

Interactive comment on “Runoff response time of a loosely defined supraglacial microbasin” by D. Scott Munro

Anonymous Referee #2

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P1570: The abstract is quite long at the moment, but doesn't clearly define the issues to be addressed or present the results and conclusions that were found. It would benefit from being shortened and clarified.

Introduction: referencing to previously published work in the introduction is generally poor, and many statements aren't backed up by cited literature. In particular, the large volume of previous work on temporal variations in supraglacial/subglacial/proglacial water flow is largely ignored (e.g., from Haut Glacier d'Arolla).

In general, a better explanation of the different components that make up a glacier's hydrological system needs to be provided. For example, no explicit mention is made of the different types of subglacial drainage systems (i.e., distributed vs. discrete) that are found beneath glaciers and how temporal and spatial variations in these affect the

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timing of proglacial outputs.

P1571, line 15-20: it would be useful here to quantify the scale over which the study will be conducted (e.g., is the microbasin on the scale of meters? Kilometres?)

P1571, line 25+: the definition of the basin sounds like an inconsistent and poorly defined process by inexperienced assistants. And what exactly does the 'apparent limits' of the basin mean? Is this where water-filled channels start? Where the topographic surface is seen to change direction? Where melt starts to move in a particular direction? Or something else?

While the point of the paper is that the basin is 'loosely defined', it would be beneficial to make some kind of independent check on the validity of the chosen basin boundaries. For example, via comparison with (e.g.): (1) High resolution DEMs (of which there are many for Peyto – see papers by Hopkinson, Demuth and others); (2) Aerial or terrestrial photography or satellite imagery; (3) Comparison with the routing of dye poured on the surface.

P1572, line 10: it is stated here that four measurement periods were used, but no data is graphed anywhere for the first two periods. Hence it is difficult to make meaningful interpretations of how the discharge and energy balance patterns changed over time.

P1572, lines 13-21: the method described to measure discharge has many problems and inaccuracies, leading to major doubts about the validity of using this data. For example, no mention is made of the correction required to convert surface water velocity to depth-averaged velocity; no mention is made of any measurements that account for the variability in velocity across the channel width; no mention is made of whether the stream width varied at the same time that it was melting downwards. In fact, no proper discharge measurements appear to have been made to enable the construction of a meaningful rating curve.

P1573, lines 13-15: need a reference for this statement

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P1574, line 4: Oerlemanns is misspelled (should be Oerlemans)

P1574, line 25 – P1575, line 6: this paragraph nicely sums up many of my major concerns with the study, and why I have low confidence with many of the results! For example, the problem of variable melt rates in the stilling well, the imprecise/inaccurate definition of the basin, issues with leakage that likely vary over the study period, etc.

P1575, line 17: it might be safe to assume a non-variable base flow if the daily temperature patterns stayed constant throughout the study period (e.g., similar minimum night-time temperatures). However, this didn't happen – for example, temperatures were very warm at the start of the fourth study period and cool at the end with snow (Fig. 2), leading to an expected change in the base flow over time.

P1576, lines 5-9: this statement indicates significant potential uncertainty with the turbulent transfer terms (and hence energy balance calculations) for the last study period.

P1576, line 25: it is difficult to make many meaningful conclusions about the importance of katabatic winds from daily averages. Hourly (or shorter) data needs to be shown to indicate how the importance of katabatic winds varies temporally.

P1577, lines 5-11: as stated at the end of this section 'Given the nature of the measurement procedure.. this result could well have been fortuitous', this section seems to be largely speculative as the data is of insufficient quality to make any meaningful conclusions.

P1577, line 21: it is argued here that the lags in supraglacial runoff measured in this study are longer than those in other studies, yet the large errors in the data (acknowledged by the author in the previous paragraph) call this finding into question.

P1578, lines 3-13: this is the first time that any mention of a weathering crust has been introduced, and no data is provided to back up any of the statements. This section seems to be entirely speculative, and even includes an unanswered rhetorical question..

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P1579, line 21-22: I've seen little to no presentation of results or evidence to back up this statement

P1579, lines 23-25: here it is argued that supraglacial flow delay is important on an hour-to-hour basis, yet hourly flow data isn't shown in the paper for the first half of the measurement period.

P1580, lines 1-9: due to the poor definition of the basin and it's likely variability over time I'm not even convinced that the shape of the basin is truly elongate. When combined with leakage issues, poor discharge measurement techniques and inadequate presentation of the results I have little faith in the validity of the conclusions presented here.

Table 2: over exactly which period do these data values relate to? The values would vary greatly throughout the course of a single day, so clarification is needed as to when they were measured, and if the measurement periods were the same each day.

Figure 1: this figure is generally poorly laid out and hard to understand. The study location is unclear (a much better map of the basin needs to be provided), the inset microbasin map is virtually impossible to understand (e.g., which direction is the flow? where are the streams? where are the basin boundaries?), and the photos are of quite poor quality (the picture of the stream in particular is unclear). In addition, the different parts of the figure need to be labeled individually (e.g., a, b, c).

Figs. 2 & 3: the similar colouring/style of the black lines makes it very hard to distinguish them from each other

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