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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.

Anonymous Referee #1

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General comments:

Karlstrom et al. present an interesting suite of methods to tackle the question of hydraulic properties of near-surface ice, using some field measurements collected at a site within the margin of the Juneau Ice Field. In particular, the mathematical approach to examining hydraulic permeability is a valued and worthwhile direction by which to expand on a, currently, rather poorly described component of supraglacial hydrology. In the current version of Karlstrom et al.'s paper, although the approach to the problem is highly novel, the quality and quantity of data used is somewhat masked, and there seems to be a wealth of literature that could be accessed to provide clearer context, if not add to the depth of analysis achievable. I would encourage the authors to

look to expanding on this work with greater focus on the methods employed to assess permeability.

Specific comments:

As suggestions for areas for the authors may wish to consider, I suggest the following topics could be examined further.

1) There is a wealth of data (or at least methods) described in this paper, however, I found that in places this lacks clarity. For example, the section on stream sinuosity, while interesting, might appear somewhat tangential to some, particularly as the novel elements in the paper appear to focus on ice permeability – for which the hard-won data relating to discharge, water temperature and near-surface ice water table heights are highly appropriate. The brief insert relating to the isotopic composition of the meltwater becomes masked in a bracketed note in the results section, and appears no further. The methods for recording discharge are developed in the text, but other than singular values for peak discharge, there is seems to be a lack of indication as to whether field observations did support diurnal variations, and whether changes in discharge relate to changes in isotopic composition or water temperatures. It felt as though there were a number of relationships that were left under-explored or perhaps lacking in explanation. A clearer focus in the paper might be beneficial.

2) Relating to this, the robustness of the methods and data could be better described. The time-frame of study, the number of measurements taken, the uncertainty in data described (not just constituent components) remain unclear in places. The manner by which discharge was estimated remains rather unclear; the method for monitoring ablation would seem to be unreliable; some of the data is not well explained. The authors present a diurnal cycle, but it is not clear if this is an average of the 4-day period noted, or if this is a single 24-hr cycle. To help readers better understand the field-methods used, a little more in the way of detail would be helpful.

3) The “weathering crust” of glacier ice surfaces has been described as well as its close

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links to synoptic conditions (see Muller and Keeler, 1969, J Glaciology). Although the authors touch upon this, utilising this older paper may provide a useful context, particularly given the importance antecedent conditions will have on the discrete measurements made. Similarly, there are sources of information on temperate or weathered ice permeability, and near surface water tables or hydraulics, which do not seem to appear here, even as comparison – in particular, to name a few, Thomas Schneider's work on firn on Storglaciaren, a range of Scott Munro's work based at Peyto Glacier, and Gorow Wakahama's work in the 1960s on ice permeability. Reference should be made to these pioneering studies which may now have increased value given the increased need to improve understanding of surface ice permeability and hydraulic conductivity.

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