

We have made the edits as requested by the editor and the reviewer. See a detailed response below. In addition, we have made a few additional minor edits to the manuscript text and figures to clarify the manuscript for the reader. A track changes document is provided for your reference.

Editor comments

1) clarify what they mean by “seasonal variability” as only one melt season is discussed in the manuscript (e.g. in L250 as suggested by reviewer #2),

We have rewritten the manuscript where we referred to the seasonal variability in our data, and instead used the phrasing such as variability over the melt season. We have also indicated that we refer to our study period from July to August as the melt season.

2) elaborate on the water-level peak at the end of the cryoconite record (i.e., in Fig. 9c),

We consulted our field notes and discovered that the cryoconite data record included a slug test taking place at 2 pm (local time) on Aug. 13. A slug test is when a large volume of water is injected into a hole to examine hydrological properties. This slug experiments were made for another project and not intended for this study. We have redrawn figure 9c and ended the time series at noon Aug. 13, so that the cryoconite water level variations are only influenced by natural drivers.

3) update the Conclusions to match the Discussion section concerning the explanations of the change in peak time lag.

We have updated the conclusions to match the discussion section concerning the explanations of the change in peak time lag

Other comments by the editor

L48-49: The editor suggests: “... study on the export of nitrogen from the Greenland ...”

L85-86: For consistency with L398, the authors could remove the Izeboud et al. (2020) reference in L85.

L88 and L470: Noël et al. (2018).

L385: Add a space between “25-50 km²” and “(40-80 times...)”.

Figure 1 : Add the location of the cryoconite hole as requested by reviewer #2.

Figure 3: Could the authors align Figs. 3a and 3b on their x-axis (i.e., so that the “-2” at the bottom left in both graphs are aligned)?

Table A1: For variables Ume to Swl, use a capital letters for “Uncertainty” and “Standard” in the “description” column.

Table A2: For variable Um add brackets around “(for a minimum ... 10 verticals)”.

For variable Uc add the missing bracket after “ms-1”.

For variable M add the missing bracket after “10-16”.

For variable K add brackets around “(for 95% CI)”.

We appreciate and accept all the above suggestions by the editor and made appropriate edits to the manuscript to incorporate them.

Reviewer comments

L114: Remove gendered language: “uncrewed” instead of “unmanned.”

As requested, we have removed gendered language

L250: Figure 5a does not depict a strong seasonal change in discharge. The lower discharge values in August are pretty much the same as the ones in the late June and early July (those periods outside of the melt episodes). The observations are made within the melt season, and do not show melt onset or cessation.

Where is the cryoconite hole in the study area? Plot on Figure 1.

L339: The last sentence of this paragraph is a repeat of the preceding sentence.

Fig 9: What is going on at the end of the record of cryoconite water-level record in panel c? Why does the water level rapidly increase when daily minimum air temperature dips below freezing?

L431: “...decreasing the storage capacity” Storage capacity of what? The weathering crust? Clarify language for the reader.

L481: Observations do not show seasonal changes in stream discharge (Figure 5).

L483: Where are the seasonal changes in discharge amplitude shown? Outside of the melt events, discharge in August seems pretty much the same as in late June/early July.

L491: The sentence that begins “The change in peak time lag through the melt season...” does not match the explanation of the slow decline in time lag over the melt season given in section 5 (Discussion). In the Conclusion, the process given to explain the declining lag is an expansion or contraction of the stream network (As an aside, shouldn’t it be either an expansion or contraction, but not both? The lag declines over the longer time period, so this should be a contraction, no?). In the Discussion, the process given to explain the declining lag is a change in the ratio of channelized to porous flow. Make sure the Conclusion section is updated to reflect changes made in the Discussion section. Better to spell out the two changes independently (i.e., (1) the slow decline in lag and (2) the abrupt change) than to try to meld the interpretations for both of these into the same couple of sentences.

We have followed the reviewer’s suggestion to spell out the two changes independently. In the revised document the discussion and conclusion section align.

We appreciate and accept all the above suggestions by the reviewer and made appropriate edits to the manuscript to incorporate them.