Dear Niccolò Dematteis,

On behalf of all the co-authors, I would like to thank the reviewer, Anonymous Referee #1 and you again for your thoughtful and constructive suggestions which helped us to improve our manuscript. According to your suggestion, we carefully revised the manuscript. We have also stored KGI data in Geopackage Format and updated the data assets and description documents.

Please refer to the point-by-point reply (**next page**) or tracked manuscript version for details.

We hope that the revised manuscript will be more suitable for further processing, but we are still happy to consider further revisions, and we appreciate your efforts in our research.

Best regards,
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NOTE

Comments (Black font)

Authors Responses (Red font)

Specific changes that were made in the manuscript (Blue italic)

■ **Anonymous Referee #1**

The authors have substantially improved the manuscript, and after some minor corrections (see below), it will be suitable for publication.

1. Line 145, the URL should be removed as it is already reported in the following table. The sentence should be modified accordingly to the requested change.

Response: Thank you for your suggestion. We removed the URL and modified the sentence.

*"All ASTER GDEM v3 tiles were downloaded **from the Land Processes Distributed Active Archive Center**, and mosaicked in local Python GADL environment."*

2. For the sake of uniformity, please, add a white background to all legends, scalebar and north arrow inserted in maps.

Response: Thank you for your suggestion. In the latest revised manuscript, we make sure that the background of all legends, scalebar and north arrow are white.

3. Line 258, the p-value is missing.

Response: *p*-value has been added (p<0.001).

■ **Topical Editor, Niccolò Dematteis**

1. L140 ICESate --> ICESat

Response: Thank you. It has been revised.

2. L258 is the correlation coefficient really equal to 1?

Response: In fact, the correlation coefficient r is equal to 0.9989 ($p < 0.001$). With reference to the comments 11 (L390 ~1 (0.997998) --> >0.99), we changed it to 0.99.

3. L293 32.5% --> 32.50%

Response: Thank you. It has been revised.

4. L297 2,200 km^2 --> 2200 km^2

Response: Thank you. It has been revised.

5. L300 55.3% --> 55.30%

Response: Thank you. It has been revised.

6. Fig 6 I think that the most important information of this figure is the glacier area distribution and,

second, the boundaries of Western, Central and Eastern (and maybe North and South) Karakoram. Yet, this information is the least evident, and it is not well explained in the caption. Rather, the most evident information is the division of the major sub-basins. Is this datum so relevant in this figure? Fig 6 should be modified in other aspects.

i) in the caption, it should be added "(in dashed black line)" after the "main central ridgeline". You should highlight the central ridgeline better, because where it is superimposed is not well visible

ii) in the legend, the ridgeline NK_SK should be written explicitly

iii) the label of the southward arrow should be SK

iv) If I understand well, there are many sub-basins, which are labelled in black font. This should be explained in the caption. Not every sub-basin is labelled with its name. Why?

v) Karakoram limits should be highlighted more clearly

vi) add "river" after the label "Amu Darya"

vii) how can the Shyok basin be crossed by the central ridgeline NK-SK? Similarly, I see rivers that cross the central ridgeline. This is confusing

viii) Is Hotan Prefecture a city? Probably the city is Hotan only. Anyhow, the label is hidden behind the legend.

I suggest you to reconsider this figure and (strongly) modify it according to the very information that you want to show. Be also more exhaustive in the figure's caption

