

We thank the referee for the positive assessment of our manuscript. We agree that, although OH-GDGT-based proxies are promising, we need to know more about their behavior under varying circumstances before we can fully apply these proxies with confidence. Our data show that at low salinity caution should be exercised.

The one question raised by the referee is a valid one and basically falls apart into two sub-questions: 1) Does the large change in distribution derives from membrane adjustment of the same thaumarchaeal species to the salinity change or is it due to a change in the thaumarchaeotal species composition, and 2) is there a GDGT-based ratio that can be used to “predict” a salinity change, which could be used to indicate that OH-GDGT-based proxies should be used with caution.

The first question cannot be answered with certainty. It seems likely that the composition of the thaumarchaeotal community will alter with a change in salinity. However, the abundant thaumarchaeotal species residing in the fresh oxic bottom waters just above the chemocline of Lake Lugano (Sinninghe Damsté et al., 2022) is phylogenetically very closely related to various *Nitrosopumilus* spp. (98.9% 16S rRNA gene sequence similarity) and *Ca. Nitrosarchaeum limnium* (96.0% sequence similarity), to which the predominant thaumarchaeom in the Baltic Sea is closely related. This would suggest a similar response of membrane composition to changing physiological conditions, but a definite answer can only be obtained by testing with cultures. Unfortunately, we only tested how the membrane composition of the thaumarchaeotal strain isolated from the Baltic Sea responded to temperature but not to salinity. This remains an important challenge for the future.

With respect to the second sub-question: the referee is right that many GDGT ratio's and those of other biomarkers such as glycolipids (Sollai et al., 2017) change at the transition from freshwater to brackish conditions with the change in BIT index as a marked example. Unfortunately, however, none of these can be interpreted with certainty as true indicators of salinity; the changes observed are predominantly caused by large changes in the microbial community composition as a response to the changes in salinity but cannot be used to confidentially indicate that. At present, we believe we should rely on other proxy records (e.g. diatom skeletons) to independently assess if salinity changes may have influenced OH-GDGT-based sea surface temperature records.

Sinninghe Damsté, J. S., Weber, Y., Zopfi, J., Lehmann, M. F. and Niemann, H.: Distributions and sources of isoprenoidal GDGTs in Lake Lugano and other central European (peri-)alpine lakes: Lessons for their use as paleotemperature proxies. *Quatern. Sci. Rev.* 277, 107352, <http://dx.doi.org/10.1016/j.quascirev.2021.107352>, 2022.

Sollai, M., Hopmans, E. C., Bale, N. J., Mets, A., Warden, L., Moros, M. and Sinninghe Damsté, J. S.: The Holocene sedimentary record of cyanobacterial glycolipids in the Baltic Sea: an evaluation of their application as tracers of past nitrogen fixation. *Biogeosciences* 14, 5789-5804, <http://dx.doi.org/10.5194/bg-14-5789-2017>, 2017.