The Cryosphere Discuss.,
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The Cryosphere Discussions

Interactive comment on "Supraglacial meltwater routing through internally drained catchments on the Greenland Ice Sheet surface" *by* Kang Yang et al.

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This is a very good paper that makes a solid contribution to our understanding of supraglacial hydrology at the process level. It is well written, provides a nice level of detail and uses a really great dataset. It is a clear example of the scientific advances made possible by the availability of very high resolution satellite data.

I found the discussion of interfluve vs channel flow very interesting and it is this in particular which will be of use to others who are interested in modelling surface hydrology at the broader scale e.g. regional or ice-sheet-wide. The major limitation of this paper in this respect is that the scientific findings are somewhat parochial and it is not clear

at present how far they can be applied beyond the Rio Behar catchment. I would also have liked to have seen more consideration of whether the results scale in the context of modelling supraglacial hydrology on a grid with resolution of the order of 100 m or so. For example a sensitivity analysis with respect to DEM resolution.

I agree with the other reviewer that this paper presents a solid methodological basis for studies in other catchments, and indeed the authors themselves present their study as a starting point for further work at the broader scale. I therefore recommend publication subject to the following, mainly minor, comments being addressed.

Throughout: Please add spaces between references

Page 2, line 11: consider adding 'on seasonal and shorter-term timescales'

Page 2, Line 16: add a sentence about basal-surface transmission being dependant on ice thickness (Lampkin and van der Berg, 2011).

Page 4, section 2: add a sentence acknowledging that this is sub-grid scale with respect to RCMs and ISMs

Page 4, line 15: What are the elevations of the MAR cells used here? How does this compare to the 'real' elevation of the catchment?

Figure 1: Overlay the boundaries of the MAR grid cells used in this study.

Section 3: This section spends too much time repeating Smith et al., 2017. Suggest rolling sections 3 and 4 into one and replacing much of the section 3 text with a table indicating which data comes directly from that paper. This would also help to more clearly outline the novel contribution of this work.

Page 4, line 30: 'point clouds' which 'were'

Page 4, lines 28-30: Why did you need to produce this concurrent DEM?

Page 5, lines 8-9: 'Dissected' is a strange choice of words. I'm not sure I understand

what you mean by it.

Page 5, line 29: a ‘DEM’

Page 6, line 1: Does this mean that you do not accumulate water into lakes? Is this justifiable?

Page 6, line 3: I don’t understand what Ac is and how it is incorporated into simulations. Could you please explain this better?

Page 6, line 24-26: This should probably go into the list of data taken from Smith et al., 2017

Page 8, line 24-26: Perhaps include a comment on the impact on ice albedo.

Page 9, line 3: How do you define ‘channel-like’?

Page 9, lines 6-9: Could you use these data to develop a better channel/non-channel classification? From figure 3 it seems to me that the ‘conservative’ map agrees better with the UAV image.

Page 9, line12: ‘mapped rivers’ and burned WV DEM.

Page 9, line 30: How do you define ‘large’? A threshold width?

Page 10, line 4 and Table 1: What is ‘E’? Please explain.

Page 10, lines 8 and 9: I think this is fairly obvious. Suggest rephrase to ‘This finding confirms’

Page 10, section 5.4: What is the ‘time to peak’ in your catchment? Did you look at this? If not, why not?

Page 11, lines 3 and 4: I think this is significant for broader scale studies where use of a WV DEM is impractical. What about grids of the order of 100 m?

Page 11, line 8: Have you tried modifying your SRLF routine to include interfluve flow?

Page 12, line 1: Also earlier in the melt season I expect, i.e. before your study period starts.

Page 12, line 14: Delete repeated ‘IDC’

Page 13, lines 12-14: How? Would you need proglacial discharge measurements for each catchment?

Page 15, line 7: Is it possible to characterise surface conditions using your satellite images or would an in-situ investigation be necessary?

Figure 1: Explicitly say that the moulin is under the black star.

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