

Clim. Past Discuss., author comment AC1
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Reply on RC1

Jacinda A. O'Connor et al.

Author comment on "Ring-width and blue-light chronologies of *Podocarpus lawrencei* from southeastern mainland Australia reveal a regional climate signal" by Jacinda A. O'Connor et al., Clim. Past Discuss., <https://doi.org/10.5194/cp-2022-13-AC1>, 2022

Referee #1 Response

L 122-124. Please, explain the reason you don't follow this previous experience and takes less time in the extraction process.

We explain the reasoning for this in the following sentence (L124-125): "This method allows for the preparation of entire disks, which is highly advantageous given the lobate growth behaviour of *P. lawrencei*."

L 129-130. I understand that delta BI is used to correct the differences between heartwood and sapwood but not to correct stains. Please, specify what was the reason for calculating delta BI in this study. To correct color differences between heartwood and sapwood or to correct stains? Moreover, this sentence interrupts the continuity of the writing about the acetone treatment. Please, check it.

The main reason was to attempt to correct the heartwood-sapwood colour difference. We shall clarify this in the transcript and integrate the sentence more clearly into the paragraph.

L 133-134 Two treatments were applied? 1- 120 h acetone and 2- 168 h acetone? If what you wanted to evaluate is treatment efficacy, why not also evaluate the option acetone x 48 h and 72 h following the methodology applied by Rydval et al. (2014) and Frith, (2009)? It seems appropriate to mention briefly in this methods section, what was the optimal time you detected in this experimentation. Necessary information to continue with the treatment of the remaining 6 samples

Thank you for the suggestion, we will be sure to highlight what the optimal treatment time was (120 hrs) in the methods section. And whilst we agree that it would have been optimal to follow the previous methodology of Rydval et al. (2014) and Frith (2009), unfortunately this was not an option due to strict COVID-19 lockdowns in Melbourne which left our samples stuck in the lab during the acetone soaking process for longer than expected.

L 148. I assume that prior to developing the ring width and BI chronology, the series were crossdated. This is not explained in the manuscript so it is necessary to describe the crossdate process and report the statistics such as the mean series intercorrelation and mean sensitivity.

We agree and shall include this information, including the key statistics mentioned.

L 148. Please explain some where in method section the criteria used in the BI series. Which BI measurement is being considered? reflectance or absorbance?

We will clarify that we are measuring BI reflectance.

L 160-161. I suggest to plot the standard chronology also with its statistics (EPS, RBar, Mean sensitivity). Perhaps it can be included as supplementary material.

We agree and shall include these, thank you for the suggestion.

L 162. I suggest to report also the RBar statistic to complement the EPS.

We agree and will include this.

L 173-174. Please, clarify if the correlation values represent a particular monthly time series, a season or if it is the annual average of max and min monthly temperature. Also, indicate the common period between both weather stations

The correlation values represent the annual average of max and min monthly temperature across the overlapping time period, we will clarify this. We will also include the overlapping period between the weather stations (1925 - 1975).

L 176-177. Please explain how the chronology sensitivity to rainfall was evaluated. Which rainfall data were used? Did you consider months corresponding to previous years? how many?

We evaluated the chronology sensitivity to mean monthly rainfall at Harrierville (however, as per the last comment, we will change this to instead look at total monthly rainfall), and looked at both the current growth year and the previous. We will make sure this is clearer in the methods section of the manuscript.

L 191. One of the advantages that dendrochronology has over other climatic proxies is the high replicability. In this case the number of trees sampled is nine (13 individual series), which seems to me to be very poor for a representative chronology of the population growth. With such a low sample size it is highly

probably that a lot of non-climatic noise will be introduced in the ring width chronology, especially if it is a species with lobular growth.

We agree that this is a key limitation of our study, which was developed from an undergraduate thesis and was thus quite time-restrained. We acknowledge this in the discussion (L312-317) and the need for further sampling, however we believe that our results show a promising outlook for the future study of the species. Additionally our chronology surpassed the commonly used EPS threshold of 0.85 for the 70 year period (1929 - 1998) we used for climate analysis.

L 208. Is winter part of the growth season of this species? normally, growth season occur since spring to autumn. Please, check.

Climate correlation analysis was undertaken across a 12 month span, from June in the calendar year in which growth commenced, through to May of the following year in which growth ends. The wording of L208 ("current growth season winter") is referring to the winter months within the current 12 month (June-May) period, however we will amend this to just "current winter" as we agree that this sounds like we are including the winter month in the growth period.