Response: Thank you very much for your advice. First of all, we apologize to you. Due to the revised version we submitted could not clearly distinguish between the new version and the old version of the figure 6, which led you to comment on the old version of the figure 6. But your suggestion still stands. We modified the figure 6 and its caption according to your suggestion. (NOTE: In the new revised version, we only keep the latest version of the figure.)
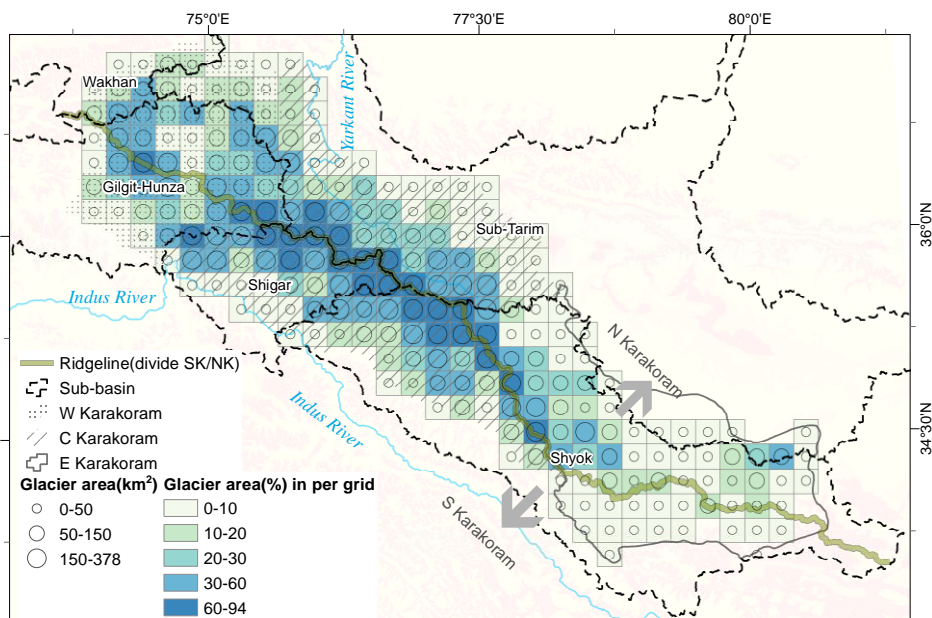
Fig. 6. **Spatial distribution of Karakoram glaciers.** *For regional comparison, the Karakoram mountains were divided into western, central and eastern Karakoram (WK, CK and EK) according to the Indus and Tarim sub-basins, and into Northern and Southern Karakoram based on the main central ridgeline (green line). The major sub-basin divisions (Wakhan, Gilgit-Hunza, Shigar, Sub-Tarim and Shyok) in the Karakoram mountains also are shown. Hollow circles and coloured grids represent the glacier area and glacier proportion on the 20 km × 20 km grid.*

7. L327 74.4%--> 74.40%

8. L359 remove the tilde

9. Fig 7 Consider to split the figure into two or three figures, containing panels a-b, c-d and e-f. In any case, panels c-d and e-f should be on the same line (instead of the same column). Panel f should be on the left, in agreement with panel a, which shows debris-covered glaciers
   Consider using a logarithmic scale in panel b, because it is difficult to distinguish between the different years. Alternatively, you may also add a subpanel that zooms on the interval 5000-6000 m
   The x-label of panel a should be "debris-covered area (km2)"
   Remove the colorbar in panels c-d. Moreover, is there any reason for displaying slices SE and E (in panel c) and SE (in panel SE) separated from the main circle? If not, you should display a solid circle.
   In the caption
   i) Plots showing glaciers' number and area by aspect (c and d) --> The pie charts show the distributions of glaciers' number (c) and area (d) according to the aspect
   ii) Begin a new statement to describe panels e-f and remove "in addition".

