**Response to Topical Editor (Min Feng)**:

Dear Topical Editor,

Thank you very much for your valuable comments to improve this manuscript. We responded point by point to each comment as listed below, along with a clear indication of the location of the revision.

If you have any queries, please don't hesitate to contact us at the address below. Looking forward to hearing from you.

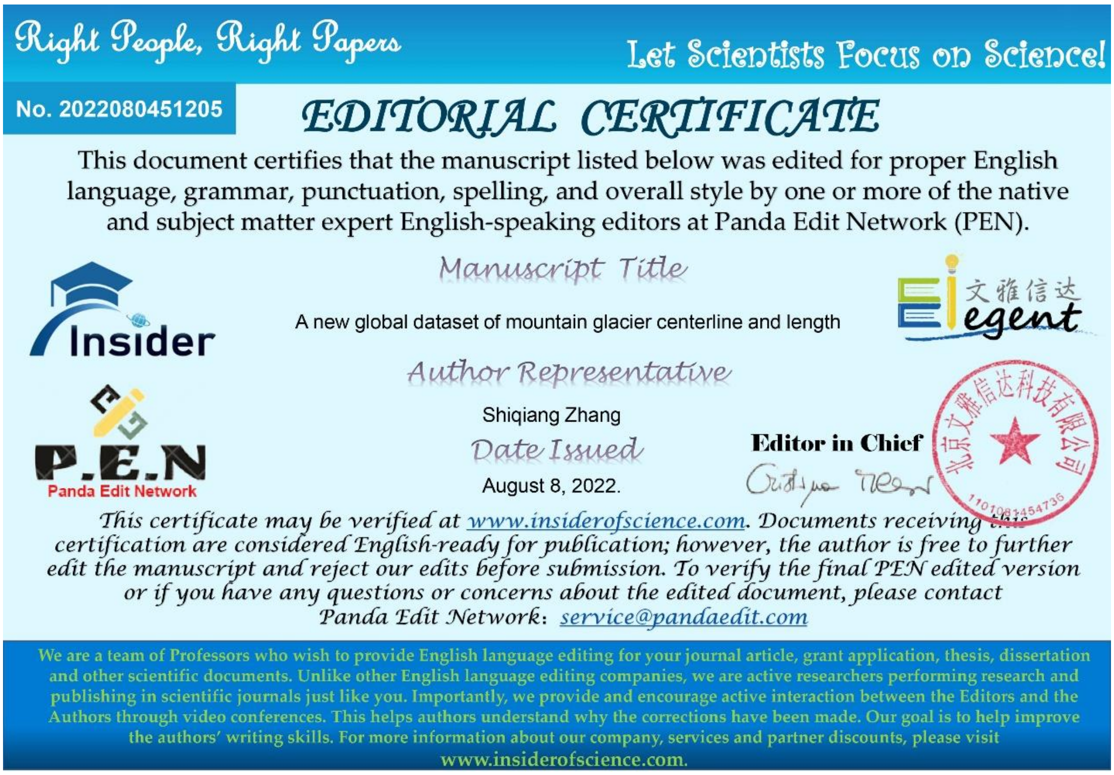
Thank you and best regards.
Sincerely,

Dahong Zhang, Gang Zhou, Wen Li, Shiqiang Zhang *, Xiaojun Yao, Shimei Wei
Email: Shiqiang Zhang (zhangsq@lzb.ac.cn) and Dahong Zhang (zhangdh_yx@163.com)

**Please Notes:** Text in BLACK is the comments and our responses are in BLUE. In addition, the notation used to locate the changes first defines the page number, then the line number(s). For example, **P4L15** means that the described modification to the manuscript can be found on the 15th line of the 4th page in the track-changes file.

**Comments to the author**:
I would like to thank the authors for submitting the revision, which I believe has addressed the previous review comments. However, there are still many ill-expressions and confusing sentences in the manuscript. I think that the authors need to carefully check and improve the writing of the manuscript before it is accepted for publication. I would also encourage the authors to ask for help from native English speakers or language professionals.

Thanks for your decision and good suggestions. We try our best to improve the manuscript followed by your suggestions. The whole text has been polished by native English-speaker of Insiderofscience Company (Fig. R1). We believe that all possible questions are clarified and it is useful and friendly to future readers.



