

Dear Editor and Reviewers,

We sincerely thank you for your careful review of our manuscript and for providing valuable comments and suggestions. We have carefully considered all the feedback and revised the manuscript accordingly. Below we provide a detailed, point-by-point response to each comment.

To reduce the manuscript length and page count, we have moved the tables originally placed at the end of the manuscript to the Supplementary Material.

Reviewer#1

Comment 1: *Steiner et al. have shared the global LGT. And, this work also produce the LGT in HMA in different time. I would suggest share those LGT. And please Emphasize in the abstract that the vector data are provided as shapefiles / GeoPackage with full attribute tables compliant with the RGI 7.0 vocabulary; this is not obvious to casual readers.*

Response: Thank you for pointing this out. Following your suggestion, we have provided further clarification in the abstract, explaining that the data is published on Zenodo in GeoPackage format, adhering to the internationally recognized RGI 7.0 data standard. This ensures that our data is easily accessible and usable by readers and other researchers.

Comment 2: *It is useful to share the GEE javascript/pythod code as a supplementary file or link to a public Github.*

Response: We have packaged the code and shared it as a supplementary file accompanying this manuscript.

Comment 3: *The minimum lake threshold was used 0.0036km^2 (4-pixel), which is justified and consistent with earlier regional work. However, I also noted that the uncertainty of proglacial lakes less than 0.01km^2 is larger than 40% in Figure 6. Consequently, I wonder what's the point of taking such a small threshold? I would suggest Keep the threshold at 0.01 km^2*

Response: We sincerely thank the reviewer for raising this important point. We fully understand your concern regarding the minimum lake threshold, especially noting that Figure 6 shows the uncertainty of proglacial lakes smaller than 0.01 km^2 exceeding 40%. This indeed indicates that small proglacial lakes have relatively large measurement errors. In fact, when we initially considered the threshold for lake area, we also discussed this issue extensively. Particularly around 1990, the availability of

remote sensing data was limited, and the image resolution and quality were relatively low, which made the measurement of small lakes more uncertain.

Nevertheless, we ultimately chose to adopt a minimum threshold of 0.0036 km² (equivalent to 4 pixels), based on several considerations:

Priority of research objectives: The primary goal of this study is to identify and screen lake-terminating glaciers. To achieve this comprehensively, it is necessary to maximize the detection of proglacial lakes. Even though very small lakes may have higher measurement uncertainty, their existence is crucial for determining whether a glacier terminates in a lake.

Actual existence of small lakes: In reality, some small glaciers do have proglacial lakes with areas below 0.01 km², and newly formed proglacial lakes are often small in their early stages. If we set the threshold at 0.01 km², these lakes would be excluded, which would affect the identification of lake-terminating glaciers.

Role of manual verification: To mitigate the impact of uncertainty in small lake measurements, we conducted manual verification. This allowed us to confirm the factual existence of these lakes and their contact with glaciers. Thus, even if the area measurement is uncertain, the existence of the lakes can be reliably established.

Acceptability of uncertainty: While the uncertainty of small lake areas is indeed larger, especially in the early period around 1990, this uncertainty does not affect the factual existence of the lakes. In other words, the uncertainty mainly influences quantitative precision but does not alter the qualitative identification of lakes. Considering that the primary objective of this study is the identification of lake-terminating glaciers, we regard this level of uncertainty as acceptable.

In summary, we selected a smaller threshold to ensure the completeness of the study and the achievement of its scientific objectives. Although small lakes may have larger measurement uncertainties, through manual verification and methodological adjustments, we can guarantee the factual existence of the lakes and thereby achieve comprehensive identification of lake-terminating glaciers. We believe this choice aligns with the purpose of the study and does not affect the main conclusions.

Comment 4: *A 2025 global LTG inventory (Steiner et al., 2025) identified 1912 LTGs in HMA (vs. 1740 in this study), with only 47.4% overlap. The study attributes this to temporal differences (2000 ± 2 vs. 2022) but does not explore potential methodological*

discrepancies (e.g., Steiner et al. 's use of ASTER data and expert cross-validation), limiting cross-dataset consistency.

Response: Thank you for your valuable comment. In the revised manuscript, we have further discussed the sources of differences between our dataset and that of Steiner et al. (2025), including both temporal and methodological aspects. Specifically, we elaborated on the influence of different imagery periods (2000 ± 2 vs. 2022) and the variations in data extraction methods and classification criteria. These clarifications have been added to the discussion section to address the reviewer's concern regarding methodological discrepancies.

Comment 5: *Table format. "Table 4: " is different with Table 1,2,3. Figure format "Figure1,2,3,4, " , "Figure 5: " , Please check those format*

Response: Thank you for pointing out the formatting inconsistencies. We have carefully checked and revised the table and figure formats to ensure consistency throughout the manuscript.

