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Climate of the Past Discussions

Interactive comment on "Relationship between Holocene climate variations over southern Greenland and eastern Baffin Island and synoptic circulation pattern" *by* B. Fréchette and A. de Vernal

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We acknowledge the positive review of Referee #2 regarding our submitted mansucript. All comments are very helpful to clarify and improve our manuscript. Below we placed our reply to the questions raised by Referee #2.

Page 881-882, Line 25-27 and Line 1-4. Figure 1. "The map of location is not very detailed. This part of Greenland is also know for acheological reasons: the Norse colonization and the creation of the Eastern settlement between 986 and 1450 AD. Is

Qipisarqo very far from Eastern Settlement? Is the site enough far away from zones of human impact? There is no information about the size of the lakes: are they big or small lakes? What is the size of the catchment area of these lakes? What is their depth? This is of a great importance to understand pollen rain: a big lake has a regional pollen rain representation and a small lake a local pollen representation." These comments are important and to provide details would be of needed for a paper discussing the vegetation history. The purpose of the present study rather concerns the climate history of southwest Greenland and eastern Baffin Island. A paper on the vegetation history at Qipisarqo Lake is in preparation. The Eastern settlement is less than 150 km from Qipisarqo Lake and the Western settlement is about 1000 km north of Qipisarqo Lake (Kaplan et al., 2002, Quaternary Research 58, 149-159). Information on Qipisarqo Lake size, water depth, etc is given in Kaplan et al. (2002). Qipisarqo Lake is irregular in shape (600 x 900 m) (see Figure 1 in Kaplan et al. (2002)) and Akvaqiak Lake is roughly oval (390 x 600 m). This will be indicated in the revised version of the manuscript. The local vegetation is dominated by birches and heaths and these two pollen taxa (Betula and Ericales) dominate both pollen records (Supplementary Figure 1). Therefore, the pollen rain registered in both lakes is mainly from local plants.

Page 884, Line 5-8 and Supplementary Figure 1. "Pollen sums are about 500 grains. Please add a sentence in the legend explaining what is included in the pollen – 100% - sum. Spores, aquatics and foreign pollen grains should be excluded." The basic sum only includes pollen grains from spermatophytes. Spores from pteridophytes, bryophytes and aquatic plants have been excluded. Because the purpose of this study was the climate history of southwest Greenland and Baffin Island only the 39 pollen taxa considered for climate reconstruction were conserved (cf. Fréchette et al., 2008, Quaternary Science Reviews 27, 1197-1216). This will be clarified in the revised version of the manuscript.

Page 889, Line 1-5. "Pollen assemblages dominated by Betula and Ericaceae. There is possibility to make the difference between pollen types in the Ericaceae family: Em-

petrum type, Vaccinium type and Ericales for indeterminate Ericaceae. One can regret that the different pollen types were not made by the pollen analyst." Because the purpose of this study was the climate history of southwest Greenland and eastern Baffin Island we must used the same pollen taxa as those used for climate reconstructions. In the modern pollen database used for climate reconstructions (n = 828 sites) all Ericaceae are grouped (Fréchette et al., 2008; Whitmore et al, 2005, Quaternary Science Reviews 24, 1828-1848). However, at Qipisarqo Lake, an effort was made to distinguish pollen types from the Ericaceae family. Thank you for the comment regarding the underrepresentation of Ericaceae taxa in the pollen rain in subarctic southern Greenland (Schofield et al., 2007).

"The following comment is more a reflection than a real question. Have you noticed that in Fredskild diagrams (Isoetes, Spongilla, Klofto), when there are high percentages or influx of Ericaceae, there are also more important percentages or influx of Alnus? Ericaceae and Alnus seem to be associated. Do you know the ecological conditions of Alnus in Greenland today?" Regarding the relationship between Alnus and Ericaceae, we do not agree with you because it is rather the reverse situation that is observed. At Isoetes, Alnus frequency decreased from pollen assemblage zone (PAZ) D (ca. 7500 14C years BP) to PAZ G (0 BP) and Ericaceae frequency (principally Empetrum) increased from PAZ D to PAZ G. The same applies for Spongilla. The relationship between both taxa is less evident at Kflotso. According to Fredskild (1996, Meddelelser om Gronland Bioscience 45), Alnus crispa is present only in west Greenland today and it prefer the inland. According to "The Biodiversity of Greenland – a country study" edited by Dorte Bugge Jensen and published in 2003, alder prefers heavy snow cover and it mainly grows on protected slopes. Alder also need wet-moist soils.

Page 891-892, Line 13-26 and 1-11. "The timing of the immigration of Alnus crispa in southwest Greenland is very interesting. However, I wonder about the distance from southern sites to northern sites. The time of migration from Fredskild sites (Isoetes...) to Iversen site is very slow, about 3500 years... how do you explain that?" The distance

between the southern and the northern sites is about 600 km. At present, we cannot explain unequivocally this delayed migration in west Greenland. However, we think that the late Holocene sea-level rise in Greenland could have favoured its migration. Please, see our reply to Referee #1 for more details.

"Last detail, the reader is left alone to find out about datations, which sometimes are mentioned in uncalibrated (3500 14C years BP), and sometimes in calibrated (5600 cal. years BP) or just 5000 years. This mix-up of dates is not of any use to the reader. Please use only calibrated/calendar ages throughout the text." Yes this could be confusing. The reason for this mix-up is explained in our reply to Referee #1. Clarification will be made.

On the behalf of Anne de Vernal, Bianca Fréchette

Interactive comment on Clim. Past Discuss., 5, 879, 2009.