Climate of the Past Discussions

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Comment on cp-2022-19

Anonymous Referee #2

Referee comment on "Evaluation of the distributions of hydroxylated glycerol dibiphytanyl glycerol tetraethers (GDGTs) in Holocene Baltic Sea sediments for reconstruction of sea surface temperature: the effect of changing salinity" by Jaap S. Sinninghe Damsté et al., Clim. Past Discuss., https://doi.org/10.5194/cp-2022-19-RC2, 2022

This paper presents OH-GDGT distributions in surface sediments and two sediment cores from the Baltic sea and investigated the potential impact of salinity on the OH-GDGT distribution in these samples. The sea surface temperature (SST) was found to be the major factor controlling the RI-OH', and a higher culture temperature results in a higher RI-OH' value in a thaumarchaeal enrichment culture experiment. However, several outliers were found to deviate from the linear correlation between RI-OH' and SST in surface sediments of the Baltic sea, suggesting that a lower water salinity may increase the RI-OH' value. In addition, the RI-OH´ index in a sediment core shows a good correlation with the TEX_{86}^{L} in the brackish phase of the Baltic sea whereas this index shows abnormally higher values during the freshwater phase. These pieces of evidence collectively suggest salinity should be considered when applying RI-O' to the reconstruction of SST in sediment cores. This paper is generally well written and easy to read. The finding of salinity impact on the distribution of OH-GDGTs is interesting. I have some concerns that need to be addressed.

The authors may need more evidence to support the argument that salinity influences the OH-GDGT distribution. Two points in the paper indicate there might be a salinity effect: abnormally high RI-OH' values occur in surface sediments with potentially low water salinity as well as in the freshwater phase of a sediment core in the Baltic sea. These unusually high RI-OH' values were attributed to the low water salinity. However, it remains to be determined whether there is a causal relationship between higher RI-OH' and lower salinity. It would be interesting to see whether there is a close relationship between RI-OH' and salinity in the thaumarchaeal enrichment culture. Also, the previously published global data set may provide some clues for the impact of salinity on the RI-OH' because those samples were collected from seas with different surface water salinity.

L20-22 The inconsistency of OH-GDGTs between the thaumarchaeal enrichment culture and core top sediments might be because the dominant thaumarchaeota producing OH-GDGTs in sediments differ from that cultured in this study.

L144-145 Why do you use base hydrolysis here? The base hydrolysis can only transform a part of intact polar lipid (IPL) to core lipids (CL) while those polar lipids with glucose headgroup remain intact.

L146 grounded should be ground

L176 Lu should be Lü

L186 Why were the thaumarchaeota cultured only at 4 and 22 °C? Culturing this thaumarchaea along a temperature gradient would be better to test the relationship between isoGDGT distribution and temperature.

L217 and 250 - ~ keep one

L294 'grown at' at which temperature?

L350 than that of …..

Figure 1 I am confused about the legend and the illustration of the figure. I did not see green squares but only see red squares, which represent sediment cores in the legend.

Also, a scale bar and the north direction should be presented.

Figure 2 and 3 I do not know what the grey lines indicate. If they are not used to highlight anything important, I suggest the authors remove these grey lines to make a clearer figure.

Figure 4 Liu et al. 2015 should be Lü et al.,2015

I have noticed the sediment cores used in this study have been dated and described in Warden et al. (2016). However, core depths, instead of the ages, were presented in the figures of this study. That is not helpful for interpretation of the SST change if the time

frame is not well constrained.