

Biogeosciences Discuss., author comment AC3  
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## Reply on EC1

Jonathan H. Raberg et al.

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Author comment on "Revised fractional abundances and warm-season temperatures substantially improve brGDGT calibrations in lake sediments" by Jonathan H. Raberg et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-16-AC3>, 2021

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Response to Editor Comments 1 (EC1):

***We thank the Editor for his additional insightful comments and suggestions. A detailed response is provided below:***

Additional comments from Associate Editor:

Thank you for submitting this very interesting manuscript to Biogeosciences. I think the reviewers have some good suggestions and raise interesting questions, some of which I also have, so won't repeat them here in detail.

Further, I wonder if you could provide more details about in situ production of brGDGTs in the lakes vs what is the imprint of brGDGT supply from the lake catchments. The origin of the brGDGTs will determine which parameters can be reconstructed, such as pH in soils vs in the water column, temperatures of different water depths, etc? I also think a more detailed discussion about the reasons for the apparent covariance between conductivity and pH in your dataset would be useful.

***We thank the editor for these comments and suggestions. We agree that the relative abundance of in situ lacustrine vs. catchment-derived brGDGTs has important implications for calibration studies and downcore applications. Much research has been invested to tease apart the sources of brGDGTs to lake sediments as a result. Unfortunately, even basic studies of the sources of brGDGTs to the lake surface sediment are missing for the vast majority of the lakes in our study, limiting our ability to address these issues here. This unavoidable source uncertainty likely enters our study as scatter in the data – a lake with significant soil input might be shifted from its "pure lacustrine" position. We will include a discussion of this topic in the text. We will also discuss the covariance between conductivity and pH, as outlined in our response to Reviewer 1's comment.***

I also wonder if there should be more information about global vs regional/location

calibrations for the reader that is less familiar with the topic and to explain why you rather extend the global calibration instead of developing another regional calibration that better capture the strong seasonality.

***We thank the editor for this suggestion and agree that it will be a valuable point to discuss in the text. We initially set out to construct regional calibrations for our Canadian and Icelandic datasets. However, we found that brGDGTs were not able to adequately resolve temperature differences within the small MAF range (6.6°C, or 3.2°C without the warm and cold end-members) of these datasets. This is an important result as it indicates that other environmental and/or site-specific effects complicate the link between lake sediment brGDGT distributions and air temperature. We will discuss this in the text.***