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Climate of the Past Discussions

Interactive comment on "Reconstruction of Holocene oceanographic conditions in the Northeastern Baffin Bay" *by* Katrine Elnegaard Hansen et al.

Anonymous Referee #2

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The manuscript provides important new information on holocene ocean circulation changes in eastern Baffin Bay, in an area where until now relevant knowledge has been very limited. Thus, this is a significant contribution, fitting well within the scope of CP. A few minor linguistic corrections are recommended, e.g. singular it/he/she = verb +s, plural they = without adding s to verb

The work is based on the analysis of the benthic foraminiferal fauna of a 7.5 m long sediment core in combination with sedimentological information and multi-element data obtained from XRF scanning. Both the laboratory methods and data quality are of high standard, whereas the age model is based on > 10 AMS C14 data levels well covering

the entire core.

Both titel and Abstract clearly and concise refer to the contents of the manuscript. Only doubt here, is whether the core site should be described as being situated in 'North-eastern' Baffin Bay, or this 'Northeastern' should be better replaced by just 'Eastern' (Baffin Bay).

As for the 'Introduction' I may suggest generally some shortening and re-structuring. This includes to move the section line 55 - 68 to the Regional Setting section, where some (double) information thus could be removed. Moreover, at the end of the 'Introduction, line 149 - 154, would fit better early in 'Regional Setting', i.e. following in line 95. More generally, some older references (oceanography/hydrography) could be omitted and/or replaced by more recent, f.ex.: *) Bi et al. 2019, Baffin Bay sea inflow and outflow..., The Cryosphere 13, 1025-1042; *) Castro de la Guardia et al. 2015. Potential positive feedback between Greenland Ice Sheet melt and Baffin Bay heat content on the west Greenland shelf. Geophys. Res. Lett. 42, 12; *) Munchow et al. 2015 Baffin Island and west Greenland Current Systems in northern Baffin Bay, Progr. in Oceanography.

Discussion: Within the context of the Ca/Ti and Ca/Sr interpretation, mid Holocene (line 595 - 608) another Ca source could be Uumannaq fjord area, where the Marmorilik Formation includes thick strata of dolomite marble and calcite marble (Garde, 1979, Precambrian Research 8, 3-4, p.183-199). This possible source is found not far to the south, i.e. drifting with the WGC, icebergs from Uumannaq Fjord may (also) have contributed.

With regard to the Mid- and Late Holocene, a short reference should be made to the later HTM stage, where f.ex. in Ameralik, near Nuuk, evidence was found for (still) strong melting until 3.2 ka (see Møller et al. 2006 Late Holocene environmental and climatic changes in Ameralik Fjord, Southwest Greenland – evidence form the sedimentary record. The Holocene 16, (5), 685-695). Same applies to Disko Bugt. Within

this context, important to note is significant cooling and freshening recorded (until c. 4.0 ka) in Newfoundland cores (e.g. Solignac, Sheldon), which must be related to Baffin Bay (melting, NAO-ocean control) conditions. Furthermore, the North Water Polynia was correctly mentioned in the Introduction; which function/contribution to corrosive bottom waters could this have had after it had formed ?

And finally: Great support for your conclusions you can find in Saini et al. 2020. Holocene variability in sea ice and primary productivity in the northeastern Baffin Bay, Arktos doi:10.1007/s41063-020-00075-y !

Herewith I may (thus) strongly support publication of this manuscript

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