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Manuscript Title

A new global dataset of mountain glacier centerline and length

Author Representative

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**Figure R1: The editorial certificate of Insiderofscience Company.**

**A few specific comments and suggestions:**

- The current Abstract is a bit flat and lengthy; I would suggest the authors revise the Abstract to be concise and highlight the most important conclusions of the work.

Thanks for your suggestion. Some redundant parts have been removed, and the Abstract has been simplified from 290 to 210 words. The revised Abstract is shown below, including only the most important components of our work.

**Abstract**. The length of a glacier is a key determinant of its geometry and is an important parameter in glacier inventories and modeling; glacier centerlines are the lines along which the main flow of glaciers takes place and, thus, are crucial inputs for many glaciological applications. In this study, the centerlines and maximum lengths of global glaciers were extracted using a self-designed automatic extraction algorithm based on the latest global glacier inventory data, digital elevation model (DEM), and European allocation theory. The accuracy of the dataset was evaluated through random visual assessments and comparisons with the Randolph Glacier Inventory (RGI) version 6.0. A total of 8.25% of the outlines of the RGI were excluded, including 10,764 erroneous glacier polygons, 7,174 ice caps, and 419 nominal glaciers. A total of 198,137 glacier centerlines were generated, accounting for 99.74% of the input glaciers. The accuracy of glacier centerlines was 89.68%. A comparison between the dataset and the previous dataset suggested that most glacier centerlines were slightly longer than those in RGI v6.0, meaning that the maximum lengths of some glaciers had been likely underestimated in the past. The constructed dataset comprises 17 sub-datasets, including global glacier centerlines, maximum lengths, and DEMs, all of which can be found at: https://doi.org/10.11922/sciencedb.01643 (Zhang and Zhang, 2022). **(P01L09)**

- Line 69-74, are these three types of methods or three methods? Please be consistent.

  Thanks for your reminder. It has been modified as follows:

  Three types of automatic and semi-automatic methods have been proposed to meet the demand for large-scale acquisitions of glacier lengths. First, there are typical hydrological analysis methods (Schiefer et al., 2008), but they result in lengths that are longer than equivalent maximum distances taken along typical longitudinal centerline profiles. The second type is a simplified algorithm based on the skeleton theory (Le Moine and Gsell, 2015), but it has not been widely used. Third, there are centerline methods based on the axis concept proposed by Le Bris and Paul (2013) and first applied to calculating global glacier length by Machguth and Huss (2014). **(P02L75)**

- Line 75, what does "complex glaciers" refer to?

  Thanks for your insights. 'Complex glaciers' represents the glaciers that have branches morphologically. The modified sentence is as follows:

  However, with this type of algorithm, the glacier centerlines tend to be noticeably deflected by their tributaries (Le Bris and Paul, 2013). **(P02L84)**

- Line 82-83, "including that of …" is confusing.

  Thanks for your reminder. It has been changed as follows:

  Despite many attempts to overcome these limitations in recent years (Yao et al., 2015; Yang et al., 2016; Ji et al., 2017; Hansen et al., 2020; Xia, 2020; Zhang et al., 2021), to date, global datasets of the centerline and length of mountain glaciers are rare. **(P03L93)**

- Line 85, 30 m -> 30-m

  Thanks for your reminder. It has been modified. **(P03L97)**

- In figure 1, some regions on the map were not mentioned in the caption, such as R04.

  Thanks for your reminder. The full names of all glacier regions have been added to the caption of the revised Figure 1. **(P03L110)**

