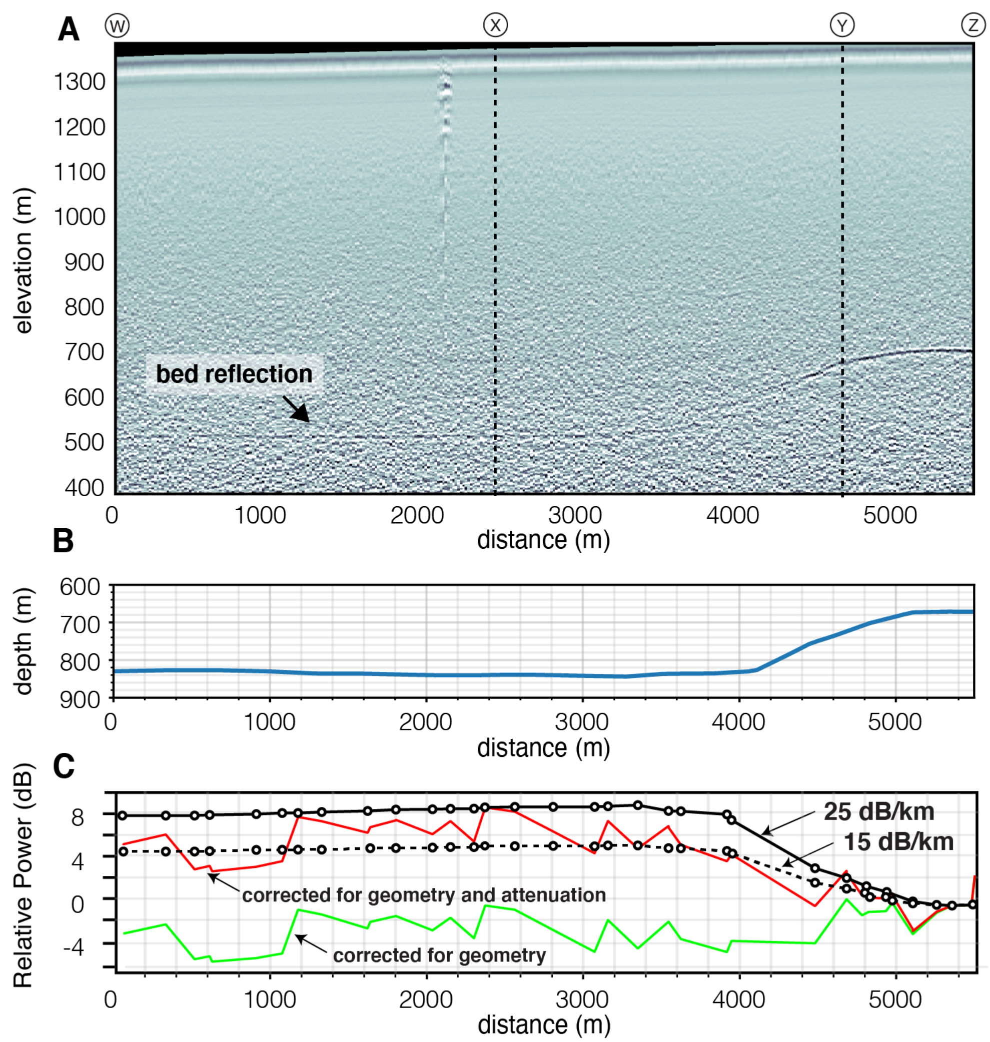
Reviewer 1:

I was reviewer 1 for the previous version of the manuscript and most of my concerns have been addressed, however two remain:

1) The authors only state that the GPR reflectivity is 10 dB higher than the surrounding area. As a result readers are not able to evaluate their interpretation or analysis. This issue could be addressed if Figure 3 was expanded to include echo power, the calculated reflectivity, and the sensitivity of that calculated reflectivity to the assumed attenuation rate.

We have added a panel to Figure 3 (shown below) that shows the GPR reflectivity at the base of the ice, which shows the contrast between the reflectivity of the lake and the surrounding region. Depending on the assumed attenuation profile, the relative power of the lake bottom reflection is approximately 4 - 8 dB stronger than the reflection from the adjacent bed.



Updated Figure 3.

The description of this analysis is given in our new Section 2.2, which reads:

2.2 Basal radar reflectivity
"We estimated the relative basal reflectivity of the bed reflector along the track by first correcting for geometric spreading, then correcting for englacial attenuation assuming the englacial attenuation rate is uniform. This assumption of uniform englacial attenuation is common, but not ideal for this situation because horizontal variability in the thermal structure of the ice is not well constrained. We picked the peak power along our bed profile using a semi-automated picking routine, where the user provides the approximate bed picks to guide the automated routine. We assume an englacial average attenuation rate of -15 dB km-1 which is the lower end on the range of values suggested for northwest Greenland by MacGregor et al. (2015), which are based on internal layers and averaged for ice between 25 and 65% of the ice thickness. We chose the lower end based on fitting a linear curve to peak power versus depth for our data set, which suggests attenuation between -12 dB km-1 and -20 dB km-1. This method, described by Jacobel et al. (2009) and further assessed and compared to other methods by Hills et al. (2020), has limitations for our data set because of the 1) limited depth range, 2) limited spatial sampling, 3) scatter in the data due to noise, 4) it relies on the assumption of uniform horizontal attenuation, and 5) it only applies to the depth range of our data; therefore, we only use this estimate as rough proxy for basal material. Because of uncertainties in the attenuation assumptions, we also provide the correction factors for -25 dB km-1 attenuation."

