

LINE SPECIFIC COMMENTS AND AMENDMENTS

- 44 Not obvious what time frame you mean my 'since industrialisation' - this could be anything from 1750 to 1900... suggest you replace with clear time frame - either 'since specific year' OR 'over the last specific number decades' OR similar
- 45-53 Need to include timeframes for each of these 'observations' eg. rate of warming in AP only valid to a specific interval – not indefinitely.
- 56 'seems to be interrupted' understates the scale of decline recorded since 2014.
- 71-72 Phytoplankton are the source of dimethylsulphide not sea ice.
- 76 Replace 'impact' to 'contribute to'
- 81 Add 'climate' before 'mode'
- 84-86 Add reference.
- 90 Replace 'westerlies' with 'westerly winds'
- 92 Change describe to 'assert' or 'propose' or similar.
- 114 Change 'among' to 'between'
- 114 & 121 Explain why the IPSO signal is associated specifically with spring sea ice
- 123-124 Explain the relevance of analysing cores from different depths.
- 137 Add 'and SSI' after AP
- 138 Reverse order of 'yet not'
- 141 Replace Antarctic with 'AP'
- 143 Currents and water masses are not the same – ACC is a current; BSW is a water mass. Water masses can be carried/transported by currents but currents cannot produce water masses.
- 146 Replace Antarctic with 'AP'
- 159-161 Add that the areas of high PP are associated with diatom(?) production
- 161 Add 'Varied/heterogeneous' or similar before 'upwelling'
- 168-169 Delete 'input' and change 'silt and clay' to 'silts and clays'
- 171 Unless you used more than one multicorer you should change multicorers to 'a multicorer'
- 174 Need to include description of how 072-1 and 072-2 were correlated to match sample depths/ages.
- 175 Replace with 'Immediately after recovery, sediment cores were sectioned into 1 cm slices and subsampled. Samples designated for biomarker analyses were stored in glass vials at -XX deg C and samples for micropaleontological ...'
- 193 Add 'was measured' or similar after either '226Ra' or 'depth interval'
- 201-202 Add info on sample size
- 209 Replace 'extracted' with 'processed'
- 215 Add 'of the residues/sample/' after fraction
- 222 Reword: not clear whether 'followed by temperature increase to 150 degC over 6 min, and to 325 degC within 57 min' is correct – do you mean 'the temperature was gradually increased to 150(325) deg C over the course of 6(57) min' or do you mean 'the temperature was raised to 150(325) deg C and sustained for 6(57) min.'
- 200-268 Clarify whether standards are used for the GDGT analyses
- 270 Need to state how many and the resolution of diatom samples as it is clearly different to the 1 cm resolution you describe in the section on sampling.
- 272 Slide preparation not described in Cardenas et al (2019), instead refers to method of Gersonde & Zeilinski, (2000)
- 280 Add justification for applying this TF for sea ice in the AP. Eg. how many of the 274 reference samples are from the AP?
- 287 Add justification for applying this TF for SST in the AP? How many of the 336 reference samples are from the AP?
- 293 Add 'proxies' after 'biogeochemical'
- 295 What about ice sheet dynamics?
- 298 Convert resolution of atmospheric model (1.9 degree) into km so it can be compared directly with ocean model.

300 Why is the resolution over the Arctic relevant here?

307-308 Reference/Evidence required. What about glacial isostatic adjustments?

322 – Is there a specific reason for using Dyer Plateau MSA record? Why not Bruce Plateau which is closer to the Bransfield Strait. Bruce Plateau record shows strong relationship between accumulation and sea ice cover too (Porter et al., 2016) but also has MSA record.

322 Delete 'coastal'. The Dyer Plateau site is on the spine of the Peninsula at >1900m elevation.

366 Give value of high F. curta contribution. Also need to include F. curta data in figure OR supplementary info. Consider including the diatom concentrations as one of the figures or supplementary info as another proxy for export productivity.

387- Since you provide an explanation for the outlier temperature in the SOTTEX record (392-393) you should also consider the strong divergence of trends between the biomarkers and WSI records, and the elevated SSST in the youngest sample.

391 Format 25 as subscript

392-393 Given that the SOTTEX exceeds realistic temperature min at the Trinity Island and Orleans Trough – can the other temperature points be trusted?

394-395 Either delete the statement 'A general weak cooling trend is present in SSST and SOTOH from 1920 CE to the 1990s.' or add an explanation and/or discussion point.

395-398 What is the evidence for increased mixing? More mixing would imply a convergence of both SOT temperature records and SST which is not evident in the SOTOH results from the Orleans Trough site.

