

General Response to the Editor and Reviewers

A few recurring points were raised during the review process: (i) the manuscript was considered somewhat lengthy and would benefit from trimming, (ii) some figures required improved clarity (iii) the discussion of potential large-scale connections between the identified cycles was regarded as overly speculative and better be toned down or removed.

In response, we have streamlined the text where possible, revised the figures to enhance their clarity, and substantially moderated the discussion of large-scale cyclic connections. While one reviewer suggested that this could be developed further, we selected not to make additional analysis in the manuscript, which is already, as pointed out, rather extensive. In this version of the manuscript, we simply present pre-existing power spectra and explicitly state the periods over which the two cycles are most dominant, without further speculative interpretation.

Point-by-point Response to Reviewer 2:

R2.1

References. *The manuscript would benefit from including a few key recent works, especially those related to long-term hydroclimate variability and cyclic patterns. I recommend citing in the introduction Esper et al. (2024), and when talking about microsites, Hartl et al. (2021). Additionally, the recent work done by Torbenson et al. (2025), could provide relevant methodological and interpretive context for multidecadal variability and the role of large-scale ocean–atmosphere dynamics, particularly regarding the Maunder Minimum..*

Comment: Esper et al have conducted important work in the region that should be cited, and micro site condition by Hartl et al is highly relevant for our work. Both are now cited in the introduction (L39/L46). The work by Torbenson et al are brought up in the discussion related to the Maunder Minimum (L451).

R2.2

Figure 9 – *This is arguably the main figure of the paper, yet its current design is suboptimal. The reconstruction, uncertainty bands, and historical annotations are visually cluttered. I suggest a clearer graphical layout ens. Lower the shades and highlight the reconstruction..*

Comment: Efforts have been made to make this figure less cluttered, without removing relevant information, such as removing crossing lines and some text. We trust it is found to be in an acceptable state after these adjustments.

R2.3

Discussion of cyclicity and solar forcing – *The discussion of the ~64-year and ~34-year cycles is intriguing but could be developed further. In particular, the authors briefly mention the Dalton and Spörer minima but omit the Maunder Minimum, which is essential in the context of multi-decadal hydroclimate variability and possible solar forcing. I recommend adding a more explicit discussion of the Maunder Minimum, potential links to solar cycles (e.g., Gleissberg or Suess/de Vries), and whether these correspond to the periodicities found in the reconstruction and in AMO/PDO.*

Comment: For reasons expressed in the general section at the top of this document we have chosen not to go deeper into the possible causes of the observed periodicities identified in the time series.

We agree that, particularly as we bring up both Spöer and Dalton, the maunder minimum should not be neglected, and is added as an annotation in figure 9. Further, we emphasize that this period constitutes an exception to the overall tendencies observed throughout the rest of the chronology (i.e., cold conditions tends to be favorable for tree growth at site) (L444f). We further note that the short cycle reaches its maximum strength in the wavelet analysis during the Maunder Minimum, without speculating on the underlying causes (L446f).

R2.4

Appendix Figure D1. Very difficult to interpret. I suggest to include a larger plot with pannels for each reconstruction. Perhaps use only the 11 y running mean with shades in red for dry, and blue for wet periods. I would be better for interpreting all the figures. Otherwise it is useless..

Comment: We agree that this figure clearly was suboptimal and it has now been changed into a stackplot, which makes it considerable easier to discern the presented time series. The correlation matrix in the top of the figure is also informative.

R2.5 Minor edits

Line 39 add Esper et al., 2024.. Difficult to explain why it is ommited.. Esper, J., Torbenson, M. & Büntgen, U. 2023 summer warmth unparalleled over the past 2,000 years. Nature 631, 94–97 (2024). <https://doi.org/10.1038/s41586-024-07512-y>

Comment: Added at L39

Line 46. Include <https://doi.org/10.1016/j.dendro.2020.125787>

Comment: Hartl et al added at L46

Line 164, (march??) what's that?

Comment: Changed to mRCS

Line 312, what about comparing it with the OWDA or the most recently updated GEDA? that would be more sound than Pauling.. and apples to apples..

Comment: I is a valid point to included GEDA in the comparison, and this is now included Appendix Figure D1.

Line 465.. and the Maunder?? it is the solar minima of the last 500 years.. why is it not mentioned? you can discuss such growth-climate disruption using the recently published Torberson et al., 2025. Torbenson, M. C. A., Stahle, D. W., Cook, E. R., Cook, B. I., Büntgen, U., Chen, F., et al. (2025). Disruption of drought teleconnections between ENSO-influenced regions around 1700 CE. Geophysical Research Letters, 52, e2025GL115600. <https://doi.org/10.1029/2025GL115600>

Comment: Maunder minimum is now discussed and included in the main figure, see further comments regarding this in R2.3

Lines 485-490. More discussion on the relationship of AMO/ PDO and the positive and negative cycles.. is there a connection?? this is very important and could add value to the reconstruction.

Comment: The possible relationship with AMO/PDO has been removed in this version of the manuscript as discussed in the introduction.