

Dear Professor Fischer,

We would like to thank the reviewers for their thoughtful and critical assessment of our paper. Below we address the reviewers' comments (in red) with details of how changes will be implemented in the paper and point to point replies to the reviewers comments.

Best wishes,

Babette, Joy and Robin

Reply: Editor

Dear authors

Your manuscript has been reviewed by two referees, who stress the value of your paper, however, both raise important questions and ask for major changes in the manuscript before publication in CP.

I would like to encourage you to send a carefully revised manuscript (including a point-to-point reply to the reviews) to CP. In view of the criticisms by the referees, this manuscript will most likely be subject to a second round of reviews.

From an editor's point of view, there are two points in the reviews that I would like to stress:

- please, discuss more thoroughly the implication of your results on ocean (and atmospheric) $\delta^{13}\text{C}$ (see referee #1)

We have widened our discussion of the implications of our results on ocean and atmospheric $\delta^{13}\text{C}$. For more details please see our point to point responses to reviewer 1 comments below.

- please, provide a more thorough discussion of the comparison between data and models and clarify any differences or overlaps to the paper by Sanchez-Goni & Harrison, QSR 2010 (see referee #2).

Differences and overlaps with Harrison and Sanchez-Goni (2010):

The Quaternary Science Review Special issue, edited by Harrison and Sanchez-Goni specifically deals with vegetation changes under millennial scale climate change, the Dansgaard-Oeschger cycles. Indeed, many records discussed in papers in Fletcher et al. (2010, Europe), Jimenez-Moreno et al. (2010, North America), Hessler et al. (2010, Africa and South America), and Takahara et al. (2010, for east Asian islands) also feature in our paper. In their papers Fletcher et al. (2010), Hessler et al. (2010), Takahara et al. (2010) do not apply the uniform biomization applied here; subtle subdivision were applied by all apart from Gonzales-Moreno et al. (2010). However, subtle subdivisions appear in Fletcher et al. (2010, eurothermic conifers, and xerophytic steppe), Jimenez-Moreno et al. (2010, southeastern pine forest). Furthermore, in their biomization approach Fletcher et al. (2010) used one biomization scheme for all European records, whereas in our approach we started off with the three original schemes for Southern Europe, the Alps and northeastern Europe, and merged the individual biomes into megabiomes. Similarly we first applied two regional biomization schemes for northern and northeastern America and for western America, and then merged those biomes into megabiomes. In our revised manuscript we now refer to the sites which are discussed in the QSR special issue. More details can be found in the response to reviewer 2. We have also provided details there about the author contributions to the paper.

Please note that while the QSR special issue specifically deals with vegetation changes over DO cycles, we purposely avoided those! Our biomizations were carried out at a 1ka resolution (this does not resolve millennial scale variability), and the time intervals discussed in the main text were chosen not to represent intervals of millennial scale change.

I am not in favor of supplementary text in a CP publication, so please include this discussion as separate chapter in the manuscript.

Additional changes:

1. Trevor Hill should have the same affiliation as Gemma Finch (at the moment this is wrong)
2. Granoszewski's address is wrong, as is the reference to Horoski Duze (T.2)
Added: Granoszewski W.: Late Pleistocene vegetation history and climatic changes at Horoski Duze, Eastern Poland: a palaeobotanical study, Acta Palaeobotanica, Suppl. 4, 1-95, 2003.
3. Updated affiliation order.
4. Updated biomization record for Potato Lake.

Request to editor:

For visualization purposes, and following requests from both us and now the reviewers, please could the panels of Figure 3 (a and b) be on separate pages. Higher resolution vector graphics are available if necessary.