

Response to Reviewer #1. Riccardo Cerrato

Dear Editor,

Below we provide a point-by-point response to the comments of Reviewer 1 that were very helpful to finalize the manuscript. Our responses to the reviewer comments are given in *orange*, and new text in the manuscript is pasted in quotation marks.

GENERAL COMMENT

In the manuscript 'Abrupt termination of the Little Ice Age in the Alps in the mid-19th century: lessons from a multi-proxy tree-ring reconstruction of glacier mass balance' Lopez-Saez and co-authors present seasonal (and annual) mass balance reconstructions for a Swiss glacier since 1802 CE. Authors use several proxies obtained by different methods (total ring width, quantitative wood analysis, and isotopes) and Principal Component Analysis to perform a multiparameter linear regression. The obtained scores were used to explain and to reconstruct mass balances' variance in the last century (since 1919). Results are statistically significant and pass the tests normally used in dendroclimatological reconstructions. They show variations of the mass balance compatible with known glaciological history in the Alps. Thus, authors conclude that the use of different wood-proxies permits the seasonal mass balance reconstruction of the Silvretta glacier. The manuscript, in my opinion, is well written and the aims are clearly presented. Authors present exceptional datasets for an overlooked species in the Alps (i.e., *Pinus cembra*). In fact, in my knowledge, they present first isotope chronologies from Swiss stone pine in the area and one of the first chronologies of anatomical traits. Scientific design is solid and well presented. Moreover, only few dendroglaciological papers about European Alps were published, thus the manuscript is also characterized by a high level of novelty. I had the opportunity to read a previous version of the manuscript, and I can appreciate the amount of work performed by the authors to clarify some points. Their replies are convincing and pertinent; the manuscript was amended accordingly. Only a few typos are still present and they are reported below.

REPLY: We would like to very much acknowledge the reviewer for these words. We have taken all your suggestions into consideration, they helped to greatly improve the manuscript.

SPECIFIC COMMENTS

[#001] Page 1 line 23: maybe typo, I think that "s.le" means "stable"

REPLY: Thank you, the sentence was modified accordingly.

[#002] Page 1 line 23 (and following occurrences at line 330, 331, and 345): the abbreviation of Latin locution "id est" usually is followed by a comma.

REPLY: Thank you, sentences were modified accordingly.

[#003] Page 2 line 44: as well as "id est", also the abbreviation of "exempli gratia" is usually followed by a comma.

REPLY: Thank you, the sentence was modified accordingly.

[#004] Page 3 line 81: formatting typo (dashed underlined reference).

REPLY: Thank you, the reference was modified accordingly.

[#005] Page 3 line 84: in the reference list "Cerrato et al. 2020" is missing.

REPLY: Thank you, the reference was added accordingly.

[#006] Page 4, 12, 14, and 15 lines 106, 277, 327, 334, and 337: All along the manuscript the glacier was identified as "Silvrettagletscher" as exception of five times that was identified as "Silvretta glacier". Consider changing the latter for coherence.

REPLY: Thank you, we changed “Silvrettagletscher” by “Silvretta glacier” throughout the manuscript.

[#007] Page 7 line 179: Please consider moving the reference list at the end of the sentence.

REPLY: Thank you, we moved the reference list at the end of the sentence.

[#008] Page 7 line 187: Actually, R Studio is a GUI for the program language R. Consider to cite also the R-project: R Core Team, 2023. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>, R Foundation for Statistical Computing, Vienna, Austria version: 4.3.1 (2023-06-16)-Beagle Scouts [*Refer to the used version of R*]). Moreover, the reference is missing in the reference list.

REPLY: Thank you, we changed the reference and added in the reference list.

[#009] Page 14 line 316: Authors report and discuss the results of the analysis performed on $\delta^{13}C$ series in the previous paragraph, results that, in my opinion, are worthy to be reported. However, in this and in the following paragraphs the results are completely ignored with no explanations to the readers that did not read previous version of the manuscript or the comments in the on-line discussion. I think that a single sentence that explains the motivations of the exclusion of $\delta^{13}C$ series from the following analysis is necessary.

REPLY: Thank you, we agree and we added a single sentence as follow:

“The isotopic parameter $\delta^{13}C$ has been excluded from the combinations for Bw and Bs reconstruction because statistically, it is not significant”.

[#010] Page 14 line 320: Typo in “Statistics or these reconstructions are reported in Tab. 3.”

REPLY: Thank you, we agree and we change “or” by “of”.

[#011] Page 15 line 344: I think that the given reference “Holzkämper and Kuhry, 2009” should be “Cerrato et al. 2020”, instead.

REPLY: Thank you, we agree and we changed the renfence Holzkämper and Kuhry, 2009” by “Cerrato et al. 2020.

[#012] Page 18 line 411: “[...] decrease significantly before the 1860s (Fig. 5B)” maybe authors mean 1960s, instead. In Fig. 5B 1860s are out of the range, otherwise should be reported that with 1860s is intended the start of the moving window.

REPLY: Thank you, we agree and we change “1860” by “1960”.

Figure 2: Caption (line 256): “The dotted black line [...]” I think that in the amended figure the line has become solid and red.

REPLY: Thank you, we agree and change the caption.

Figure 3: Caption (line 277): see comment [#006]

REPLY: Done

Figure 4: Please consider specifying what the horizontal line represents (I suppose the mean of the reconstructed series).

REPLY: Thank you, we agree and we added the caption sentence as follow:

“The black line represents the mean of the Winter (A) and summer (B) mass balance reconstructed series.”