

Answers to the associate editor's comments:

Thank you for submitting this final version, which I am happy to accept for publication in C. Past, pending the implementation of the minor/technical revisions listed below.

Thanks for your comments, we answered below in blue and highlighted the changed in the revised manuscript.

-In the Introduction and elsewhere in the manuscript, please replace “the last deglacial” or “the Deglacial” with “the Late glacial”, and “Middle Holocene” with “Mid-Holocene.”

We changed throughout the text.

-Line 58 and elsewhere in the text (please check throughout): replace J. Wu et al., 2020 or L. Wu et al. (line 138) with Wu et al. (2020).

We have two references called Wu et al. 2020 but from two different authors. We use the Copernicus reference style in Zotero which automatically include initials when identical citation exists. Let us know if that is not the custom for Copernicus citations.

-Line 63: “This highly branched isoprenoid (HBI) and its isomer HBI diene (HBI-II) are used to trace the presence of spring sea ice in modern and geological settings.” Please add at least one reference.

We agree that we missed some references, we added references that highlight past use of HBIs to trace sea ice. L64: “(e.g., Belt et al., 2010; Fahl & Stein, 2012; Hörner et al., 2016, 2018; Vare et al., 2009).”

-Line 75: please clarify and homogenize the terminology: seawater temperature, sea water temperature, or SST?

We use both seawater temperature and sea surface temperature (SST). Here biomarkers, including GDGTs, can be used as seawater temperature (subsurface) or sea surface temperature depending on the environment. Here we use the term seawater temperature in the intro and SST afterwards.

-Lines 114 and 118: multi core or multicore — please check and standardize throughout.

We use multicore and homogenized throughout the text.

-Line 156: Replace “For PCB09 we applied the approach used (Keigwin et al., 2018) for JPC15/27 and (J. Wu et al., 2020) for ARA04C/37 ...” with “For PCB09, we applied the approach used for JPC15/27 (Keigwin et al., 2018) and for ARA04C/37 (Wu et al., 2020)...”

We replaced accordingly.

Section title “2.3.5. Biomarker ratios”: please consider a more precise title, such as “2.3.5. Biomarker ratios and environmental indicator reconstructions (sea ice, salinity, SSTs).”

We agree and used the suggested section title.

Figures

Figure 3:

I do not understand why both brown circles and green triangles are shown for PCB09 in panel 3c, please check and correct on the figure. PCB09 and PCB09MC?

We have a different shape and color for the core-top MC samples or PCB09. We amended the legend to precise that.

In addition, the caption of panel 3b is unclear, and there appears to be a bad copy/paste in the curves.

We checked and revised panel 3b.

Figure 4 caption:

Replace “Reconstructed environmental parameters for PCB9 (red circles) and PCB11 (brown squares)” with “Reconstructed environmental parameters for PCB09 (brown circles) and PCB11 (red squares).”

We corrected accordingly.

Figure 5:

Replace PCB9 with PCB09, both on the map and in the panel.

Thanks for pointing it out, we changed the names.