Comment 6: *Discussion session is weak. The title of this Manuscript is rapidly changes of LTG, So, it is better to link LTG changes to climate drivers (such as how climate effect on regional variations in LTG loss) or others. Furthermore, LTG are link to hazards, so it is usefull to discuss/ass their risk. It would enhance the dataset ' s value for disaster risk management.*

Response: Thank you for your valuable suggestions. Based on your feedback, we have revised the discussion section to include a new subsection linking changes in lake-terminating glaciers (LTGs) to climate drivers. Additionally, we have expanded the discussion to explore the connection between LTG changes and associated hazards, particularly in the context of glacial lake outburst floods (GLOFs). Through this addition, our goal is to enhance the practical significance of our dataset and highlight its importance for disaster risk management.

Reviewer#2

Comment 1: *I think that a detailed approach flowchart should be included.*

Response: Thank you for this helpful suggestion. We agree that a more detailed workflow flowchart would improve the clarity and reproducibility of the mapping procedure. In the revised manuscript, we have added a detailed approach flowchart illustrating the full workflow for mapping lake-terminating glaciers and proglacial lakes.

Comment 2: *I would suggest the author to discuss the difference in proglacial lake*

count compared to other recent regional inventories Chen et al. (2021) and Zhang et al 2023. For example the overlapping between this work and chen et al is less than 70 % and this should be more explained.

Response: Thank you for this constructive suggestion. To further substantiate the interpretation, we additionally performed a sample-area cross-validation in the central Himalaya. The discrepancies between our inventory and existing datasets in this subregion likely arise from a combination of definitional, classification, and methodological differences. Some inventories adopt a more permissive criterion for proglacial lakes and may include water bodies located near glacier fronts even without direct ice contact, which can inflate lake counts and broaden mapped extents. In addition, transitional water bodies can be labeled inconsistently across datasets, such that features classified as supraglacial lakes elsewhere may be mapped as proglacial lakes in our inventory when they exhibit clear frontal coalescence and a terminus-proximal setting, thereby reducing agreement. Differences in the minimum mapping area threshold further affect the inclusion of small lakes and can amplify mismatches in both lake counts and spatial patterns. Finally, variations in image quality, acquisition season/year, cloud/snow and shadow contamination, and vectorization and post-processing workflows may also contribute to the observed inconsistencies. We have incorporated these in the revised text to make the comparison and its implications clearer.

Comment 3: *The high average relative error for proglacial lakes looks quite high >20%, for the smaller lakes is quite high but should highlight it more clearly. And should explain more precisely about the precaution to reduce the uncertainty specially for the smaller lakes of ne lakes.*

Response: Thank you for this valuable suggestion. We agree that the average relative error for proglacial lakes (>20%) appears high. In the revised manuscript, we further stratified relative error statistics by lake area bins and glacier types. The results indicate that the largest relative errors are primarily associated with proglacial lakes smaller than 0.01 km², which have a mean relative error of 49%. Within this size class, Type 2 proglacial lakes are most common, accounting for 52% of all lakes <0.01 km². We also expanded the Discussion to describe specific quality-control measures, including visual verification and, where necessary, manual boundary corrections using higher-resolution remote-sensing imagery (PlanetScope, Esri basemaps, and Google imagery), to reduce misidentification and boundary bias caused by limited spatial resolution.

Comment 4:

Line by line

L38; correct the referencing

Response: We have corrected and standardized the reference citation format throughout the manuscript.

L41; reference is missing

Response: We have added the relevant references in the revised manuscript.

L67; The HMA abbreviation is used before the full text

Response: We have added the full term (High Mountain Asia) at its first mention.

L69-70; provide the proper reference for the average elevation

Response: We have added the data source information in the revised manuscript.

