We want to thank reviewer #1 for their comments and providing constructive feedback on our manuscript. Below we address all the comments with our replies in italics.

Reviewer #1: This manuscript uses cultures of two Thaumarchaeotal strains to investigate growth temperature and phase on OH-GDGT distributions and OH-GDGT-based proxies. This is an important piece of work in the context of the emergence of OH-GDGTs as a GDGT-based temperature indicator, especially in cold water settings. The paper is clear and well written with nicely presented figures, and thoroughly reported results. I mostly only have a few very minor suggested comments/changes, but did feel like the manuscript was missing an 'implications' or 'summary' section to tie the results together and put them into a wider context. Could the authors comment on what they see as the key implications of interspecies variability in OH-GDGTS with changes in growth temperature for OH-GDGT-based temperature proxies?

We thank the reviewer for the positive feedback on our manuscript and we agree that including an Implications/ Summary section would be a valuable addition. Therefore, we will add this in the revised manuscript.

Specific comments below:

Line 23. Add 'the' before natural.

We will change this in the revised manuscript.

Line 32. Add a comma between 'moieties' and 'and'.

We will change this in the revised manuscript.

Line 43. Add 'the' before Black Sea.

We will change this in the revised manuscript.

Line 141. Correct format for tex86oh.

We will change this in the revised manuscript.

Figure 3: Is there a reason purple shaded boxes haven't been added to c) and g)? It would be good to see how these results compare to global core top data sets for RI isoGDGTs.

The reason why mean and standard deviations in purple shaded boxes were not presented for $RI_{isoGDGTs}$ is because in this study we calculated the ring index of isoGDGTs based on Equation 5 according to (Pearson et al., 2004) where isoGDGT-4 was included. However, most studies in literature have not reported the isoGDGT-4 data and therefore, mean and standard deviation of $RI_{isoGDGTs}$ could not be calculated for global marine surface sediments to present here.

Line 347: Extent rather than extend.

We will make this modification.

Discussion: It feels like an implications section is missing here, that sums up the results and discussion and distills out the key points and implications of these findings for future OH-GDGT- based research. I recommend adding a paragraph to this effect before the conclusions.

We will add this as mentioned in the general comments above.

References

Pearson A., Huang Z., Ingalls A. E., Romanek C. S., Wiegel J., Freeman K. H., Smittenberg R. H. and Zhang

C. L. (2004) Nonmarine crenarchaeol in Nevada hot springs. Appl. Environ. Microbiol. ***70****, 5229–5237.*