

Interactive comment on “Using ground-penetrating radar, topography and classification of vegetation to model the sediment and active layer thickness in a periglacial lake catchment, Western Greenland” by Johannes Petrone et al.

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Comment: The paper is well written and presented an interesting case study.

Response: We thank the Referee for taking the time to read through and assess the paper.

C1

Comment: “Page 6, line 7: I suggest to improve the description of the system used for bathymetry. In particular, I suggested to insert the description of the GPS acquisition characteristics (e.g the acquisition has been done with or without RTK correction) and the estimated accuracy of the obtained DTM. . .”

Response: The resulting DEM has three data sources. i) A previously refined DEM (5 meter resolution) originally based on orthophotos by Scancort. ii) Combined GPS and Echo sounding measurements in the lake. iii) LiDAR data from measurements presented in the present paper.

Details about the data processing based on information from Scancort are presented in Clarhäll et al. 2010. Two measurement campaigns with the combined GPS-Echo sounding technique were performed; one campaign in 2010 and one in 2011. Details about the measurements performed in 2010 are presented in Clarhäll et al., 2011 and the measurements performed in 2011 are described in the present paper. However, some information about the equipment is missing and therefor presented in the following. The GPS acquisition for the bathymetry was done without RTK correction, as there is no such option for this particular GPS-receiver. The combined GPS-echo sounding equipment has estimated accuracy in the range of $\pm 1\text{m}$ in the horizontal plane and $\pm 0.1\text{m}$ in depth.

Manuscript changes: Appendix 1 will be included in the updated manuscript with a map showing which extents of each data source used in the final interpolation of the DEM (i-iii mentioned above). In Appendix 1 details about accuracy of the different data sources and used field equipment (Humminbird 798ci HD SI) equipment are given.

Comment: “Page 6, “Page 7 from line 21: I suggest to improve the description of the relation between figure 4B and 4C. If I understood correctly, 4C is the real section of the presented GPR section. If yes, I suggest to plot over figure 4C the limit of the permafrost reflector presented in figure 4B.”

C2

Response: Yes, 4C is the real section of the presented GPR section where elevation and vegetation types are illustrated. Due to different scales on the y-axes in Figure 4B and C it is hard to plot the interpreted permafrost boundary in Figure 4C. Instead, in the updated manuscript we have included information on vegetation types from 4C in Figure 4B in order to make the coupling between B and C clearer. The text in the updated manuscript is presented below.

Manuscript changes: Clarification regarding Probe transect 1, marked in Figure 3B, which is situated in the northern valley of the catchment. The results and interpretation from the transect is shown in Figure 4A-C, and the profile is presented in E-W direction. Processed GPR data is displayed in Fig. 4A, showing travel time and reflectors. The identified permafrost table reflector and active layer depths from probing are presented in Figure 4B. Electromagnetic wave velocity was calculated for the probed locations. The corresponding surface altitude and vegetation class variation is shown in Fig. 4C, along with any permafrost features. For clarity, the vegetation classes along the transect shown in Figure 4C, are also included in 4B.

Comment “Page 10, line 21: the indication of figure A and B in figure 7 is missing please improve accordingly.”

Response: Correct, A and B is missing.

Manuscript changes: Figure 7 is updated with A and B. The figure caption is updated accordingly.

Comment: “Figure 4: use the same order or presentation of section (e.g. change 4F with 4E) “

Response: Correct, the order should be consistent.

C3

Manuscript changes: Figure 4 is updated and the order of the figures in D-F is now the same as in A-C.

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C4