

Interactive comment on “Provenance of branched GDGTs in the Tagus River drainage basin and its outflow in the Atlantic Ocean over the Holocene” by Lisa Warden et al.

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We appreciate the encouraging response and positive assessment from the referee and thank the referee for the constructive criticism of our manuscript. Below we explain how we will respond to the comments and concerns brought up in the review.

1) More clearly communicate the finding that brGDGTs are not reliable as a temp recorders in this and possibly other settings The study does a heroic job in testing the proxy and assessing also why it may not work. They find that a combination of diverse terrestrial source systems, production along the transport route, dilution, as well possibly non-conservative transport of the brGDGTs fingerprint prevents application of these biomarkers for the originally intended application. This is an important

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finding and ought to be clear to any reader from the abstract and ideally also reflected in the title – this is the major contribution of the paper.

We thank the reviewer for the kind words and agree that these findings could be made clearer in the title and so we will change the title to “Examining the provenance of branched GDGTs in the Tagus River drainage basin and its outflow in the Atlantic Ocean over the Holocene to determine their usefulness for paleoclimate applications”.

2) Clarify the meaning of various org geochem tracers and terms To leverage impact of studies like this one, it would help to keep a broader audience in mind and explain the different tracers in an accessible way. Terms like DC', IR, BIT; MBT, MBT', MBTx, CBT' etc is confusing to the vast majority of geoscientists, who then may stop reading/considering the study. Perhaps a table listing discussed biomarker proxies, possibly with columns/headings such as biomarker ratio, proxy for, end-member values, would help.

We agree with the reviewer that it would be useful to have a table to refer to the terminology specific to this field as well as helpful for readers from other fields to refer to and so in the revisited manuscript we will include a table with the terms, their abbreviation, and a brief description that can include end-member values.

3) Title Should reflect the testing/evaluation aspect of the study, and possibly that it is a “revisit” to brGDGTs in the Tagus system.

See our response to comment #1.

4) Statistics The standard approach, to calc mean and std dev may not always be the best to reflect properties such as distribution of concentrations of a population. It frequently results in a 1 s.d. nearly spanning into negative concentrations (and 2 sd stretching into such unphysical space). See e.g. p. 11. Consider instead to report conc distributions with IQR or 95% CI around the mean (or median).

We understand the point the reviewer is making about how the standard deviation is

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not always the best method for showing the distribution of concentrations and appreciate their suggestion for reporting IQR or CI instead. We do think, however, standard deviation is okay to report in this case and want to be consistent with how values were reported in many other studies of GDGTs. In the future we might consider reporting IQR since, as the reviewer pointed out, in some situations it can be more appropriate than standard deviation.

5) Section numbering Need to be corrected. Both "Introduction" and "Study Area" is labelled "1". On page 11, Results start as "3" but then the first Results subheader is 4.1. . . .

We thank the reviewer for pointing this out; it will be fixed in the revised version.

6) Removing carbonates for $\delta^{13}\text{C}$ -OC Methods involving rinsing run the risk of losing some organic molecules that are solubilized in the acidic aquatic solution. Please provide test demonstrating minimal loss.

Although we agree with the reviewer that there is the risk of losing some of the organic molecules that are solubilized in the aquatic solution, this can only have a significant effect when the loss of organic matter during carbonate dissolution is large and they are isotopically distinct from the remaining organic matter. For Holocene marine sedimentary organic matter this is highly unlikely and in cases where similar measurements have been compared using both off-line and "in-cup" removal of carbonate differences in $\delta^{13}\text{C}$ -OC were minimal and will certainly not be larger than 0.2 permille. For our purposes (discrimination between marine and terrestrial OC) this is irrelevant. Therefore, we feel a test demonstrating minimal loss is not necessary.

7) Resolution of reported data in Holocene cores Lines 245-247 indicates that data was averaged for sediments covering 0-6kyr. It seems that a lot of temporal information is lost this way. Please provide at least in Supp Info and discuss.

We agree with the reviewer that by averaging the values over 6,000 years temporal

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information is lost, however, we believe this was the best way to compare the four records in this study. Furthermore, the temporal changes are relatively small. The individual values corresponding to the sediment depth and age can be found in Table 3.

8) Values of proxies relative to end members Line 293 states that "The BIT index is fairly high. . .". This is one example of where it would be really useful to readers to learn what the end-member values are to be able to make judgments and appreciate the biomarker results.

Please see our response to comment #2. Additionally, a sentence describing the end members and what the values mean will be included in the revised manuscript.

9) Language The paper is overall well written. Two aspects that can be improved throughout is (i) straight word order, and (ii) honing of topic sentence. Line 348 is a good example where improvements can be made.

We will carefully read over the manuscript again specifically concentrating on these two suggestions of improvement.

10) Figure 1 The right hand legend is too small (even for figure placed in full page format). Furthermore, the meaning of the text at bottom right is not clear.

We thank the reviewer for pointing that out and in the revised manuscript the figure legend will be made bigger and the meaning of the text in the bottom right will be made clearer.

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