

Interactive comment on “Highly branched isoprenoids for Southern Ocean semi-quantitative sea ice reconstructions: a pilot study from the Western Antarctic Peninsula” by Maria-Elena Vorrath et al.

Anonymous Referee #2

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While a lot of effort has gone into evaluation and calibration of the HBI proxies in the Arctic (their source, environmental factors affecting their production, relation of surface sediment HBI concentrations to sea ice concentrations based on satellite data etc.), very little has been done in the more remote Southern Ocean. The study by Vorrath et al. is hence a valuable effort to better understand HBI sea ice proxies around Antarctica. The study nicely combines sea ice (related) biomarkers, open water phytoplankton markers and qualitative and quantitative diatom data from surface sediments, and compares these with satellite-derived sea ice concentrations in the study area.

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As reviewer 1 already pointed out, there are some issues about the region where the study has been conducted, relating to the time period the surface sediments represent (especially in the Drake Passage due to winnowing). However, as the authors are out to explore rather than to strictly calibrate their sea ice proxies (especially the PIPSO25 index), this is not a crucial problem and the authors are aware of it. This is in general one of the most challenging issues with calibration of surface sediment proxies against instrumental data, as there rarely is a good control on the time period the surface sediments represent. As a comment on another main point reviewer 1 raised, PIPSO25 is produced in the spring shortly before the ice melts, not in the winter, so the authors' hypothesis about the surface sediments representing a time when spring sea ice cover resembled modern winter sea ice cover appears plausible. Otherwise I agree with the thorough reviews & comments by the editor and reviewer 1, and have only a few more comments/corrections to add:

Page 3, line 3: Initially,.. Page 5, 3.1. It would have been useful to date the surface sediment with ^{210}Pb , to constrain the time period the surface sediments represent. ^{210}Pb is more suited for dating surface sediments than ^{14}C . I am not asking the authors to conduct this now, but it is something to consider for future work. Page 6, 3.3.: Insufficient information is given for diatom methodology. In addition to references given, at least a brief summary of the sample preparation should be provided, whereas the transfer function technique used should be presented with much greater detail! Page 7, line 1: The diatom species *Fragilariopsis*. . . Page 9, line 1 – Rontani et al. (2019) Autoxidation of the sea ice biomarker proxy IPSO25 in the near-surface oxic layers of Arctic and Antarctic sediments. Page 9, line 13 . . .seasonally ice-free + line 17: . . .ice-covered.., + line 27: phytoplankton. . . Page 9, line 29: remove comma after “both” Page 10, line 4: add comma after 2015) Page 12, lines 7-9: The likelihood of winnowing in Drake Passage should be brought up also here in the discussion. Page 13, lines 25-29: Although an attractive idea – and circumventing the time window issue when calibrating against satellite data - calibration of the PIPSO25 index against diatom data faces issues around the reliability and robustness of diatom-based quantitative inferences,

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which should certainly be mentioned!

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