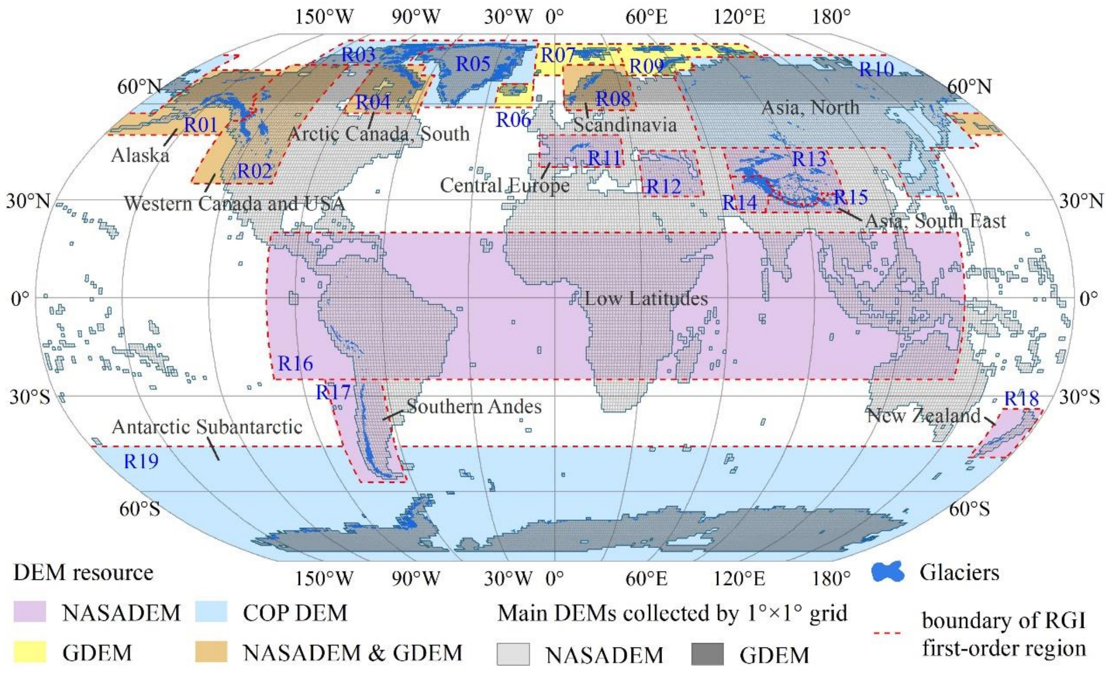


**Figure 1.** Distribution of global glaciers, first-order glacier regions, and Digital Elevation Models (DEMs) used. The background is the global DEM grid (1°×1°) covered by NASADEM and GDEM. GDEM and COP DEM represent the ASTER GDEM v3 and the Copernicus DEM, respectively. **Notes:** R01: Alaska; R02: Western Canada and USA; R03: Arctic Canada, North; R04: Arctic Canada, South; R05: Greenland Periphery; R06: Iceland; R07: Svalbard and Jan Mayen; R08: Scandinavia; R09: Russian Arctic; R10: North Asia; R11: Central Europe; R12: Caucasus and Middle East; R13: Asia, Central; R14: Asia, South West; R15: South Asia East; R16: Low Latitudes; R17: Southern Andes; R18: New Zealand; R19: Antarctic Subantarctic.

- Line 104, I do not think “preliminary” is a proper term for describing these DEM data efforts.

  Thanks for your insights. It has been modified as follows:

  Five DEM products (Table 1) were used in this study. **(P04L121)**

- Line 107, “modernization” is confusing. The SRTM is not the most up-to-date DEM.

  Thanks for your insights. It has been modified as follows:

  NASADEM is the reprocessed version of the NASA Shuttle Radar Topography Mission (SRTM) data (Farr et al., 2007), with a low mean absolute error (MAE) (Carrera-Hernández, 2021) and improved root mean square error (RMSE) (Uuemaa et al., 2020). **(P04L125)**

- Lien 142, “unknown projection coordinate system” is a confusing description. Does it mean the data is not usable?

  Thanks for your insights. Glacier length in *. xy format does not include a specific projected coordinate system, but related paper (Machguth and Huss, 2014) shows that it is the UTM projection and The UTM zone is determined by the location of each glacier. Related description has been modified as follows:

In addition, graphical data (Machguth and Huss, 2014) of glacier length in *. xy format (the UTM projection), which correspond to the attribute of the glacier maximum length ($L_{max}$) in RGI v6.0, were collected in High Asia. **(P05L163)**

- Figure 3, would it be helpful to add satellite images for the regions for reference?

  Thanks for your insights. The flawed glacier polygons shown in Figure 3 (a-c) are mainly caused by topography, so DEM data is appropriate as backgrounds. The flawed glacier polygon shown in Figure 3 (d–f) are mainly polygons with geometric problems, and they cannot be revealed by satellite images. For the above reasons, Figure 3 in the revised manuscript remains unchanged. **(P07L208)**

- Line 182, "incorrect glacier outline" is confusing.

  Thanks for your insights. It has been modified to 'erroneous glacier outlines caused by vectorization.' **(P06L198, P07L210)**

- Lien 192-194, Line 199, Line 226, the sentences are confusing.

  Thanks for your insights. They have been improved as below.

