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Interactive comment on "Geophysical constraints on the properties of a subglacial lake in northwest Greenland" *by* Ross Maguire et al.

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Hello,

First and foremost congratulations and excellent work on a paper which utilizes an array of geophysical methods to probe the existence and properties of a subglacial hydrological feature that has broad implications for a number of scientific fields, including glaciology, climate science, and planetary science.

I do however have a number of comments and concerns with the current manuscript:

1) I believe in the current manuscript the geothermal heat flux labels of Figure 6b are mislabeled and need to be switched.

2) I do not feel the 1D thermal model of the ice sheet is described in enough detail so as to reproduce or validate the presented results. There is a broad reference to Patankar (1980) but this text focuses on general numerical methods rather than the setup for the specific ice sheet problem discussed here. What is the advection term utilized here? Is it the deposition rate? Accumulation rates are given in 'ice equivalent' form, but are these deposited at the already compacted ice density of 920 kg/mˆ3 or at a lower density and then compacted? I think expanding on the description of the model would help to clarify the utility of the results.

3) At no point are the reflectivity results gathered over the presumed lake (either GPR or seismic) quantitatively compared to the surrounding bedrock reflectivity values. This seems like a missed opportunity to me. The difference in expected reflectivity between bedrock and an ice-water phase transition is discussed, and hypothetical reflection coefficients are plotted in Figure 4, however it is not demonstrated that this is observed in the current study site. I find results comparing such contrasts in reflectivity crucial to the validity of these types of studies - for example Rutishauser et al (2018) "Discovery of a hypersaline subglacial lake complex beneath Devon Ice Cap, Canadian Arctic" present relative power measurements that show striking contrast between regions with lakes and the surrounding bedrock. I feel a comparable approach could be taken in this manuscript to substantially bolster the evidence for the existence of a lake. I do not feel qualitative inspection of the radargram in Figure 2 is enough evidence to conclude that a lake is present. Why are reflection coefficients for regions not directly over the lake excluded from Figure 4 (when this could validate the claims made in the manuscript)? Without an explicit example of contrasting properties between the purported lake and surrounding terrain I do not feel that the conclusion of a substantial (10-15 m thick) lake existing beneath the ice is a valid one.

Best,

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