402 'SSST corresponds quite well with SOTOH at PS97/056-1 and with SOTTEX at PS97/072-2'. What is the relevance/significance of this observation?

405 You need to give the values for the modern temperature range for the different areas when you make this type of assertion.

406 '...no clear dominance from one or the other regime is evident and we suggest that GDGT-derived temperatures are affected by influences of both BWS and WSW.' Do you mean both GDGT temperatures? How does this account for the distinct OH and TEX SOT records from the Orleans Trough site? You should also address why the temperatures derived from the SOTTEX are mostly warmer than the SOTOH temperatures.

411 As the site is farthest from the coast, please suggest the source(s) of this iron fertilisation

412 Replace 'have resulted from' with 'suggests' or 'indicates' or similar

413 Replace 'water' with 'subsurface ocean temperature(s)'

472 Delete either 'do not show such' or 'are not present'

484 Supplementary Table 7 not available (only supplementary Figure 1-5 were included in supplementary file).

486 Either delete 'coastal' or replace with offshore or similar

496 Does the 30x30 km model resolution apply to both atmosphere and ocean or just ocean? If both, this should be made clear in the methods section.

499 Insert 'in (the) model(s)' after 'missing feedbacks'. You should also state what the 'internal variabilities and missing feedbacks' are.

501 Replace 'recorded period' with the specific age range(s)

506 Consider changing 'be more related' to 'match' or 'more closely match' or 'reflect' or 'better reflect'

515-518 Should acknowledge that the proxy records do not resolve the observed patterns but that this could be a limitation of the resolution.

545 Have you considered using diatom concentrations, other diatom assemblage information and/or to convert your biomarker records into fluxes?

551 Why are the Bruce Plateau snow accumulation and MSA records not used? Bruce Plateau is much closer to your sites than Dyer Plateau.

557 It is not clear how your records are 'strongly influenced by the AP as a geographic barrier'. Please state what this influence is.

560 Please replace 'covered' with 'reflected' or 'represented' or similar

565 Consider replacing 'account for' with 'resolve' or 'capture'

566 This is the first mention of 'seasonal input of drift ice from the Weddell Sea'. You should include this in section 2.1 and state which of the sites are impacted by this and how.

574 Consider comment for lines 395-398 re: mixing at the Orleans Trough site.

588 Change 'picture' for 'depict'

589-590 If you are implying that the SOT temperatures are an annual signal you should state this clearly either in the paragraph at 247-250 or in your discussion of the temperature records.

1039 Initials missing from ref.

FIGURES

> Figure 1 - In Moffat & Meredith (2018) West of Anvers Island the APCC is illustrated as flowing southwards. Please check.

Delete replicates of 'Abram et al 2010' in figure caption.

Intervals when the Orleans Trough site has SOT_{tex} 2-3 degC warmer than the Trinity Island and East Bransfield Basin site. Please provide some potential explanations for these offsets in the discussion.

> Figure 2 - Reword: 'extrapolating ages based on sedimentation rate of oldest 3 cm' – I think you mean the 3 cm of sediments at the base of the 'reliably' dated interval not the oldest 3 cm.

Add comments on the changes in sedimentation rates to your discussion.

> Figure 4 - Add sample markers to biomarker data to show sample numbers/intervals.

Add comments/discussion on why transfer function WSI % is generally much higher than observed.

> Figure 6: - Include the modelled SSST to compare with diatom-derived SSST.

SUGGESTED REFS

> Abernathy et al. (2016) Water-mass transformation by sea ice in the upper branch of the Southern Ocean overturning. *Nature Geoscience*, 9. 8 pp. doi:10.1038/ngeo2749

> Frew et al. (2019) Sea ice – ocean feedbacks in the Antarctic shelf seas. *Journal of Physical Oceanography*, 49. 2423-2446. doi:10.1175/JPO-D-18-0229.1

> Holland et al. (2012) Wind-driven trends in Antarctic sea-ice drift. *Nature Geoscience*, 5. 872-875. doi:10.1038/ngeo1627

> Montes-Hugo et al. (2009) Recent Changes in Phytoplankton Communities Associated with Rapid Regional Climate Change Along the Western Antarctic Peninsula. *Science*, doi:10.1126/science.1164533

> Porter et al. (2016) Bellingshausen Sea ice extent recorded in an Antarctic Peninsula ice core, *Journal of Geophysical Research Atmosphere*, 121, doi:10.1002/2016JD025626.