

Clim. Past Discuss., referee comment RC1
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Comment on cp-2021-19

Anonymous Referee #1

Referee comment on "Evaluation of lipid biomarkers as proxies for sea ice and ocean temperatures along the Antarctic continental margin" by Nele Lamping et al., Clim. Past Discuss., <https://doi.org/10.5194/cp-2021-19-RC1>, 2021

Authors present work, exploring applications of specific geochemical proxies for interpreting sea surface conditions in West Antarctica. In particular they explore applications of HBI and GDGT derived indices as proxies for sea ice and temperature reconstructions and compare the outcomes with satellite and modelling data. I think study represent standard approach in development of environmental proxies and thus provides an important contribution to the current knowledge about their potentials as well as caveats.

I have few comments to the manuscript though, listed below

- I was wondering why authors decided to present (and discuss!) data only for specific (HBI triene Z and Brassicasterol) phytoplankton derived HBI indices in the main text while moving others into the supplementary. Do data in supplementary add anything to the study? Are there any key outcomes? If so which ones etc. I think it would be nice to comment on those additional data. It also implies that those outcomes presented in the main text (based on HBI Triene Z and Brassicasterol) have shown most promise (reflect environmental settings best) in previous calibrations and have been applied most extensively, while I`m not convinced that`s the case in Southern Ocean. While they have been utilised fairly extensively in the Arctic and subjected to several calibration studies, It`s not been the case in the Southern Ocean (as author also point out) and applicability of approach utilising any of these pelagic lipids is vastly unexplored.
- There seems to be weighting towards HBIs, which somewhat detracts from GDGT outcomes. It made me wonder if perhaps "less" could be more. Should authors concentrate either on GDGTs or on HBIs? While they carry out the evaluation between the individual indices and satellite/modelling data I was missing an intercomparison between lipid derived proxies and where outcomes from one support/contradict those

derived from other.

- Have authors considered including any taxonomy work? It seems like biomarkers are depicting some regional differences (e.g. EAP vs WS or EAP vs WAP or even WS vs AS) and I was wondering to what extent these could be observed via differences in diatom distributions. Could taxonomy/diatom work also provide some indications about productivity or phytoplankton composition differences that authors refer to in text (e.g. lines 247-249, 282 etc.)?

Some other minor comments

- Introduction seems to be rather generous towards HBIs but relatively scarce on GDGTs. I think it would be worth expanding this part and provide overview of current knowledge with respect to use of GDGTs in Southern Ocean.
- Title: perhaps consider rephrasing. "...sea surface.." Authors state that it's not clear if GDGT based temperatures they've derived represent SST, near-surface or sub-surface (e.g. lines 448-449).

Line 56: "...emerged as a robust proxy..." seems to contradict with authors conclusions (c.f. line 532).

Line 65: I think authors might have wanted to say "by analogy" rather than "because of the structurally close relationship of this lipid..." e.g. HBI trienes are also structurally similar to IP25 and IPSO25

Line 68: change "...reconstructions is..." to "...reconstructions are .."

Line 140-141: internal standards-provide mass equivalent added

Line 247-249: "... ,pointing to elevated productivity..." somewhat misleading given follow up sentence. Rephrase to ... pointing either to elevated productivity or reworked terrigenous organic matter

Lines 267-269: sentence beginning "Here productivity of the source diatoms.." any studies or diatoms data that could provide some support if that is the case?

Line 283: 2 magnitudes – add *orders of* after 2

Line 337-341: "This difference between.." seems like really important point to consider! Where does this leave sterols as a phyto counterpart in PIP index?

Line 364: "..., with up to 11C.." – add *temperatures* after with

Line 395: $\delta^{13}C_{org}$.5 – should .5 precede $\delta^{13}C$?

Line 402: "The sea ice biomarker IPSO25 is hence.." Are there any detailed time series sea ice studies to support this statement? Analogy is based on what is known about IP25 in the Arctic, but I don't think this is yet true for IPSO25 in Southern Ocean.

Line 458: I think authors shouldn't use reference which have not been at least accepted for publication

Line 477: remove `HBI diene`