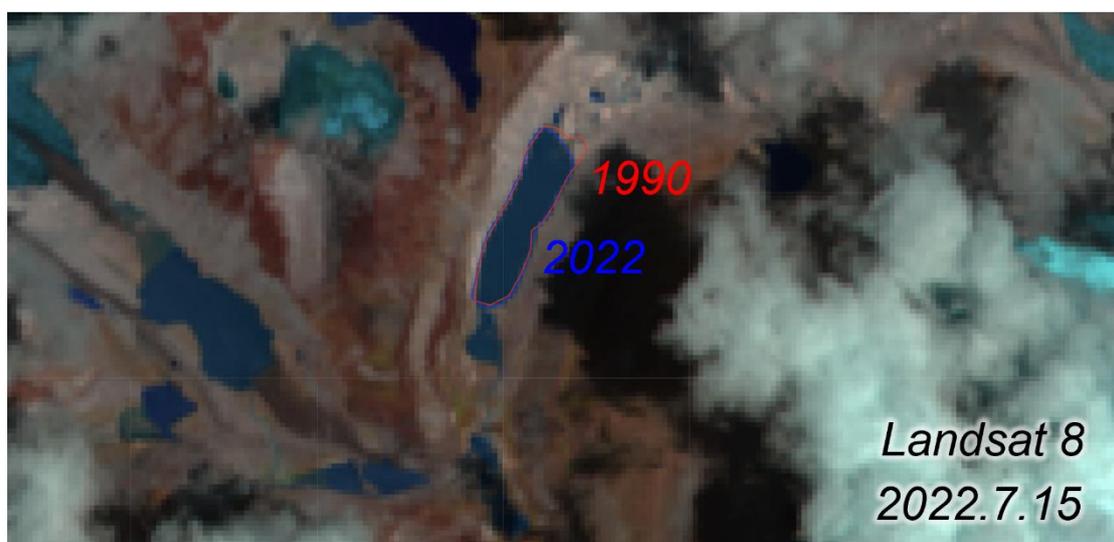
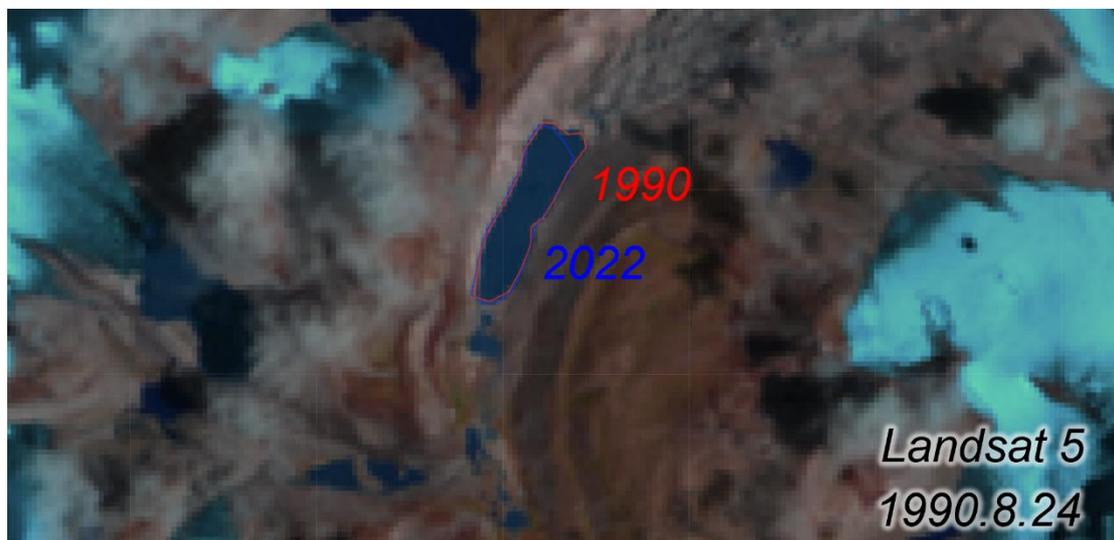
L78-84: climatology should be in better and precise way as the glaciers and region are dominated by westerly and monsoon in different season, and also the glacier density and the glacier lakes characteristics should be detailed a bit as there are many recent glacier lake inventories

Response: Thank you for this helpful suggestion. In the revised manuscript, we have rewritten the climate background section to explicitly describe the dominant circulation regimes in different seasons and the resulting north–south and west–east hydroclimatic gradients that control glacier accumulation and ablation across HMA. We have also expanded the regional glacier description by adding clearer information on glacier spatial distribution based on RGI v7.0. In addition, we added a short synthesis of recent HMA-scale glacial lake inventories and summarized key characteristics of glacial lakes in terms of their distribution and spatial heterogeneity across subregions.

L120-121 ; it doesn't look like the result are detailed visual correction with the other data foe example here i compared the shapefile from 2022 lakes from this paper and the chen et al 2019 for one location (27.8423, 86.9384) and it looks the lake is and LTG is not in both 1990 and 2022 list.

Response: Thank you for the reviewer's careful cross-check and for providing a specific example. For the location at (27.8423, 86.9384), we re-examined multiple images within our mapping time windows (1990 \pm 2 years and 2022 \pm 1 year). We confirm that our interpretation differs from that of Chen et al. (2021). Chen et al. classified this

glacier as lake-terminating, whereas the inventory of Zhang et al. (2023). is consistent with our assessment, and neither of us identifies it as a lake-terminating glacier. We suggest that this discrepancy is mainly related to extensive supraglacial debris cover near the glacier terminus. Debris cover substantially reduces the interpretability of the ice-water boundary and, together with differences in interpretation criteria and image timing among datasets, can lead to inconsistent judgments regarding the presence of direct ice-water contact. For this case, within our adopted time windows we did not observe stable and unambiguous geomorphic evidence of direct ice-water contact, such as crevasses or ice cliffs. In addition, the water body at this site did not show an expansion pattern consistent with a sustained glacier – lake interaction over 1990 – 2022, but remained broadly stable or slightly shrank. Therefore, we did not include this glacier in our LTG inventory. We have added this explanation to the Discussion in the revised manuscript to clarify the source of discrepancies among datasets.



L232; IN MANY PLACES the cross refence of table A3 is different than other

Response: Thank you for pointing this out. We have revised the manuscript accordingly, following your suggestion.