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Interactive comment on “A new method for deriving glacier centerlines applied to glaciers in Alaska and northwest Canada” by C. Kienholz et al.

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This paper is an important contribution to the field of automated glacier mapping. As is well described in the paper, centerlines are important for a variety of reasons, including glacier flow modeling, automated glacier length change determination, and estimating glacier volume. Glaciers are numerous, so it is important to have an automated way of obtaining centerlines of glaciers, as manual methods are prohibitively expensive for large-scale studies.

Overall, this contribution is well structured, well written, and covers an important new method. Thus I recommend that it is published with only minor changes. The largest

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of the minor changes would be a quantitative comparison between centerlines from this method and another method along the entire length of the centerlines – not just looking at their lengths. This could be easily done, for example, by looking at the mean distance between the vertices of one centerline and the corresponding one from another method. Also, a figure showing centerlines from different methods would help the reader understand the differences in quality.

The rest of the suggested minor changes are detailed below.

With best regards, Bruce Raup

Page 5191, line 14: "thereof" -> "the resulting"

Page 5192, line 16: "either one of them often required" -> "both of which are frequently requirements"

Page 5194, line 10: Remove comma (",") after the word "areas".

Page 5195, line 8:

Change "We consider filling and filtering as most important for large receding glaciers, ending in flat terrain, that are generally characterized by a rough 10 surface with numerous depressions."

to

"In this method, filling and filtering are most important for large receding glaciers, which end in flat terrain and are generally characterized by a rough surface with numerous depressions."

Page 5195, line 16:

Is it assumed that the spacing of vertices in the polygons is always less than the 100 m sample spacing? Otherwise, it would make sense to look at the vertices themselves rather than sample every 100 m. Please clarify in the text.

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Page 5197, lines 20-25:

Normalizing and then rescaling using f_1 and f_2 seems like over-complication. Why not remove f_1 and f_2 entirely, and then tune a and b to the normalized values? That would remove two parameters. It would also make the method more scale independent, I think. Alternatively, f_1 and f_2 could be replaced by one parameter f , where $0 \leq f \leq 1$, by multiplying the first term by f and the second by $(1-f)$.

Also, the power-law form for the terms in equation 2 tend to produce a cost grid with a flat bottom (low curvature) to the cross-glacier minimum. Did you try other forms that would yield a sharper notch, such as $f \cdot \text{abs}((\max(d)-d)/\max(d))$?

Page 5198, line 24:

PEAK and its expansion don't match. Should be PAEK. Should have a reference as well, perhaps http://resources.esri.com/help/9.3/arcgisdesktop/com/gp_toolref/data_management_tools/smooth_line_data_management

Page 5205, line 7:

I would say that "deceeded" isn't a word yet. Though it appears in Merriam-Webster online dictionary in the "new words and slang" section, it appears not to be widely understood. Thus, replace:

"The proximity analysis is applied only within the glacierized terrain, that is, a branch separated by nunataks is not flagged unless k is deceeded at a point without nunatak between branch and reference branch."

with

"The proximity analysis is applied only within the glacierized terrain. That is, a branch separated by nunataks is not flagged unless the distance is less than k at a point without any nunataks between the branch and the reference branch."

Note the correction of the typo in "separated" in the above.

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Page 5205, line 22:

"Glacier termini are moved..." – make it clearer that this is not the algorithm, but the manual adjustments.

Page 5205:

It's not clear to me how the decision is made to optimize or not. Is this done automatically, or manually?

Page 5206, line 15:

[Mentioned above also] It would be good to see quantitative comparisons between at least a few pairs of centerlines. This could be done by computing the mean distance between vertices of one and the other, for example. Also, a figure showing pairs of comparable centerlines plotted together would help the reader understand the quality of these results.

Page 5208, line 24:

Change

"In Alaska and northwest Canada, only a handful of glaciers drain into multiple tongues, therefore, the amount of manual intervention remains relatively small."

to

"In Alaska and northwest Canada, only a handful of glaciers drain into multiple tongues, hence the amount of manual intervention required is relatively small."

Page 5209, line 17: Change "constellations" to "combinations".

Page 5212, line 6: maxima -> interfere

Page 5212, line 11: ... in any error "category" (should be singular)

Page 5213, line 9: insert "than" between "results" and "from".

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Page 5220, Table 2:

Why isn't the total number of centerlines equal to the number of heads? Is it because some centerlines are deleted later, essentially deleting heads too?

Page 5227, Figure 7d:

There's a major tributary to the "4" branch missing from the result, but this isn't discussed in the text.

End of review

Interactive comment on The Cryosphere Discuss., 7, 5189, 2013.

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