Dear Editor,

We would like to thank referee #1 for the recognition of our efforts in revising the manuscript, as well as referee #2 and the editor for their valuable comments. Below we summarized our responses in a point-by-point report. At the same time, a new revision of the manuscript was prepared based on the review comments. We are confident that the revision addresses the main issues raised by the referees and hope for a positive outcome of the revision process.

Yours Sincerely,

Yi-Ying Chen and Sebastiaan Luyssaert

The editor:

Two reviewers have now looked through your manuscript and both are positive about the revision. R1 is now satisfied that the revision addresses their previous points and recommends publication.

Thank you for the recognition.

Comment 1

By contrast, while R2 is complimentary of much of the revision, they do raise an important point about the focus on "**drought**" in the title, the narrative and the extent to which this is drawn out in the analysis. In looking through the manuscript I feel R2 makes a fair point. You have two drought metrics: "accumulated rainfall" and "prior SPEI", with your analysis making a link to leaf area. The current text is perhaps quite subtle in its messaging around the role of drought. For example, you argue that cyclones increase soil wetness (SPEI increases) and suggest that due to the timing, the implication is the land surface is dry. I'd suggest that this does not necessarily mean it is in "drought". I think the reviewer is making a reasoned point that you could either add an analysis plot or clarify in the text the extent and intensity of drought.

This point is well taken and was addressed as follows:
- *We used Liebig's law of the minimum as the framework for an explicit hypothesis to explain the observed increase in leaf area (L83-87), i.e., "Following Liebig's law of the minimum, the observed increase (or reduced decrease) in leaf area implies that about one third of the cyclones alleviated one or more growth factors that were limiting leaf area prior to the passage of the cyclones. We hypothesis that a dry spell could be the growth limiting factor prior to the cyclone, whereas the precipitation brought by the cyclone could enhance plant growth through mitigating soil dryness".*
- *The statistics, figures and narrative of the manuscript were revised and now test the hypothesis. (L557-562, Table1; L625-630, Fig. A4, and L641-643, Table A2; L527-536, Fig.1; L548-555, Fig.3).*
- *Although the region experiences frequent droughts (when defined as events where SPEI drops below -1.0), we replaced "drought" by "dry spell" to stress that our findings relate to a larger range of plant water stresses (L359-360).*
- *Figure 2 (L539-546) shows the location and frequency of the SPEI index dropping below -1.0 and the spatial correlation with the passage of tropical cyclones.*

Comment 2

To extend this point, I was personally a little unclear how to interpret that "accumulated rainfall" was so important in explaining LAI responses in Fig 2, but "prior SPEI" had no role.

This comment made us decide to revise the statistical approach used in the manuscript. Initially we used a factor analysis to detect collinearity and then filtered out collinearity in the random forest. Because "accumulated rainfall" and "prior SPEI" are correlated, mainly one of them, i.e., accumulated rainfall, was retained. "Prior SPEI" entered the analysis only sporadically when accumulated rainfall was not included. In hindsight the way we dealt with collinearity was too complex, i.e., a factor analysis to feed a random forest with largely uncorrelated variables to create a decision tree. The revised statistical approach uses a factor analysis to propose the main axes explaining ~60% of the variance. These axes are then used in the decision tree. The approach shows the relationship between "accumulated rainfall", "prior SPEI", and effect size on leaf area and therefore addresses this concern.

Unless I've missed it, I don't see much text afforded this point and given the title of the paper is about drought, I think it is fair to ask for a bit more quantification of the links - either via a figure or via the text.

The revised manuscript is centered around the links between droughts, cyclones and changes in leaf area. Large parts of the text have been revised, the statistics has been revised in line with the narrative and two new figures (Fig. 1 and 2) were added. Note that to keep the manuscript within the word limit, the previous Fig. 1 (frequency map of cyclones) and Fig. 3 (decision tree) were moved to the Appendix. The previous Fig. 2 (random forest) was deleted following the revised statistical approach.

Reviewer #1:

The revised manuscript has adequately addressed most of my concerns raised in the previous review. By focusing on the recovery of leaf area from summer droughts, many of the previous concerns disappear. However, the current version is imbalanced regarding the two key parts in the title "tropical cyclone" and "summer drought".

Comment 1

The description on cyclone disturbance is insufficient but the description on summer drought is in adequate. For a study on the recover from droughts, the prevalence and severity of drought should be clearly described and quantified. Currently, the description in the Introduction is very limited and so is the Discussion. In fact, as a key component, I am surprised to see barely any data in the Results related to droughts.

The first sentence is confusing us. Two typo's might be the cause of this confusion. We understood this sentence as "The description on cyclone disturbance is sufficient but the description on summer drought is inadequate" and revised the manuscript accordingly:

- *We used Liebig's law of the minimum as the framework of an explicit hypothesis to explain the observed increase in leaf area (L83-87). The statistics, figures and narrative of the manuscript were revised to test this hypothesis*
- *The new Fig. 2 shows the location and frequency of the SPEI index dropping below -1.0 and the spatial correlation with the passage of tropical cyclones.*
- *The correlation between dry spells and tropical cyclones is further analyzed in Tables 1 and Figs. 1&2c*

<u>Comment 2</u>

It is only a small part of Figure 2 (prior accumulated rainfall which is not really drought). In fact, the only result that highlights drought is Figure A3. I do not think this is adequate to show the importance of drought in this study. Thus, I recommend a substantial revision that make droughts in the upfront of the manuscript before I can recommend it for publication by Biogeosciences.

The relationship with drought has been better developed in the text and figures but we did not follow the advice to make it in the upfront of the manuscript. In our

opinion the central theme of the manuscript is the interplay between cyclones,
drought, changes in leaf area and their relationship with the atmospheric conditions.

Reviewer #2

Overall comment: I thank the authors for thoroughly addressing my comments in detail. Overall, I think the manuscript has been improved, and will be more accessible to a greater number of readers. If I have not commented on specific responses in the following, please interpret this as my agreement with the author's response and or revision.

Specific comments:
The new title is more appropriate.

Thank you for the recognition.

LAI is a standard abbreviation, but thank you for removing the other abbreviations.

Thank you for the comment.

Figure 4 is nice. The legend text is a bit small, although perhaps the copy editor can resize the figure to take up more page space.

Texts and the legend in the original Figure 4 have been resized and renumber as the new Figure 2.

Figure A3 is nice, and quite useful for understanding the rainfall distribution.

The original Figure A3 was no longer needed in the revised manuscript.

Noted Comment 3: It's not a big issue, but I still find the display of fractions (negative, neutral, positive), in Figure 3 a bit difficult to interpret.

A legend for describing the fraction was added to the new decision tree in the Figure A4.

I do not argue for its removal, but I still do not get much value from **Figure A2**. It is quite complicated and it is a bit difficult to discern the nuanced differences between subpanels. Perhaps others will gain more insight from it than I have.

The Figure A2 in the original manuscript (A3 in the revised manuscript) aims to show

that definition 3a has little bias in terms of cyclone intensity and was therefore used in Figs 2, A1, and 2a&b.

Comment 9: Agreed, I think figure 4 helps clarify this point about tropical cyclones aiding LAI recovery from summer drought stress.

Thank you for the recognition. The figure was renumbered and became Fig. 3 in the revised manuscript.

L294: Also I thank the authors for clarifying the use of these references in the main text. I strongly agree with the authors' point that starting the assessment from the actual storm tracks is necessary to reduce bias in the assessment. This approach is sorely needed, although not always possible, in the disturbance ecology literature.

Thank you for the recognition.