2) In their response the authors claim that conductivity analysis would not be possible with, however, recent work in this journal (Tulaczyk, S. M. and Foley, N. T.: The role of electrical conductivity in radar wave reflection from glacier beds, The Cryosphere, 14, 4495–4506, https://doi.org/10.5194/tc-14-4495-2020, 2020.) suggests that some analysis from the reflectivity of the lake surface should be possible as well.

We thank the reviewer for their suggestion, and for bringing this paper to our attention. While we have added a citation to this paper, unfortunately we are not able to perform this analysis to constrain conductivity. This is explained below, in paragraph 2 of our updated Results section. Additionally, we have reached out to the first author of this study, and they agree with us that our conclusions are independent of the analysis described in their paper.

"In addition, we observe that the bed reflected power is approximately 5 dB higher over the lake compared to the surrounding region (Fig. 3C). Similar to the conclusion of Palmer et al., (2013), which was based on airborne radar, we infer this elevated reflectivity to result from an ice/water interface. However, Tulaczyk & Foley (2020) show that subglacial materials with high conductivity can produce similar reflections to an ice/water interface. Additionally, Tulaczyk & Foley (2020) provide a method using information about phase and multiple frequencies to better distinguish among freshwater, brine, or water- or brine-saturated clay. Our available data, however, are at a single frequency and do not retain phase information; therefore, we do not have sufficient information to distinguish between these high conductivity materials based on radar alone. The secondary seismic reflection discussed above suggests that the lake is water of unknown salinity, rather than saturated sediments."

Reviewer 2:

1. General comments:

The revised manuscript looks good. The structure of the paper is improved. Introduction tells sufficient background of the study. Additional materials given in Supporting Information provides more details of the seismic reflection. The discussion on the lake origin is still not conclusive, but I think it is sufficient as possible interpretations of the important in-situ data. Please consider several minor comments and corrections listed below.

We thank the reviewer for their careful and thorough comments, which have helped improve the manuscript.

2. Specific comments:

Line 19: I think the citation to Palmer et al. (2013) is not necessary here. Guideline of the journal on the website states "Reference citations should not be included in this section, unless urgently required".

The reference has been removed.

Line 33: "ice sheet" >> ice sheets?

Corrected.

Line 90: "Noel et al., 2018" >> Missing in the reference list.

The missing reference has been added.

Line 92: "cm/yr" >> Here and everywhere, "/" and "^{−1}" are mixed up. The journal guideline says "Units must be written exponentially (e.g. W m–2)". I also suggest to stick on MKS unit system.

Per the journal guidelines, we have changed our units to be written exponentially. Also, when appropriate we stick to the MKS system (for example, we changed all instances of cm to m). The only unit that is not MKS is time, which we sometimes use in years instead of seconds.

Line 113: "were stacked" >> Duplicated.

The duplication is removed.

Line 114: Space is missing between 8 and MHz.

It now reads “8 MHz”

Line 132: "Q" should be italic because it is a variable. This is just one example. Please check all variables in the text.

All variables have been made into italics.

Line 141: "(i.e., a wave that has traveled twice….)" >> This should be explained earlier in the text in Line 119.

This was indeed explained earlier. But it is redundant, so we have removed it.

Line 150: "lake velocity" >> This sounds odd. It's seismic wave velocity.

It now reads "seismic velocity of the lake"

Line 166: "a function distance along …" >> a function of the distance along …?

The typo has been corrected.

Line 171: "strongly negative" >> I do not understand why is "strongly". Just "negative"?

"strongly negative" has been replaced with "negative"

Line 183: "IMBIE Team Report" >>Please indicate the author name (not "Report") consistent with the reference list.
We have noticed that this paper is most commonly cited in the literature as "Shepherd et al. (2019)", and have changed our citation accordingly.

Line 186: "shot gather 12" >> Please explain this number "12".

We now explicitly state that this is the 12 shot gather in our seismic line.

Line 206: "lakes below Antarctica" >> lakes below the Antarctic ice sheet?

The suggested change has been made.

Line 223: "existence of liquid water underneath ice" >> Something is missing in the text. Something like, "existence of liquid water underneath ice at temperature below melting point"?

The liquid water must be above the melting temperature, so adding this seems redundant.

Line 227: "If the lake is hypersaline it can…" >> What is "it"? Should be "lakewater"?

Yes. The sentence now reads: “If the lake is hypersaline the lakewater could remain liquid at low temperatures by depressing the freezing temperature. ”

Line 228: "depress the freezing temperature …−1.2 …." >> I would expect a positive number after "depress".

Line 229: "roughly 6x that of" >> Please consider to reword "6x".

The word “roughly” has been removed.

Line 270–271: I don't know if these arguments are correct. Even when the lake is maintained by high geothermal flux, basal melting can be small or zero depending on the thermal flux. Moreover, in the accumulation area, ice usually flows downward and vertical strain rate is negative. Are you really able to distinguish the basal processes from measurements above?

This is a valid point. We have replaced the sentence with:

"For a freshwater lake created by high geothermal flux, the basal ice temperature would be near 0o C, vertical velocity would be downward if melting exceeds accumulation”

Figure 1D: Please explain the red triangles in the caption.

The caption has been updated. The red triangles indicate the geophones.

Figure 6: Please consider a larger font for the text in the plots.

We have increased the font size of the labels in Figure 6.

Line 499: "Modeling" >> Modeled?

Corrected.

Table 1: The papers in the caption are missing in the reference list.

The two papers, “Christianson et al. (2014)” and “Peters et al. (2008)” are now in the references. The table incorrectly read “Palmer et al. (2008)” previously, but it has been updated.