The Cryosphere Discuss., 7, C2452–C2455, 2013
www.the-cryosphere-discuss.net/7/C2452/2013/

The Cryosphere
Discussions
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Interactive comment on "Near-surface permeability in a supraglacial drainage basin on the Llewellyn glacier, Juneau Ice Field, British Columbia" *by* L. Karlstrom et al.

M. Pelto

mauri.pelto@nichols.edu

Received and published: 21 November 2013

Karlstrom et al (2013) utilize some innovative techniques to assess near surface glacier ice permeability, water table level and supraglacial stream temperature. These methods applied over a significant period of field work and placed in the larger weather and glacier surface condition context could be important. At this point the four days of field work do not provide a robust enough data set. Further this data set is not provided a meaningful context. I encourage the authors to employ these methods again for a longer period, and to utilize both local weather records and satellite imagery to aid in setting the context. Below are larger general points to address.

1) What days encompassed the field season? What are the weather conditions for this period. I assume the field work occurred in the first few days of August, 2010. If so this is an exceptional period of weather, particularly August 4, 2010. Atlin, BC daily weather records note the average daily maximum in August is 17.4 C, with an all-time maximum of 30 C. From August 1-4 daily maximum temperatures were 22 C, 25 C, 26 C and 28 C respectively, the latter just two degrees short of the August historic maximum at this long term station. The daily minimums were also well above average. This sets the stage for an unusual level of ablation in the study area. This was observed on Taku Glacier as well with ablation being higher in August 2010 than any other period observed during the last decade.

2) Supraglacial streams in this region begin to develop until after snowcover is lost and tend to become increasingly incised. In the specific area of the field study satellite imagery indicates snowcover still exists on July 8, nearly snow free conditions by July 19, and on August 1 no patches of snowcover in the vicinity. Utilization of satellite imagery can readily identify the duration of bare surface conditions before the field season began. The surface ice character will change with the progression of the melt season, leading to changes in permeability.

3) The field location is on the glacier edge, has fewer crevasses, lower albedo and higher slopes than the adjacent main area of the glacier. This needs to be better characterized. McGrath et al. (2010) provide an excellent Figure 1 showing their basin of study and the stream network. The field site in this study is not near the annual ELA which typically is at least 5 km and 300 m upglacier, as was the case in 2010. 5284-21: Field observations are too spatially and temporally limited to assess how ephemeral the streams, in fact most field work on the icefield indicates streams typically are longer lasting.

I had the chance to work with Marston (1983) during this fieldwork for the referenced paper. This included some work in the same area of the Llewellyn Glacier that was too brief to include in that paper. Marston (1983; Figure 7) notes that downcutting of

the supraglacial streams exceeds lateral expansion, which led to channel deepening, increased sinuosity and persistence of the channels. Immature channels have the chance to not be persistent, but as the melt season continues the channels tend to incise further. This only occurs if downcutting exceeds surface melt rate. The fact that the 2010 short field season likely coincided with exceptional ablation may have led to difficulty in downcutting exceeding surface ablation particularly in an area of lower albedo near the medial moraine.

4) Reference should be made to ablation measurements in the region, some of which in fact coincide with the study period. They are not in the same location and do not substitute for field area measurement, but provide necessary context. Mernild et al (2013), Pelto (2011) and Pelto et al (2013) provide overall assessment and more specific 2010 assessment of ablation in the area from August for Taku Glacier and Lemon Creek Glacier.

5) Reference needs to be made to the recent paper exploring supraglacial stream development from a modelling approach (Jarosch and Gudmundsson, 2012). How do your observations compare to their model results in Figure 2,3 and 5.

6) Some of the methods are not adequate as described 5285-7: how can a tape measure be used to assess stream depth? 5285-8: Ice screws not an accurate means of ablation assessment. How do you extrapolate from this point measure, realizing that the screw during emplacement disrupts ice locally around screw. 5287-14: This requires a velocity of 8 m/s, which is unrealistic. The hydraulic geometry must be assessed for general conclusions can be drawn about evolution of the channels, note for example Table 1 from Kostrzewsk and Zwolinski (1995).

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Interactive comment on The Cryosphere Discuss., 7, 5281, 2013.