

Review of BG-D ms "*Provenance of branched GDGTs in the Tagus River drainage basin and its outflow in the Atlantic Ocean over the Holocene*"

by Warden et al.

Introductory comments

A central goal of organic geochemistry is to utilize molecular-scale information to derive insight of major system properties. Such trace biomarkers have contributed improved knowledge on several aspects of past climate. The current ms explores how well different sets of branched GDGTs can inform on system variables such as MAT and pH in an Iberian land-ocean system. Using state-of-the-art analytical techniques and recent re-definitions of the proxies, they carefully assess and finds that the brGDGTs are not reliable in deriving e.g. past temperature records, at least not for this setting. However, the findings may have broader repercussions for this particular biomarker proxy. While this is an overall "negative" result, this is important for science, and for the credibility of organic geochemistry. The authors earn compliments for this effort. The paper is overall well structured and well written, yet I provide some suggestions below for their further consideration during revisions. My central recommendations are that the ms much more clearly articulate (i) the limitations of the brGDGT proxy for temperature (incl in title and abstract), and (ii) that the plethora of (abbreviated) biomarker indices are much better overviewed and explained (a Table would help). These changes would aid in making an ms like this one accessible and considered by geoscientists beyond biomarker experts.

SPECIFIC COMMENTS

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 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.

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', MBT_x, 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.

FURTHER COMMENTS

3. Title

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

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).

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 sub-header is 4.1....

6. Removing carbonates for d13C-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.

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.

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.

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.

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.