

Interactive comment on “Stable isotope signatures of Holocene syngenetic permafrost trace seabird presence in the Thule District (NW Greenland)” by Sebastian Wetterich et al.

Anonymous Referee #2

Received and published: 6 July 2019

Comments on manuscript by Wetterich et al. submitted to Biogeosciences. The manuscript is well written and fairly well illustrated and the subject is suitable for Biogeosciences. However, the authors need to refer to previous work carried out in the area. Over 30 radiocarbon ages from peat deposits below sea-bird colonies from the Thule region were reported by Delibrias et al. (1972) and discussed by Malaurie et al. (1972). The peat deposits were also discussed by Salomonsen (1979). The authors could also refer to a paper by Burnham et al. (2009). Malaurie et al. discussed peat accumulation rates – an issue also discussed by Wetterich et al.

The oldest ages reported by Malaurie were ca. 1500 years BP. Wetterich et al. have

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ages going back to ca. 5000 years. I wonder if the lack of older ages is due to the sampling methods? I would assume that sea birds colonised NW Greenland already in the Early Holocene, but I agree that colonies expanded during the Late Holocene. We know from radiocarbon dating of shells of marine molluscs in the region that there was a rich marine invertebrate fauna already in the Early Holocene. And of course there are also very large sea-bird colonies in other parts of Greenland.

The authors describe some of the cores as brown moss peat. I wonder if the mosses were identified? The peat on Nordvestø consists of *Aplodon wormskioldii*, which is a most uncommon fossil species. I wonder if the other peat deposits in the Thule region are also dominated by this species? On page 10, line 35 we hear about *Polytrichastrum alpinum*, which is present in the GL3 core. Does it dominate?

Some other comments Page 2, line 8. How many pairs of thick-billed murre? Page 2, line 33 and 34. I prefer use rather than employ Page 3, line 18. Please provide data on the elevation of the sites. Are the sites below or above the marine limit? Page 3, line 24. Please provide data on the local vegetation as you observed in the field. Grasses and sedges are much more important than rushes in the area. Not sure about dwarf shrubs at the actual sampling sites. Page 4, line 2. How do you know you reached bedrock? Could it be stones or boulders? From the photos it appears that both sampling sites are located in areas with thick gravel deposits. Page 5, line 4-10. More information on testacean analysis is needed. How many specimens were counted per sample? What was the sample size? It would be nice to see some testacean diagrams. Page 5, line 14. The succession was divided into three zones Page 5, line 28. Is there only one testacean assemblage in the whole core? Page 7, line 3-4. Intense deglaciation occurred in the Early Holocene, long before the Holocene Thermal Maximum – due to abrupt warming at the Younger Dryas-Holocene transition. With respect to the deglaciation chronology see Bennike & Björck (2002). Page 7, line 5 9.9 and 9.2 kyr BP – not yr BP! Page 7, line 3-8. According to the compilation by Bennike & Björck (2002) the two study sites were deglaciated before 10 cal. kyr BP

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Page 11, line 23. I think the main difference is the number of little auks compared with thick-billed murre. Also the different nesting places as mentioned by the authors.

BGD

Some references: Bennike, O. & Björck, S. 2002: Chronology of the last recession of the Greenland Ice Sheet. *Journal of Quaternary Science* 17, 211–217. Burnham, K.K., Burnham, W.A. & Newton, I. 2009: Gyrfalcon *Falco rusticolus* post-glacial colonization and extreme long-term use of nest-sites in Greenland. *Ibis* 151, 514–522. Delibrias, G., Guillier, M.T. & Labeyrie, J. 1972: Gif natural radiocarbon measurements VII. *Radiocarbon* 14, 280–320. Malaurie J, Vasari Y, Hyva Áirinen H, Delibrias G, Labeyrie J (1972) Preliminary remarks on Holocene paleoclimates in the regions of Thule and IngleiňAeld Land, above all since the beginning of our era. *Acta Universitatis Ouluensis, Series A, Scientiae Rerum Naturalium* 3, *Geologica* 1, 105–136. Salomonsen F (1979) Ornithological and ecological studies in southwest Greenland (59°46'–62°27'N. Lat). *Meddelelser om Grønland* 204(6), 214 pp.

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2019-71>, 2019.

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