

The study by Petersen et al. "Stream hydrology controls on ice cliff generation, evolution, and survival on debris-covered glaciers" uses a number of methods to study ice cliff evolution and determine the importance of supraglacial streams on the longevity of ice cliffs. It is a well-written, detailed study that presents some interesting conclusions from a large amount of excellent data and observations. I think the results could be better utilised to support some of these conclusions, and I would like to see more detail in the Methods and Discussion sections, particularly in the discussion of the presented results.

General comments

1. While I appreciate the focus of the paper is on the impact of streams rather than supraglacial hydrology as a whole, I find the omission of any discussion of supraglacial ponds a little strange, particularly when there is mention on L157 that large cliffs are more generally associated with ponds near the terminus, and on L282 that ponds are dominant in this area. I think this needs to be at least acknowledged – even just a description of pond coverage in Section 2 would be helpful and a statement that ponds were not considered.

2. Throughout the Discussion, it would be good to see more discussion of your results – there are so many fantastic figures that are barely mentioned. For example, at L219 you could mention and discuss Figure 5, particularly panel D, which shows quite convincing evidence to support this statement but isn't currently mentioned at all. I would also like to see more development of the discussion in places, for example, at L266 – have you evidence for this point? Abandoned, debris-filled channels have been observed on debris-covered glaciers (e.g., Miles et al., 2020, 10.1016/j.earscirev.2020.103212), but streams can also meander around large debris clasts and might even undercut cliffs farther to flow around such obstructions. Periods of higher flow could also evacuate debris from channels and even reorganise the englacial/supraglacial system (e.g., during a flood event; Miles et al., 2018, 10.5194/tc-2018-152), creating new ice cliff faces.

3. One smaller point – in the title and conclusions (L290), I'm not convinced there is enough evidence to claim that streams control the generation of ice cliffs. For me, your results demonstrate the impact of streams on the dynamics and longevity of ice cliffs. The example in Section 4.4 (Figure 9) is a great complementary observation, but of ice cliff growth more than generation. I'd recommend removing "generation" from the title and conclusions and keeping the focus on the dynamics between existing ice cliffs and streams.

Specific comments

L25-38: I think these two paragraphs would read better if you swapped them around, so that you first discuss how ice cliffs are formed, then their importance on glacier surfaces. It would also save repetition, as you could remove the descriptive phrase in L25 ("where the glacier surface...").

L25: Give some values to demonstrate that melt from ice cliffs is "significant".

L29: Rowan et al. (2021, 10.1029/2020JF005761) found that ice cliffs only contributed a small proportion of the debris-cover anomaly on Khumbu Glacier.

L36 and throughout: Remove Scott Watson's first name (Scott) from references in-text and the bibliography.

Figure 1: Please consider using a colour-blind friendly colour scheme. It's also quite difficult to spot the red lines for cliff-ramp profiles in panel C – perhaps making the background more transparent, removing the black outlines from the other features, and making these lines bolder (and darker, perhaps black) would help.

Figure 1B: There are less cliffs (and streams?) at the terminus of the glacier, with an almost abrupt transition between there and the denser ice cliff coverage upglacier. It would be interesting to see a mention of this in the Discussion – is something preventing ice cliffs persisting at the terminus? The velocity map in Supplementary Figure 6 could be relevant (and isn't currently mentioned anywhere in the text, though the caption contains an interesting interpretation that could also be developed in the Discussion).

L58: A brief sentence on the coverage/number of supraglacial streams over the glacier surface would help the reader evaluate how accurate the DEM-predicted stream and cliff prevalence at this point in the paper (there seems to be a lot of both – is this the case? Are the streams all of a similar size or can only a proportion be seen from the glacier surface? How many are water-filled and how many are remnant channels?)

L65: Where is this airport? Can it be shown in Figure 1 or a distance and direction from the glacier given?

L68-73: Why were these angles chosen? Can some justification and/or references be given? I think the 50° on L72 should be 30°, as anything shallower is more likely to have debris? Was the aim only to sample completely ice-free cliffs? What about cliffs with a thin layer of very fine sediment deposited by melt rivulets?

L85: More information is needed here – are these total stream lengths and cliff areas or 2 m sections? Was the distance calculated using centre points or the shortest possible distance between features?

Figure 2C: Please consider using a colour-blind friendly colour scheme and/or line patterns.

L91: Backwasting ramps may not have been identified in the literature, but your schematic and model of ice cliff backwasting has a lot of similarities with that presented for ice sails by Evatt et al. (2017, 10.1017/jog.2017.72) and I think a brief comparison should be included.

L129: Can you give the uncertainty of these velocity measurements, or at least an idea of the variation (the standard deviation, for example)? It would also be worth noting that due to the time of day measurements were taken at, the velocities are likely near to the maximum daily velocity (and, later on, thus also the maximum potential for debris transport).

L139: I can understand the logic behind the methods used to delineate stream channels and cliffs, but I do think there needs to be some evaluation of the method and/or consideration (e.g., at the very start of the Discussion section) of how the results compare to what is actually seen on the glacier surface – from field observations or from the orthophoto. Can you give a rough idea of how many are water-filled vs. abandoned?

L142-146: Are these statistics for full channel lengths or the 2 m sections described in L85? A reminder here of how these were calculated would allow the reader to correctly understand the data and interpretations.

L149-150: The final clause of this sentence is an interpretation and should really be in the Discussion section.

L161: Is this stream location also confirmed by the field observations? Does it contain meltwater or has it been abandoned (i.e., active or historical undercutting)?

L168 and throughout (incl. figures and supplements): The journal recommends using SI units, though perhaps there is good reason for using cm?

L190-202: These are interpretations and should really come in the Discussion section.

L210: It could be interesting to present and discuss these statistics in two categories: 1) cliffs where the stream is immediately adjacent and actively influencing the cliff; 2) cliffs where the stream is farther away and has historically influenced the cliff. This could allow for an analysis over time of how the ice cliff profile changes as a stream moves farther away from it, though that's probably beyond the scope of this paper!

L261: Why an increased debris thickness? General debris-covered glacier trends? If so, give references.

L269: Reference Benn et al. (2001, 10.3189/172756501781831729) for ice cliff formation from collapse of englacial conduits – and at L35 in the Introduction.

L274: Was there a difference according to ice cliff size for the order of importance of these influences?

L283: Where are cliffs more common and is there a variation in size? What could be inferred about ice cliff longevity on the basis of this spatial variation in supraglacial hydrological features?