Response to Reviewers and Editor for Minor revision: 14-Dec. 2025

Manuscript Title: *Constantly renewing glacial lakes in the Kyrgyz Range, northern Tien Shan*
Authors: Mirlan Daiyrov & Chiyuki Narama
Journal: *Natural Hazards and Earth System Sciences (NHESS)*

General Statement

We thank the editor and reviewers for their constructive feedback and recognizing the improvements made in our work. We have carefully revised the manuscript to address all comments. Below, we provide a detailed, pint by point response, with red sentences.

Reviewer #1 Comments

Comment 1:

The implementation of the InSAR analysis is now clearly described, but the results have been removed. Please reintroduce at least one example showing how InSAR data contribute to identifying GMC locations or delineating GMC boundaries. Also clarify whether all GMCs still contain ice, whether displacement patterns reveal other types of movement, and which geomorphological indicators support GMC delineation.

Response:

Thank you for pointing out the lack of InSAR data. In the revised manuscript, we added have added a new figure (Fig. 6) presenting seasonal displacement maps of GMCs in 2009 and 2010 derived from DInSAR. We have also expanded Section 4.3 to explain that 65% of mapped GMCs exhibit measurable deformation, supporting the presence of buried ice, whereas 35% show no displacement patterns reflect subsidence due to ice and minor creep, consistent with permafrost-like processes In addition we have listed geomorphological indicators (thermokarst depressions, arcuate scarps, drainage anomalies) in Section 3.2, 4 and 5.1 as complementary evidence used for GMC delineation and interpretation.

Comment 2:

You have looked at 483 glaciers, why did you identify 611 GMCs? How can there be more GMCs than glaciers?

Response:

A previous study () invesigated 483 glaciers in the northern flank of the central part as written in Section 2. While, our study mapped glaciers and GMCs across the entire range, including both northern and southern flanks. We carefully re-analyzed and cross-checked the distribution of GMCs and confirmed that there are 521 GMCs in total. Accordingly, the number of GMCs in this study is 521 not 611, and these 521 GMCs are distributed on both flanks of the Kyrgyz Range. In addition, we mapped 787 glaciers in 1968 and 757 glaciers in 2021. Because some glaciers don't have host GMCs, the total number of GMCs is smaller than the number of glaciers. These revisions have been incorporated into Section 4.3.

Comment 3:

Enlarge the maps in Figures 5, 6, and 7.

Response:

The figure numbering has been updated: the former Fig. 6 is now Fig. 7, and Fig. 7 is now Fig. 8, due to the addition of a new figure as Fig. 6.

Dear reviewer, because of the size consistents and the need to maintain consistency between maps and the adjacent figures, we are unable to enlarge the maps in Figs. 5, 7, and 8. Enlarging and reformatting them would compromise the overall size balance of the figure set. However, we have improved these figures to enhance their crealy and readability.

Editor's Comments

Comment 4:

Strengthen contextualization: Compare findings with other mountain ranges and global studies. Discuss hazard relevance (GLOFs) more explicitly.

Response:

It would go beyond the scope and focus of the paper, as well as the available space, to discuss global cases of GLOFs. This paper is not intended as a global review of glacial lakes and GLOFs, nor as a study that provides a detailed, data-driven explanation of GLOF mechanisms, as these topics have already been comprehensively addressed in previous work. Rather, by referring to representative examples of moraine-dammed lakes in the Himalaya, we focus on characterizing the development of glacial lakes in the Kyrgyz Range. In the final part of the Discussion, we also briefly outline the remaining challenges for future GLOF hazard assessment in this region.

Comment 5:

Ensure consistent terminology for lake types and environmental trends.

Response:

We reviewed the manuscript and standardized terminology for lake types (glacier-contact vs. contactless/thermokarst) and environmental trends, following ICIMOD and GLIMS guidelines.

Comment 6:

Comment on implications of data resolution (Corona vs. Landsat) and challenges of using InSAR data.

Response:

Regarding the influence of data resolution (Corona vs. Landsat), it is indeed not feasible to fully resolve the formation and evolution of very small glacial lakes. However, by applying a consistent minimum lake-area threshold across all datasets, the impact of resolution differences on the glacial lake inventory has been substantially reduced, as already addressed and revised in response to the reviewer's previous comments. In addition to Section 3.3, the manuscript now clarifies that the DInSAR-derived displacements are evaluated for consistency by comparing them with other DSM-based elevation-change datasets and GNSS observations.

Additional Changes

- All revisions are highlighted in the tracked manuscript.

We showed changed text.

- Figures updated for clarity.

We improved figures.

- References expanded to include recent studies on glacial lakes and InSAR applications.

We added some references about study.

We hope these revisions address all concerns and improve the manuscript's clarity and scientific contribution. Thank you for your consideration.