  **Line 192-194:**

  The buffer masks generated initially were partially broken because there were overlaps or gaps between adjacent polygons of the buffer zone; thus, polygons with a perimeter of less than 12 times the buffer mask distances of each region were removed. **(P07L219)**

  **Line 199:**

  However, these outlines did not include the unclosed types: a few glacier outlines that appeared to be closed polylines, but had geometric flaws such as non-coinciding head and tail endpoints of the polylines. **(P07L228)**

  **L226:**

  The principle is briefly explained as follows: the highest and lowest points of the external outline of a glacier were extracted as two endpoints that divide the glacier outline into two parts; In the glacier polygon, points that have the equal shortest distances to the two parts were identified as other vertices; The line formed by two endpoints and these other vertices was regarded as the glacier centerline. **(P08L258)**

- Line 295, What does "All data" refers to?

  Thanks for your reminder. 'All data' represents input datasets, result datasets, and all process datasets. It has been modified as follows:

All the data associated with the dataset production were processed in units of first-order glacier regions. **(P08L237)**

- Line 233, Please disclose the full definition of the projection instead of referring to it as “user-defined”.

Thanks for your insights. The data such as glacier outlines, DEMs and centerlines involved in the calculation in this study are uniformly projected according to the unit of glacier region, and there are 19 projection coordinate systems in total. Their specific parameters are shown in **Table R1**. The reorganized sentence is as follows:

The Albers projection (See Supplement for detailed parameter files) with WGS1984 was used as a unified projection coordinate system for each glacier region. **(P09L270)**

**Table R1.** Parameters of the projected coordinate systems (Albers) used in this study

| Region | Central meridian | Standard parallel 1 | Standard parallel 2 | Origin latitude |
|---|---|---|---|---|
| R01 | -151.0 | 56.38 | 65.03 | 52.0 |
| R02 | -120.0 | 45.98 | 55.57 | 36.0 |
| R03 | -90.0 | 75.71 | 81.9 | 74.0 |
| R04 | -74.0 | 62.40 | 70.02 | 59.0 |
| R05 | -43.0 | 63.23 | 80.21 | 60.0 |
| R06 | -19.0 | 64.24 | 65.66 | 64.0 |
| R07 | 13.0 | 72.35 | 79.12 | 71.0 |
| R08 | 20.0 | 63.17 | 66.81 | 60.0 |
| R09 | 71.0 | 75.16 | 79.62 | 73.0 |
| R10 | 0.0 | 50.96 | 72.76 | 47.0 |
| R11 | 10.0 | 44.16 | 45.87 | 42.0 |
| R12 | 44.0 | 34.16 | 40.69 | 31.0 |
| R13 | 86.0 | 32.44 | 41.05 | 28.0 |
| R14 | 75.0 | 32.11 | 35.66 | 30.0 |
| R15 | 91.0 | 27.77 | 31.20 | 27.0 |
| R16 | 19.0 | 12.91 | -18.46 | -25.0 |
| R17 | -71.0 | -32.25 | -49.66 | -26.0 |
| R18 | 172.0 | -40.70 | -43.59 | -39.0 |
| R19 | -4.0 | -53.18 | -72.03 | -47.0 |

**Note:** Datum used was WGS1984; False Easting, 0.0; False Northing, 0.0; UNIT, meter. The units of the parameters in the table are ‘degree.’

- Line 234, is confusing.

Thanks for your insights. It has been deleted. **(P09L272)**

- Line 240, clarify "key associated data".

  Thanks for your reminder. It has been modified as follows:

  In addition, other data associated with the dataset production were exported, such as the segmentation results of glacier outlines, the lengths in the accumulation and ablation region of each glacier, the lowest points, the local highest points ($P_{max}$), the extracting failed glacier outlines, and logs. **(P09L278)**

- Line 242, clarify "failed glacier outlines dealt".

  Thanks for your reminder. It has been modified to 'the extracted failed glacier outlines.' **(P09L280)**

- Line 247, the 19 samples were confusing. Collecting 19 samples in each of the 100 glaciers?

  Thanks for your reminder. It has been modified as follows:

  We randomly selected 100 glaciers in each of the 19 glacier regions, obtaining a total of 1,900 glacier centerlines ($N_G$). **(P09L286)**

- Line 270, what "other model parameters"?

