EGUsphere, referee comment RC1
https://doi.org/10.5194/egusphere-2022-804-RC1, 2022

Comment on egusphere-2022-804

Anonymous Referee #1

Referee comment on "Deglacial and Holocene sea-ice and climate dynamics in the Bransfield Strait, northern Antarctic Peninsula" by Maria-Elena Vorrath et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-804-RC1, 2022

Vorrath and co-authors present a new palaeoceanographic record based on micropalaeontological and biomarker records from a marine sediment core (PS97/072-1) at the north-eastern end of the Bransfield Strait, Northern Antarctic Peninsula (NAP). The Bransfield Strait is an important region of the NAP, with oceanographic links to the Weddell and Bellingshausen Seas. The area is also characterised by declining sea ice cover and warming sea surface temperatures over recent decades. The core record covers the late glacial (Antarctic Cold Reversal) to the beginning of the 20th century. Vorrath et al. use biomarkers and diatom ecological groups to reconstruct changes in local sea ice cover and sea surface temperatures to inform their oceanographic and climatic reconstruction for the past 13.9 ka.

I commend the authors for the considerable time and effort that has been invested to produce these micropalaeontological and biomarker data. The record has the potential to be a valuable addition to the literature on past ocean and climate conditions in the NAP. Unfortunately, this potential is not realised in the current manuscript. While the general structure and style of the text is appropriate, greater attention to detail and a more nuanced consideration of the palaeoceanographic conditions are required throughout the manuscript, especially with regards to the sea ice environment.

MAJOR REVISIONS

> Study Area:

The paragraph on the oceanographic setting mostly describes the sources and distribution of sub-surface water masses which is difficult to follow and too detailed considering the water masses are not mentioned in any other part of the paper except figure 1. There is

no mention of the modern sea ice conditions or seasonal variability.

Consider whether the Northern Antarctic Peninsula would be a better description of the regional context of this study and be aware that WAP (West Antarctic Peninsula) is currently used to describe: 1) the ocean/seas over the continental shelf west of the AP landmass; 2) the western coast of the AP landmass; and 3) the whole area west of the AP spine (land and ocean). Please provide an accurate descripton of WAP and/or NAP and use the term consistently throughout the manuscript.

> Sea ice:

Descriptions of sea ice variability are too vague throughout. Whilst the relative changes in sea ice could appear to make sense in the time slice sections of the discussion, the sequence of Holocene sea ice changes summarised in the conclusions highlights the poor choice of terms used to describe the reconstruction:

• Post ACR: '***retreat*** *in spring sea ice*' - spring sea ice retreats each year, what do you mean here?

• Early Holocene: '***slightly decreasing*** *spring sea ice and* ***highly variable*** *WSI*'

• Mid-Holocene: followed by '***lower*** *spring sea ice… sea ice* ***seasons were short*** *and sea ice cover was* ***significantly reduced*** *to a minimum around 5.5 ka BP, even though* ***high seasonal amplitudes*** *and* ***short-term, centennial changes*** *in sea ice conditions occurred*'.

• Late Holocene: 'variable WSI'

Recurring phases of 'decreasing/lower spring sea ice', 'short sea ice seasons' and 'variable WSI' are difficult to put into context without some qualification. I suggest you add detail to convey the likely duration of sea ice cover (eg. 3-6 months), timing of break up/melt (eg. early/mid/late spring) or use the values of your IPSO/WSI results.

Also need to make it clear whether 'more(less) sea ice' relates to duration/extent etc. or use more precise terms.

> Diatom groups:

Composition of the various ecological groups is not given in either the main manuscript or supplementary files; frequently refer to 'open ocean' group without explanation as to whether it is the 'warm' or 'cold' ocean group or a total or both groups.

> Literature:

Very sparse reference made to other Bransfield Strait/NAP studies. Since your study is

based on single site it would be useful to establish whether the climate signals are 'locally' coherent before comparing them with WAIS/EPICA, Palmer Deep etc.

> Comparison of proxy records:

Would be useful for the results or discussion to have a dedicated section comparing the different PS97/72-1 proxy records and providing potential explanations to reconcile results. Especially with regards to:
- different signals/trends between proxies
- reliability and accuracy of proxies at the site
- how amplitude of signals relates to changes in sea-ice/temperature (broadly linear relationships or not? unknown?)

COMMENTS & SUGGESTIONS

See annotated PDFs for specific comments and suggestions on the text, figures and supplementary information.

MINOR COMMENTS

Disordered use and introduction of abbreviations

Inconsistent use of sea-ice/sea ice

Inconsistent use of spacing between signs/units and numbers eg. < 3% and <3 %

Check whether citations should be listed in date order

Please also note the supplement to this comment:
https://egusphere.copernicus.org/preprints/2022/egusphere-2022-804/egusphere-2022-804-RC1-supplement.zip