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Interactive comment on "Mid-Holocene Antarctic sea-ice increase driven by marine ice sheet retreat" *by* Kate E. Ashley et al.

Anonymous Referee #1

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Within their manuscript entitled "Mid-Holocene Antarctic sea-ice increase driven by marine ice sheet retreat", Ashley et al. establish a link between the impact of meltwater discharge from the Ross Sea ice-shelf cavity and sea ice evolution in the Adélie Land coastal region. Based on geochemical, sedimentological and micropaleontological data sets obtained from IODP core U1357 and nearby core MD03-2601, Ashley et al. identify the meltwater signal originating in the Ross Sea and assess its potential role for Holocene sea ice cover at the core site. These proxy reconstructions are complemented by a numerical model simulating the westward circum-Antarctic routing of meltwater released in the Ross Sea sector via the Antarctic Coastal Current. The manuscript is well written and in a very mature state. A major focus is on the application of fatty acid hydrogen isotopes as a proxy for glacial meltwater. Accordingly, the authors provide an extensive overview on the potential source organisms synthesizing C18 fatty acids and address various aspects relevant for the interpretation of the isotopic values. For background information on and the interpretation of the other proxies applied in this study, the reader is often referred to the supplementary information, which, to my opinion, lowers the readability of the manuscript to a certain extent. Some re-structuring of the manuscript (shifting parts of it into the supplement and vice versa) could help on this. Concerning the paleoenvironmental reconstruction (i.e. the discussion chapter), I miss a more thorough integration and discussion of other already published East Antarctic paleo records (e.g. Berg et al., 2010; Borchers et al., 2016; Kim et al., 2012). While the authors indeed mention Mezgec et al. (2017) at one instance, I miss the actual discussion of their Holocene sea ice reconstructions for the Ross Sea as this could help to link the sea ice evolution in both areas, which would clearly improve the manuscript.

minor points:

lines 56-59: these studies only refer to East Antarctica; re-phrase: "...highlight a major baseline shift in East Antarctic coastal sea ice..."

line 82: diene/triene HBI ratio: please refer to Belt et al. (2016) and provide brief comment that the diene is also called IPSO25 (at least in more recent papers using HBIs for Southern Ocean sea ice reconstructions)

lines 154-170: methods chapter 3.4 (HBIs) should be moved and integrated into chapter 3.1 (Organic geochemical analyses)

line 157: please provide information on the internal standards

lines 261-268: make clear that these simulations are already results of this study

line 327: Tang et al. (2008) do not state that P. antarctica exists within sea ice; please provide an appropriate reference

line 342: please provide reference for better preservation of biomarker lipids compared to microfossil remains

lines 393-394: unclear - what is meant with “...ice that contributed to a marine-based ice sheet collapse along this margin...”

lines 492-529: what do the HBIs reflect in terms of sea ice cover during the Early Holocene?

References

Berg, S., Wagner, B., Cremer, H., Leng, M. J., and Melles, M., 2010, Late Quaternary environmental and climate history of Rauer Group, East Antarctica: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 297, no. 1, p. 201-213.

Borchers, A., Dietze, E., Kuhn, G., Esper, O., Voigt, I., Hartmann, K., and Diekmann, B., 2016, Holocene ice dynamics and bottom-water formation associated with Cape Darnley polynya activity recorded in Burton Basin, East Antarctica: Marine Geophysical Research, v. 37, no. 1, p. 49-70.

Kim, J.-H., Crosta, X., Willmott, V., Renssen, H., Bonnin, J., Helmke, P., Schouten, S., and Sinninghe Damsté, J. S., 2012, Holocene subsurface temperature variability in the eastern Antarctic continental margin: Geophysical Research Letters, v. 39, no. 6.

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