Climate

of the Past

Discussions

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comment

Interactive comment on "Large scale climate signals of a European oxygen isotope network from tree-rings – predominantly caused by ENSO teleconnections?" *by* Daniel F. Balting et al.

Anonymous Referee #1

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By analysing a European network of 26 tree-ring sites with δ18O measurements, the authors aim at extracting regional climate signal imprinted in the records to investigate the dominant modes of variability of the European climate and their relationships with the large-scale atmospheric circulation, in particular ENSO. Their findings suggest that climate variability in Europe is strongly modulated by ENSO teleconnections at least over the past 130 years, but that some differences arises between the northern and southern regions.

Although the results are promising, I do not think the manuscript is ready for publication yet. A restructuration and reorganisation of the paper is strongly needed. While the

introduction is relatively well written and easy to follow, many confusions arise from the Material and Methods section and some clarifications are required to allow the readers to easily understand why and how the proposed analyses were made. The division of the 'Results and Discussion' section into two separate sections should improve the readability of the manuscript. It seems that the authors have not carefully re-read their manuscript to check for typos and ensure that the text is fully understandable before submitting it. The authors also should make an effort to properly, clearly and thoroughly discuss their results and their implications for the understanding of the atmospheric teleconnections. So far only in the Summary and Conclusion section are the results clearly highlighted and interpreted.

Some additional comments and suggestions:

L20: 'may not be stable. . .'

L42-43: Actually, it is the other way around: $\delta18O_{cel}$ depends on $\delta18O_{SW}$ but $\delta18O_{SW}$ itself does not depend on $\delta18O_{cel}$. Please rewrite.

L55-56: You could also cite more papers showing the potential of $\delta18O_{cel}$ for reconstructing large-scale patterns of climate variability (since it is one aim of your study), e.g.: Brienen, R. J. W., Helle, G., Pons, T. L., Guyot, J.-L., Gloor, M., Oxygen isotopes in tree rings are a good proxy for Amazon precipitation and El Niño-Southern Oscillation variability, PNAS, (42) 16957-16962; DOI: 10.1073/pnas.1205977109, 2012 Lavergne, A., Daux, V., Villalba, R., Pierre, M., Stievenard, M., Srur, A. M., Vimeux, F., Are the $\delta18O$ of F. cupressoides and N. pumilio promising proxies for climate reconstructions in northern Patagonia?, J. Geophys. Res.-Biogeo., 121, 767–776, https://doi.org/10.1002/2015JG003260, 2016.

L76-77: I am not sure what is the meaning of this sentence. Please rewrite. L75-80: I would suggest clearly rewriting this part as it is difficult to read. You should get right to the point: how are you going to achieve your goals? What are the main analyses you are going to perform to reach those goals?

L94-96: Please comment on the implication of only using latewood for oak but both early- and late- woods for the coniferous species. Are you suggesting that earlywood in the coniferous species is only derived from carbohydrates formed during the current year? Please rewrite the sentence accordingly.

L100-101: "Here" is repeated twice in the sentence. Furthermore, the sentence is not grammatically correct. Please be more careful!

L108-109: what is the COBE-SST2 dataset? Please describe it here. Also, which index of ENSO are you using to define El Niño/La Niña years?

L114-116: What is a 'nudge model scenarios/simulation'? It is not clear why you choose this title for the section. I would recommend combining sections 2.2 and 2.3 instead. How using both $\delta18OP$ and $\delta18OSW$ will inform you about 'fractionation/ photosynthesis processes'? You will never get insights into the fractionation processes occurring during photosynthesis using only those two timeseries! Please clarify.

L123-131: What is the difference between EOF and PCA? From my understanding of those analyses, EOF and PCA are really similar. Are you suggesting that EOF provides information about spatial patterns, while PCA gives information about temporal patterns? The whole paragraph is confusing (especially the filtering actually done to fulfil the North et al. (1982) rule), please rewrite.

L132-133: Why are you mentioning this here? It should be already stated in Section 2.1.