L 211. Significant positive correlations are also observed in October of the current period and in September of the previous period. Please, describe these results.

We agree and shall be sure to mention this.

L 212-214. Please, improve the wording of this sentence. example: The ability of our *P. lawrencei* RW chronology to capture temperature signals during some months of the growing season is consistent with previous dendroclimatological analysis of this species, demonstrating the air temperature as a dominant limiting growth factor.

Thank you for the suggestion, we agree and will reword this.

L 220-221. It is not clear enough to me the explanation why the species presents these antagonistic relationships between two consecutive years. During the current year it seems that it likes high winter temperatures to grow in spring-summer(?), while in the previous year the maximum winter temperatures negatively affect growth. Isn't the precipitation in June, November and autumn of the previous year also an important factor controlling tree growth?

We explain in L220-221 that higher maximum temperatures in the previous winter may negatively impact growth due to a depletion of carbohydrates and nutrients reserves. This antagonistic relationship has been found in other Australian species, as listed in L217-220. Our results do show that precipitation in June, November and autumn of the previous year also have a significant influence on *P. lawrencei* growth, as noted in the following paragraph of the results/discussion section (L271-272).

L 246. October is negatively correlated but not significant. Please, check.

Thank you for pointing this out, we shall rectify this.

L 246-248. I suggest to plot in fig. 6 the time series of max. temperature averaged for the months of Oct-Dec together with the delta BI series.

We would rather use Fig. 6 to just show the chronologies, however we agree that this would be interesting to see and would be happy to include this as a supplementary figure.

L 250-251. What about the positive relationship between delta BI and minimum temperatures during the previous growing season? This relationship is even stronger than the one found during the current growing season.

We agree, the current season min temperature relationship was highlighted as it was consistent with the results of Brookhouse and Graham (2016), but we will amend this section to include the results of the previous growth season.

L 255. Please explain in methods what it means that BI is positive or negative. In results section, explain what it means that it correlates positively or negatively with temperature...what it would be indicating in physiological terms?

We explain in this paragraph (L255-268), that since BI is used as a surrogate measurement for maximum latewood density (MXD), the relationship between BI and temperature reflects various changes in anatomical properties (however this relationship isn't fully understood). Regarding what it means for the BI-temperature correlations to be positive or negative: BI is negatively correlated with MXD and our BI data was not inverted. The strong negative relationships we observed between the BI chronology and temperature hence reflect the positive density-temperature relationships recorded in the NH. This response is also consistent with some SH species (eg: Celery-top pine and Huon pine (Wilson et al. 2021)).

L 284. I suggest to use the total monthly precipitation value instead of the monthly mean value. The average is not totally representative of the monthly precipitation.

We agree with this suggestion and will update the results using total monthly precipitation values instead.

Figures: Be consistent in the font size of the labels of all figures

Fig. 1 and 2. I suggest to combine figure 1 with figure 2, placing the map on the left and the two photos vertically on the right.

Thank you for the suggestion, we agree and will do this.

Fig. 3 and 4. I suggest to combine Figure 3 with Figure 4. Placing the three figures in a vertical order since they share the same X-axis.

We agree and will combine these figures also.

Fig. 6a. Please, indicate in the figure the correlation coefficient between the two ring width chronologies.

We agree and shall add the correlation coefficient ($r = 0.72$) to the plot.

Fig. 6b. The EWBI and LWBI show a strong positive trend. Any comments on this pattern? Does it have a climatic or biological explanation? Or is it a methodological artifact?

It is plausible that the observed upward trend could still be due to colour differences (that may not be entirely visible) between the heartwood and the sapwood. However, it may also reflect the upward trajectory of temperature in recent decades - we will include the fig. 6 BI timeseries plot along with the time series of max temperature averaged for the months of Oct-Dec in supplementary as per the previous comment to assess this further.

Fig. 7. Please, add the letters a,b,c,d corresponding to each of the 4 panels. Please indicate in the figure in a generalized way the vegetation growth period. I suggest to add in the panels the lines indicating the significance level, so that the reader can identify whether the correlation is highly or marginally significant.

Thank you for pointing out this somehow overlooked error! We will add the letters to the figures and note the vegetation growth period in the figure caption for reference. We will also add lines to indicate the significance levels as suggested.

Fig. 9. From a physiological point of view, it makes more sense to use the monthly total value instead of the monthly mean. The results can be very different if you use the monthly rainfall total instead of the monthly mean. I suggest that you perform the correlation analysis again using the monthly rainfall total.

We agree with this suggestion and will re-calculate the results using total monthly rainfall instead.