The Cryosphere

Discussions

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Interactive comment on "A new automatic approach for extracting glacier centerlines" by Dahong Zhang et al.

Anonymous Referee #2

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General Comments:

This paper automates glacier centerline extraction based on glacier surface features and Euclidean allocation. The author tested their method on the second Chinese glacier inventory and achieve high accuracy and efficiency. The author made a comprehensive estimation of the method's performance. However, some explanation and technical details of the method are needed, which are list below. Given this, I recommend this paper for publication after major revisions with attention to comments.

Specific Comments:

1. The author uses numerous abbreviations. It would be easier for readers to follow if the author could apply a list of these abbreviations.

2. It would be better if the author could provide more detailed, necessary explanations in the figure captions. Not all the figures are self-explainable. For instance, in figure 4, why the background elevation maps look differently in the first and second columns? For the DEM in the third column, some areas are masked out. It would be better if the author could explain why and how these areas are masked out.

3. Page 6, Line 118: it would be better if the author could explain more about each rule. For instance, (1) why the local highest points must be higher than ELA? (2) Why a glacier has only one exit? The author also mentioned that this single exit could cause problems (See Figure 13d).

4. Figure 2: (1) Could the author explain about extracting DEM and buffering DEM?

5. Figure 3: what is the difference between G_{po} and G_{pl}.

6. Page 8, Line 142: it would be better if the author could provide more information about hydrologic analysis.

7. Page 9, Line 148: About identifying abnormal lines, was it done automatically or manually?

8. Page 9, Line 154: Could the author provide more information about the ergodic algorithms?

9. Page 9, Line 158: Could the author illustrate more about how exactly they screen auxiliary lines using P4, P5, and P11?

10. Figure 5: the definition of Natural division point is missing. It would be better if the author could provide an example showing the natural division point.

11. Page 12, Line 196: It would be better if the author could explain more about how Euclidean allocation could get glacier centerlines from G_{fl}. To me, the Euclidean is the key part for extracting the glacier centerlines. So I think it is worthwhile to illustrate more about it.

12. Page12, Line 197: The author uses the Peak algorithm to get the final glacier centerlines from the glacier centerline. What is the purpose of this step? Figure 2 shows that the Peak algorithm is to smooth the polyline. Why do we need to smooth the polyline?

13. Page 19, Line 287: It would be better if the author could provide examples showing that their results are more consistent with the actual conditions of glaciers comparing with RGI v6.0.

14. Page 19, Line 291: The tolerance here is 90 meters (3 pixels of DEM). It would be better if the author could explain why they choose this value.

15. Page 19, Line 292: If I understand it correctly, I suggest the author rephrase the sentence as "There were 22017 glaciers within the tolerance, 925 glaciers with negative DL and 15111 glaciers with positive DL that are out of the tolerance."

16. Figure 13: For 13b, c, and d, where is the correct glacier centerline? Also, in figure 13d, what do these black circles mean? Please add more information in the figure caption (See comment 2).

17. Figure 15: Please add legends of regions with different colors or illustrate them in the figure caption. Please consider numbering each subfigure (See comment 2).

18. Figure 15: In the first two figures of the second row, where is the abnormal start point? In the fourth figure of the second row, why it is due to abnormal DEM?

Technical corrections:

Page 5, Line 85: Consider to change "arcpy" to "ArcPy"

Figure 2: In the part of the extraction of centerlines, it seems that G_{cline} and G_{gcf} should switch their position according to the author's definition.

Page 9, Line 148: In the third part of the post-processing, is it "numbers" or "members"?

Figure 9: Consider changing "inexact" to "inaccurate" for consistency.

Figure 12: Consider changing "DL" to "D_L" in the figure caption. For the figure on the right-hand side, the blue color should represent the number of $+D_L$, if I understand it correctly.