L133-140: How can you be sure that by using the gap fill method, you will not influence your results? Also, why would you need to fill in the gaps for 400 years knowing that your climate data only goes up to 1851?

L141-146: What do you mean? The whole paragraph is pretty confusing and after reading it several times, I still do not get what you are really doing here. What kind of information is providing the geopotential height 500mb (Z500) for the analysis?

L151: 'Nino 3.4 index' this should come earlier in section 2.2 when you are presenting the environmental data used in the analyses.

L158-160: The first sentence does not provide any clear information. Please remove.

Figure 1: Could you add more information in the figure A related to the latitude of each site? The names and characteristics of the sites are not presented anywhere in the manuscript. Even though the data have already been published, a Table with sites information should be included. In figures B and C, how is it possible that R2 and p-value are exactly the same for the relationships between δ18Ocel and altitude and between δ18Ocel and latitude? I suspect that there is a mistake here.

L160-161 and L172-173: Since no information about the exact location of the site presented in Figure 1A is provided, it is difficult to follow this statement.

L162: I would remove 'This might be determined genetically,' from the sentence as it is not completely accurate (different species of Quercus also have different genetic information).

L165: You could also cite more updated papers describing differences between angiosperms and gymnosperms, e.g.: Carnicer J., Barbeta A., Sperlich D., Coll M., Penuelas J., Contrasting trait syndromes in angiosperms and conifers are associated with different responses of tree growth to temperature on a large scale, Front. Plant Sci., 4, 409, https://doi.org/10.3389/fpls.2013.00409, 2013

L177: 'which could influence the relation by a latitudinal effect.' please rewrite as 'thus the latitudinal and altitudinal gradients may have confounding effects on δ18Ocel' or something similar

L177-179: I would rewrite this sentence as the effects of the two gradients on δ18Ocel have already been observed and documented in many other studies, for instance: Szejner, P., W. E. Wright, F. Babst, S. Belmecheri, V. Trouet, S. W. Leavitt, J. R. Ehleringer, R. K. Monson, Latitudinal gradients in tree ring stable carbon and oxygen isotopes

reveal differential climate influences of the North American Monsoon System, J. Geophys. Res. Biogeosci., 121, 1978–1991, doi:10.1002/2016JG003460. 2016

L181-186: Here again comes the confusion between EOF and PCA. You should clarify from the beginning (see previous comment) what is the difference between the two especially given that EOF1 and PC1 both seem to explain 16.2% of the variance in the records.

Figure 4: In the legend, you are describing the columns not the rows.

L216 Is the distribution of PC1 for El Niño (or La Niña) years significantly different from that during normal years (i.e. when excluding El Niño/La Niña years)?

L222-224: Please rewrite the sentence. As it reads now, it looks like you are saying that Europe is characterized by higher precipitation and lower air surface temperatures in summer! And it is not clear what the parentheses apply for.

L230-231: 'because we to take into account...' Why would SPEI3 index accounting for the climate conditions prevailing over the previous season? So far, nothing has been said about this dataset.

L227-233: this part mostly belongs to the Material and Methods section and could be improved for readability.

L235: 'the used reconstruction': which one?

L240: 'to capture a multi-seasonal signal' what do you mean?

L243-244: where is it shown?

L244-245: so why then $\delta18Ocel$ is not more strongly related to $\delta18Osw$? Your argument is contradictory with what is actually described.

L239-248: And so what? What are you really trying to say here? Also, I do not think the results are properly discussed and compared to the literature.

Figure 6: You mean the upper row Why description of Figure 6 comes before Figure 5?

L168-169 and L276: Please rewrite sentences

L236-237: The instability of the relationship between climate variables and ENSO has also been documented by other tree-ring studies in southern South America, e.g: Álvarez, C., Veblen, T.T., Christie, D.A., González-Reyes, Á., Relationships between climate variability and radial growth of Nothofagus pumilio near altitudinal treeline in the Andes of northern Patagonia, Chile. For. Ecol. Manage. 342, 112–121, 2015