

P.A. Meyers
Reviewer
Climate of the Past
Response to Reviewer Comments
Authors: D'Anjou et al.

12/14/2012

Dear Dr. Meyers,

The authors want to thank you for taking the time to review our paper. Your comments insightful and we feel incorporating these suggested revisions will improve the quality of our manuscript.

In accordance with your suggestions, we made the following changes:

P.A. Meyers C1:

“The underlying theme of this contribution is how glacial-interglacial climate changes impacted the production and preservation of organic matter in the lake system, yet the authors provide no information about the concentration of organic carbon in the sediment samples that they have analyzed. Absent this information, mass accumulation rates of organic carbon cannot be assessed, and these values are fundamental measures of organic matter delivery and deposition in sediments. Furthermore, the dramatic variations in the multiple molecular properties that the authors have found may at least in part result from changes in the amount of total organic matter. Some comment about how organic carbon concentrations change or do not change is needed.”

Response to P.A. Meyers C1:

Your comment concerning the missing TOC data are valid, and we agree with the incorporation of this data into the revised manuscript. As such, TOC data is now included in the manuscript. At the time of data analysis and initial drafting of this manuscript the TOC data was not available, which lead us to normalize to g dry sed⁻¹ rather than g OC⁻¹. In regards to mass accumulation rates, the researchers involved directly with this study were not present at the time of sub sampling, and necessary data such as bulk density are not available. Furthermore, uncertainty in the age model precludes confident conversion to mass accumulation rates. We have decided not to normalize biomarker concentrations to g OC⁻¹, as we note in the revisions (section 5.1) for a couple of reasons. First, the response of TOC in Lake El' gygytgyn during Quaternary glacial and interglacial periods is not consistent throughout the record (Figure 3G), and the mechanisms behind this variability are not well characterized. An example of the variable nature of the TOC record occurs during the MIS 2 glacial period, where %TOC is actually much higher than during the two surrounding interglacial periods, MIS 1 and 3 (Holland et al., 2013). The TOC data from MIS 9 and 11 reveal a somewhat contrasting response with slightly elevated TOC values during MIS 11 in comparison to the surrounding glacials, MIS 10 and 12 (Figure 3G). However, TOC data from MIS 9 cannot readily be demarcated from the surrounding interglacials MIS 8 and 10, as they are all characterized by relatively similar values. In contrast, all other biological based proxies from Lake El' gygytgyn (ie biogenic

silica) clearly show elevated values corresponding to interglacial periods throughout the entire Pleistocene, including both MIS 9 and 11(Figure 4H), making them easily discernible from the surrounding glacial periods. Second, ongoing organic geochemical work in our group suggests that the non-solvent extractable portion of TOC varies considerably, and independently of glacial/interglacial cycles, at Lake El'gygytyn. As such, we chose to present our biomarker concentration data as normalized to g sediment extracted. We note that when normalized to TOC, MIS 9 and 11 still stand out as being characterized by generally elevated biomarker concentrations in comparison to the surrounding glacial intervals; however, the biomarker records become spikier due to variability in the TOC data.

P.A. Meyers C2:

“A less important question exists in what seems to be a mismatch between the statement in Section 3.1 that 38 samples were analyzed and the numbers of data points shown in Figures 2, 3, and 4, which are almost all less than 38.”

Response to P.A. Meyers C2:

For all biomarker records (aside from GDGT measurements) the figures all include 38 data points. Many of the data points do fall within a relatively short time period, and therefore when plotted the symbols overlap. When figures were scaled down in the submission process, this overlap became an issue. For the final revisions, we will attempt to fix this by using smaller symbols on all the figures. For GDGT data, there are in fact 37 data points.. The reason for the mismatch in number of data points for the GDGT records is that one sample was compromised during laboratory procedures and had to be removed from the results.

P.A. Meyers C3:

“I offer a small number of stylistic and editorial corrections for the authors to consider...”

Response to P.A. Meyers C3:

All of the suggested stylistic and technical corrections have been addressed in the revised version of this manuscript.

We appreciated the time you spent on these revisions, and feel that incorporating your suggestions into the revised manuscript will improve the final version.

Yours sincerely,

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