  Thanks for your reminder. Other model parameters are shown in Table A1. It has been modified as follows:

  Taking the *IGODS*, *GGEDS*, and other model parameters (Appendix A: Table A1) as input data, 198,137 glacier centerlines were automatically generated using the centerline extraction tool of 'GlacierCenterlines_Py27 v5.2.1', with an overall success rate of 99.74%. **(P10L314)**

- In figure 5, the labels in the legend do not consistent with the labels on the map.

  Thanks for your reminder. It has been modified. **(P13L378)**

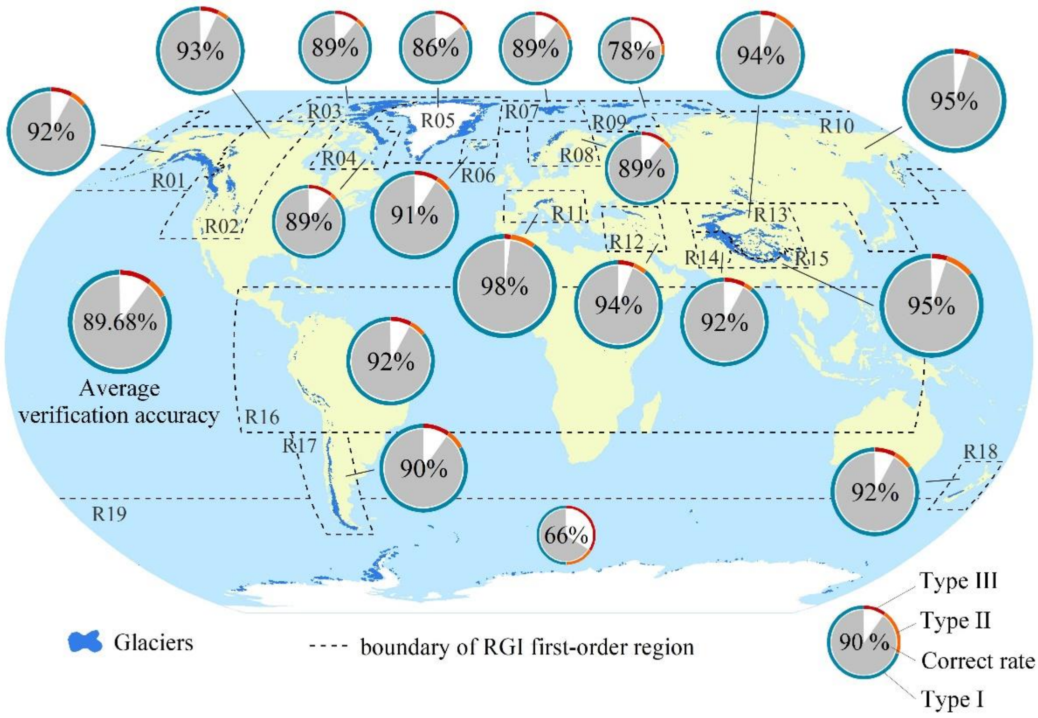


**Figure 5.** Statistical chart of random evaluation results. The pie chart rings show the proportion of each type with the total number of samples in the region. The pie chart shows the correct rate, which is the proportion of Types I and II in each region. The size of the pie/ring represents the grade of the correct rate in the region. Types I, II, and III (See Section 3.2.4) are correct, inaccurate, and incorrect centerlines, respectively.

- Line 349, please confirm that “-9” is the correct value here.

  Thanks for your reminder. ‘-9’ indicates that glacier length is missing in RGI v6.0 (RGI Consortium, 2017). **(P14L399)**

- Line 354, “histogram statistics”?

  Thanks for your reminder. It has been modified to ‘histogram.’ **(P14L405)**

- Line 388, “the results” refers to which results?

  Thanks for your reminder. It has been modified as follows:

  Furthermore, the graphic results, which were collected for the maximum length of glaciers in parts of High Asia (Machguth and Huss, 2014), were used to compare with this study’s. **(P15L440)**

- Line 390-394, the sentence is confusing.

  Thanks for your insights. It has been changed as follows:

  Visual comparison suggested that the extraction approach used in this study was robust (Fig. 7a) and that its sensitivity to topography was lower than that of Machguth and Huss (2014)

(Fig. 7b). Large differences in glacier length extraction schemes are present only in a few glaciers or in certain types of glaciers, such as slope glaciers and ice caps. **(P15L443)**

- In figure 7, please add a legend for the colors of the DEM.