Response: Thank you for your advice. We split figure 7 into three figures, and then modified the problems in each figure according to your suggestion. Figures 7, 8, and 9 are as follows:
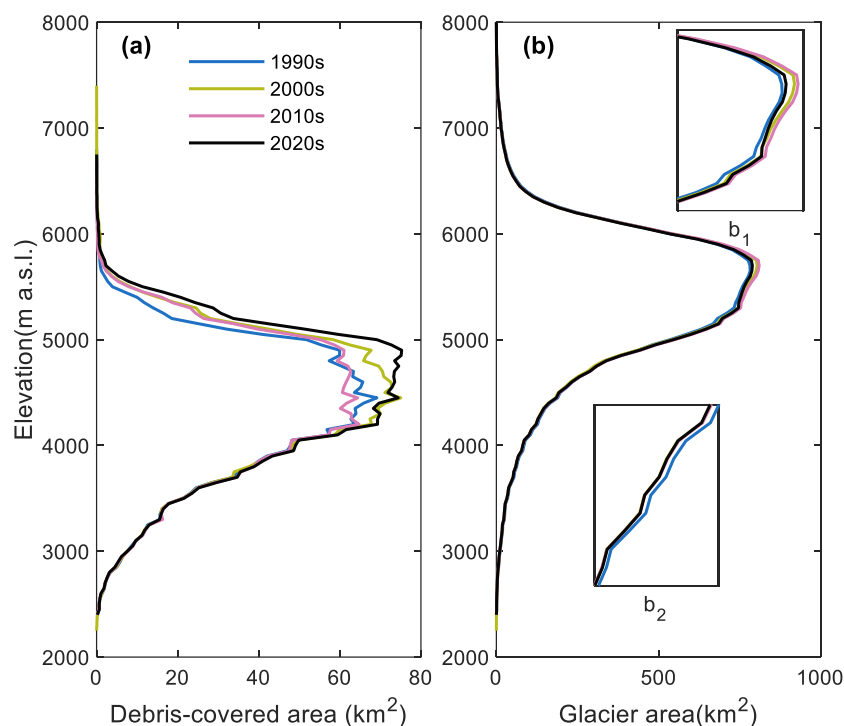
Fig. 7 Altitudinal profiles of the glacier surface area at 50 m intervals for debris-covered ice (a) and all glaciers (b), showing variations from 1990 to 2020. The subpanel b₁ and b₂ inserted in figure (b) correspond to zooms on the altitude interval 5000~6000 m a.s.l. and 3500~4000 m a.s.l..
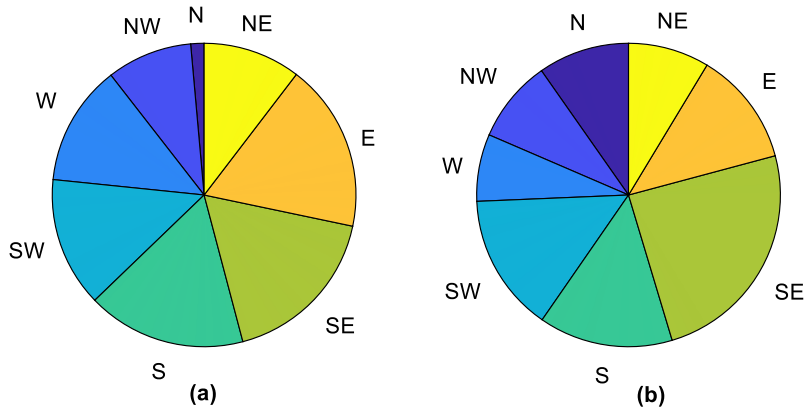
Fig. 8 *The pie charts show the distributions of glaciers' number (a) and area (b) according to the aspect.*
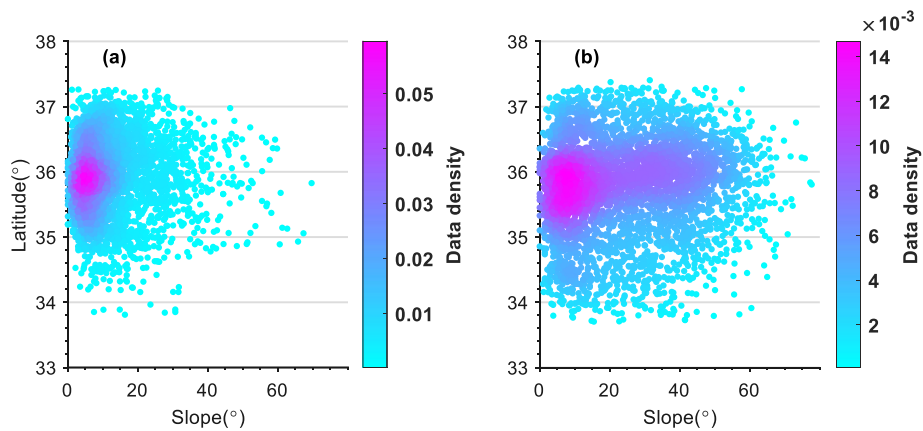

Fig.9 *Glacier surface slope versus latitude for debris-covered sections (a) and all glaciers (b).*

10. L383 also --> conducted

Response: Thank you. It has been revised.

11. L390 ~1 (0.997998) --> >0.99

Response: Thank you. It has been revised.

12. L457 1,647.19 --> 1647.19

Response: Thank you. It has been revised.

13. L463 ~70% --> Be more specific. In general, you provide very precise data with two decimal digits. I do not understand why in a few occasions you decide to be approximative

Response: The specific proportion is 71.43% (45/63). The number of surge-type glaciers from the most recent inventory of surge-type glaciers (Guillet et al., 2022), and the number of advancing glaciers from KGI-2020s data.

14. Fig 9, caption Hollow--> white

Response: Thank you. It has been revised.

15. L478 What are the five sub-basins? The three basins are the coloured ones shown in fig 6 or EK, CK

and WK?

Response: The five sub-basins are: Wakhan, Gilgit-Hunza, Shigar, Sub-Tarim and Shyok. Now, they are shown in figure 6, also list in Table S6.

16. L484 "with runoff moving towards peak water" is unclear

Response: Thanks. Now, we changed the statement to *"On the whole, the median elevation of the Karakoram glaciers showed an increasing trend during 1990-2020, indicating that glacier melting likely is becoming more intense, **the annual glacier runoff is moving towards a maximum (peak meltwater)**"*.

References

Guillet, G., King, O., Lv, M., Ghuffar, S., Benn, D., Quincey, D., and Bolch, T.: A regionally resolved inventory of High Mountain Asia surge-type glaciers, derived from a multi-factor remote sensing approach, The Cryosphere, 16, 603-623, 10.5194/tc-16-603-2022, 2022.