

Review of the updated manuscript

In situ measurements of meltwater flow through snow and firn in the accumulation zone of the SW Greenland Ice Sheet

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In the revised version of the manuscript authors addressed most of the points I found necessary mentioning in the review of the initial submission. Please below find a few further suggestions and some technical corrections.

Specific comments

1	L108-109	<p>Not sure, where the melt rate of 2 mm we per hour comes from?</p> <p>Following the suggested assumption of 12 h of melt in one day, that gives 24 mm we of melt per day. With 35 day long melt season that is 840 mm we of melt in a year, which can't be connected with anything cited above.</p> <p>One could read ca 600 mm we off Figure 2 in https://tc.copernicus.org/articles/13/1819/2019/ (cited just above) for the annual melt at KAN-U in 2012. That will give 17 mm we per day in summer 2012 on average and 1.4 mm per hour assuming a 12 h melt day...</p> <p>And these things can be highly non-linear. But it is also not the aim of this study to assess melt rates. As a potential reader, i'd be pleased with 17 mm per day estimate of max melt rate to be expected as a background info for interpreting the results coming in following chapters.</p>
2	Chapter 3 when it comes to the Darcy flow law.	<p>Darcy flow lay assumes saturated (one phase) flow. While that is most likely the case for lateral flow described in this study, the vertical flow with extensive fingering is definitely not saturated when it comes to the bulk of the snow/firn mass. I think it is important to mention that here even if in the</p>

		results section the associated calculations are presented as "saturated flow through flow fingers" and the discussion covers the topic in much detail.
3	247-251, 259-261, headers in Table 2	<p>To some extent this comment also continues the previous comment.</p> <p>I would like to encourage authors to be as consistent and pedagogical as possible in using the terms "velocity" and "hydraulic conductivity". Attentive reader surely finds his/her way through the material, but will also appreciate the effort, I believe.</p> <p>LL389-396 is a good example: formally, there is no mistake, but intuitively it appears as two different properties are compared.</p> <p>It is not immediately obvious as that flow rate numerically equals hydr. cond. for vertical flow. May be stick with one term (i'd go for velocity, easier to understand) and make a corresponding note.</p> <p>In L250 area A is, perhaps, meant to be the area of the flow fingers, which is likely not known. That is ok, just make a note on that and possibly speculate that the flow velocity can be a lot higher, if one accounts for that and may be provide a "guesstimate" of what the relative area of fingering flow could have been.</p>
4	dye tracing of lateral flow	<p>One question arising when interpreting the results from dye tracing experiments is: how long did it take for the tracer to go through the lower gate? The speeds derived using the time first rhodamine portions arrived to the lower gate yield the highest estimate possible. One could have possibly used the times when max R. concentration is observed or the midpoint between first and last portions of the tracer...</p>

Minor comments

1	L5	"on the southwest Greenland Ice Sheet". Either southwestERN or add "of the"
2	L25, ref. to Marchenko et al., 2017	<p>That reference does not quite fit the context it is used in. The article has little to do with firn in Greenland, although it does deal with water percolation. A good reference here could be the RETMIP paper by Vandecrux et al.:</p> <p>https://tc.copernicus.org/articles/14/3785/2020/ - an up to date overview of the reg. scale models at the GrIS and their performance.</p>

		Where this reference is relevant is the text at LL 127 - 131, since the study showed that the bulk irreducible water content above the flow finger front can be as low as 1% and less as extensive dry (and cold) pockets exist in-between the preferential flow features.
3	LL44-45	When reading the definition of the runoff limit, the verb "begins" seems misplaced. May be define runoff limit as the "highest elevation from which runoff occurs", alternatively as "...part of the meltwater present leaves the ice sheet."?
4	Caption to Fig. 1	check phrasing of the second sentence. Something is odd there, "eventually" is in the wrong place.
5	L105	"and is situated" can be easily skipped
6	L132	Consider rephrasing "is analogous to". Water flow through snow literally is flow through porous medium, and ample details on that are given just above)
7	L189	is "WT" = water tracer? As a matter of fact, it is nowhere explicitly said that it is. Perhaps good to spell the abbreviation out the first time it is used.
8	L197-198	"the distance between the base of the sample and the injector head was constant at 1 m" appearing in parenthesis can be skipped.
9	L203	"are": here and throughout the chapter, make sure that tenses are used consistently. So far narration was in the past tense, here we see present, which lower down becomes past again.
10	L212	"sensors were inserted into the firn sample. " can be skipped to have "Before the start of each percolation experiment four temperature sensors were inserted horizontally to about 20 cm into the sample ~1 cm above its base."
11	L262-263	"...assuming that $2 \cdot r_{es}$ equals the average grain size observed in the sample": if that assumption is made, then it is not clear why is the SSA term needed here at all? It does not appear anywhere else, so one may as well get rid of the parameter at all.
12	LL260-261 and 268-270	not sure what motivates repetition of the unsaturated flow velocity values.
13	L309	"full cloud cover" = overcast?
15	Equation (12)	is C_0 defined later in L325 as "the background conductivity of the meltwater in a borehole..."? Could be good to explicitly define the term.
16	L345	"Some residual water...": The irreducible water content can be quantified using the density based parameterization from Schneider and Jansson, 2004 (Journal of Glaciology, Vol. 50, No.168).

17	L382	"Hydraulic head variations between individual boreholes throughout the field work period were calculated based on measured water table heights along the transect." Are the water table heights determined as described in LL303-304? If yes, then it is most likely of little relevance here, as the water table heights are referenced to the ice slab surface, which can be undulating and highly sloping as stated in ch. 6.3. It is the absolute heights that are important here as they are directly related to the Earth's field of gravity driving the water flow.
18	L384	"...are relatively high compared to existing values ": may be "earlier/previously published values"
19	L506	"...is the period during meltwater can travel..." add "which" between "during" and "meltwater".