posting another git repo of the final code (with no commit history to reduce size) would be useful. I could be wrong.

### **Line and Figure Comments:**

Figure 1: This is a nice figure but I have some suggestions that I think will increase its interpretability for the reader.

\* I strongly suggest not to use decimal degrees in the denominator, given the actual area will vary with latitude. I suggest presenting the Affected Area as a fraction of the total area per year.

\* I suggest selecting a color-blind friendly color palette for panel a, and a legend to indicate areas where forest is not the dominant land cover. A legend for the different lines would aid interpretation, in addition to a slightly more detailed or paraphrased explanation in the legend. Maybe rename the groups to something more informative (wind, precipitation, wind and precipitation) than groups a, b, c.

Figure 2: This figure is useful, but I have some suggestions:

\* I suggest adding a legend for the surface and cyclone characteristics.

\* Any reason that SPEI is not used in the random forest analysis, but is used in Figure 3?

\* suggest: "Affect area" -> "Affected area"

\* I would have thought the boxplot of the decrease in accuracy always be a positive number?

Figure 3:

\* It is a bit odd that wind speed (or some other wind metric) is not included here.

\* I suggest also briefly describing how this decision tree was derived and selected in the figure caption text.

\* The numbers in yellow are not going to be very visible if/when this is formatted.

\* I know this is sort of the single best decision tree from the ensemble, but perhaps it would be good to report something like an R2 value?

Table A1:

\* I suggest spelling out Effect Size, instead of the ES acronym.

Figure A1:

\* Copying my comment from Figure 1 -> I strongly suggest not to use decimal degrees in the denominator, given the actual area will vary with latitude. I suggest presenting Forest

Area as a fraction of the total area, and presenting Affected area in  $\text{km}^2 \text{ yr}^{-1} \text{ km}^2$  (or just a fraction per year).

\* Please spell out 'TC' and add a legend corresponding to the different line types.

Figure A2:

\* This figure is quite complicated and I am struggling to interpret it. I suggest using a facet of different panels for each different definition. A legend would also help. Also please remind the reader what C-1 through C-5 are.

Figure A3:

\* Minor point: doing significance tests on discretized groupings of a continuous variable is generally not advisable from my understanding of best practices in statistics. The authors may wish to consider a regression, or using a nonlinear generalized additive model to show the increase and decline of the effect size with respect to return frequency.

Figure A4:

\* Nice figure, although the color palette is not suitable for the colorblind. The 0-80% stretch seems to miss the focal part of the distribution of the data. Perhaps rescale the color map from 0-50% to improve the contrasts.

\* TC acronym unnecessary.

L34: I suggest stating the name of the product within each citation.

L74-50: This could be rephrased to be clearer. I suggest using commas to separate clauses.

L133: Would be good to add an average LAI % increase because of the additional rainfall.

L150-151: I don't think this text, or this paragraph, attempting to connect summer dry spells to cyclone generation is really necessary.

L162: This is a bit confusing to me, or at least the wording is around "forest dwarfing". Is small stature of forests being attributed to confer resistance to cyclone damage?

L164-165: "The observed frequency of positive vegetation responses to cyclones suggests that the present day vision of cyclones as agents of destruction" - this statement has problems. First, the reference to the Negrón-Juárez and Nelson studies is incorrect. These studies did not focus on cyclones, but on Amazonian downbursts (sometimes coming from squall lines), which is a very different meteorological process.

Second, the following are a couple papers quantifying the negative impacts of cyclones

(and hurricanes) on forest biomass or mortality, which are potentially important counterpoints to the assertion that cyclones may be providing a forest benefit.

(Negrón-Juárez et al., 2014 Remote sensing ;  
<https://www.mdpi.com/2072-4292/6/6/5633>)  
(Negrón-Juárez et al., 2014 Remote Sensing of Environment;  
<https://doi.org/10.1016/j.rse.2013.09.028>)

(Negrón-Juárez et al., 2010 JGR Biogeosciences; <https://doi.org/10.1029/2009JG001221>)

Otherwise there is a very large literature of forest disturbance impacts from Central to North American hurricanes. However, I take the authors' point that additional rainfall can (occasionally) result in LAI increases.

L170: The Stuienvolt-Allen et al 2021 paper refers to increased fire weather in northwestern North America. Again, given what the sentence says, I think this citation is used incorrectly.

L294-296: I think the citations are used incorrectly in this paragraph. "By design, the latter approach is not capable of identifying neutral or positive impacts of cyclones on leaf area." All but one of these studies have nothing to do with cyclones - so why would they be discussed with respect to cyclone precipitation? The Ozdogan et al., 2014 study is not about cyclones, but windthrows caused by downbursts and tornados. Honkavaara et al 2013 is about detecting forest damage from winter ice storms. The Forzieri et al 2020 paper (of which the second author is a co-author of) is about large-scale windstorms over Europe - again, not cyclones, typhoons, or hurricanes. I argue the authors should be far more careful in their review of the literature and attribution of citations.

L304: This seems odd (or perhaps the phrasing is?), the uncertainty almost certainly scales with the magnitude of the LAI estimate. Is 0.18 the domain mean uncertainty over forests? Also what does 0.18 correspond to - a 95% confidence interval?

L306: Minor issue: Should it not be  $0.5(\sqrt{0.18^2 + 0.18^2})$  instead of  $0.25(\sqrt{0.18^2 + 0.18^2})$ , because it's within a  $\pm 0.25$  margin of the affected area?

L315: This statement is a bit concerning - "Events for which  $ES < \Delta ES$  were not further analyzed". Filtering the data on account of small effect sizes will certainly bias any subsequent analysis. I think the way this is written could use some clarification.

L319-324: Were cyclone characteristics (2 & 3) matched to the corresponding LAI pixel location, or was this an average for the entire trajectory of the cyclone?

L327: A cautionary note that the precipitation from ERA5 is known to have strong biases in many locations. I don't suggest reanalyzing this, but perhaps a more recent version of GPCP or GPM IMGERv6 would be better for this.

L341: This is the citation for the R package "psych", not "factor analysis". By all means cite the R package, but again the attribution of the citation is written incorrectly.

L351: Please restate what the reference period was in this section.