  Thanks for your reminder. It has been added. **(P18L481)**

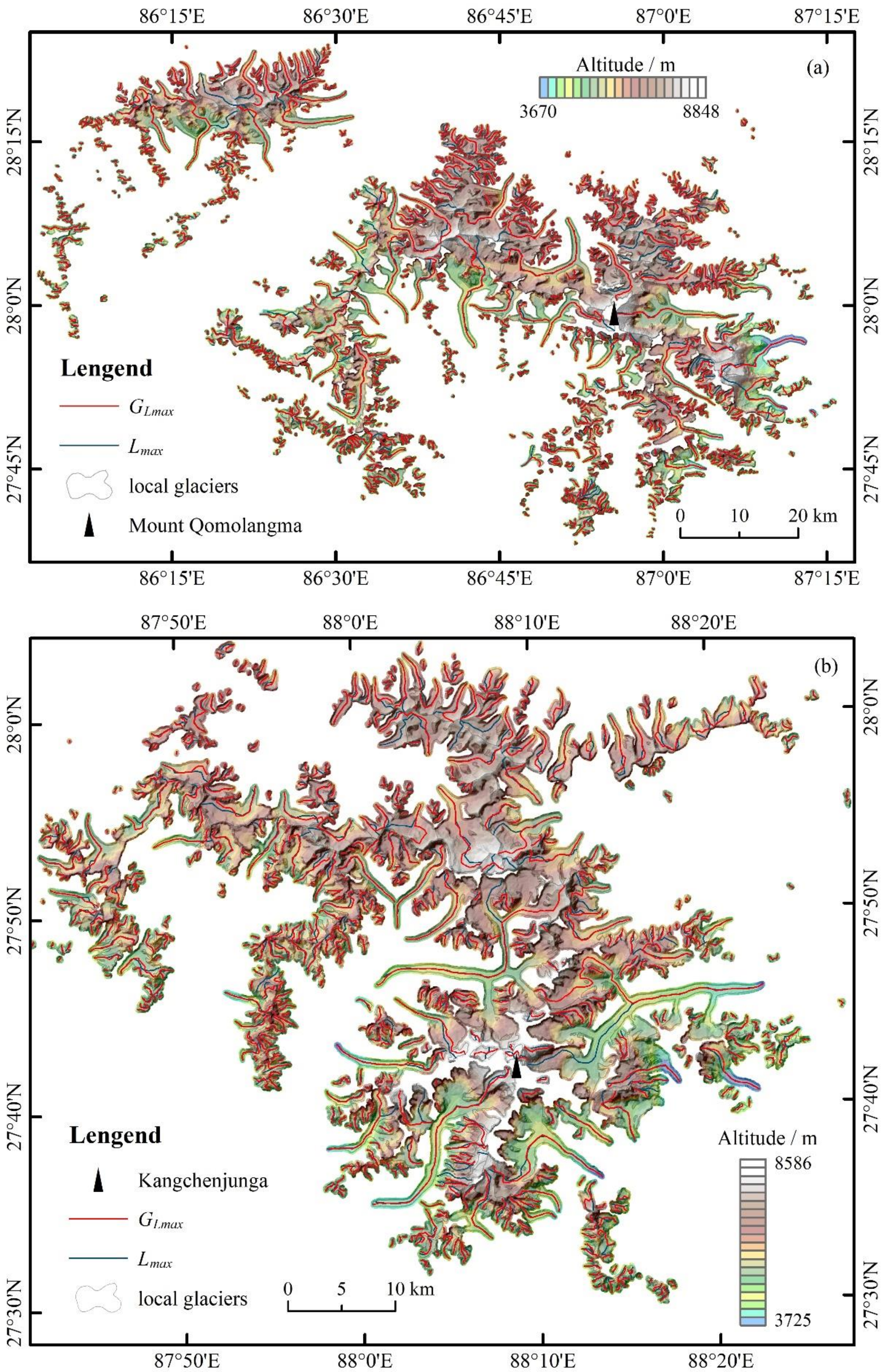


**Figure 7.** Visual comparison of the longest center lines calculated in this study and by Machguth and Huss (2014) for two glacier-covered regions in the Himalayas, covering Mount Qomolangma (**panel a**) and Kangchenjunga (**panel b**, the world's third highest mountain) and their surrounding areas. In the background is the DEM used for the calculation.

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