Reply to editor

Dear editor,

We are very pleased that this revision has been approved by you and the two reviewers. At the same time, we thank you for your comments on the revision of this manuscript. We value the comments made by you and the two reviewers and have responded to them carefully. Details are as follows:

1) All points raised by Reviewer #1 seem very pertinent and should be addressed. Two comments seem particularly important: (i) The uncertainties in Section 5.2 have indeed to be discussed. Whenever possible, this discussion should be quantitative, although I understand that a full error propagation might be difficult to implement. In such a case, even more emphasis should be set on the qualitative discussion. (ii) The comment for Lines 499-500, pointing at a questionable generalization, is important too. If a speculation is strictly necessary in your view (personally, I don't think this is the case), it should be clearly flagged as such.

Reply: Thank you for the comments given on this study. We sincerely accept the two constructive comments given by reviewer 1 and have made the best effort to revise them. Uncertainty quantification is indeed a very difficult task. In the process of doing literature research in this study, it is found that there are relatively few studies on the quantification of errors in each link of the GLOF process chain, and most of the studies focus on the establishment of the simulation process and the elaboration of the results. Therefore, this part was weakened in our pre-simulation process. However, this part is very important for scientific research. In this revision, we combined your comments and those of reviewer 1, we described and highlighted potential uncertainties in the simulations in the different links of the GLOF process chain modelling by reviewing a large amount of literature, but it is only qualitatively. In addition, for the problem in Lines 499-500, we agree with the reviewers' comments, and we removed the last sentence of illustrating a difference of glacial lakes between Himalaya and SETP.

2) Reviewer #2 explicitly asks for the language to be improved. This advice should be followed, possibly with the help of external support. In terms of specific wording, the reviewer had also commented on the use of the term "maritime", pointing out that the wording seems inadequate for the addressed study side. I agree with this appreciation, in the sense that the location seems a prime example for what one would call

"continental", and not "maritime". Please change this wording throughout the manuscript in your next submission.

Reply: We sincerely accept the comments of reviewer 2, who raised this issue in the first revision. But due to the huge workload of the GLOF process chain simulation in the major revision, we did not have more time to make improvements to the language. In this revision, we invited Mr. Jake Carpenter from USA to improve the language of this paper. We hope that this revision will make up for the shortcomings of our language. In addition, we replaced the word "maritime" with "temperate" which is also the wording commonly used in the literature to describe glaciers in our study region.

3) I noticed that your manuscript did not contain a "Code and data availability" statement so far. Please include such a statement in your revision, as this is required by TC's guidelines (https://www.the-cryosphere.net/submission.html). When preparing the statement, please make sure to respect TC's Data Policy (https://www.the-cryosphere.net/policies/data_policy.html).

Reply: We are sorry for not noticing this issue and we addressed it in this revision. "***Code and data availability****: The Landsat MSS/TM/OLI image are available from the United States Geological Survey (https://earthexplorer.usgs.gov/). The AST14DEM dataset and ALOS PALSAR DEM used in this study can be obtained from the National Aeronautics and Space Administration (NASA) EARTHDATA website (https://earthdata.nasa.gov/). The MapWorld image is provided by the National Platform for Common Geospatial Information Services (https://www.tianditu.gov.cn/). The GLC10 LULC product is available from http://data.ess.tsinghua.edu.cn/fromglc10_2017v01.html.*"

Reply to Referee #1

Dear reviewer,

We are very happy to see your approval of the revised manuscript. Thank you for your guidance over the past months. We valued the excellent comments you have made on this study and made corresponding modifications.

1. Section 4.2.4 – it would be nice to how many man-made structures (buildings, bridges, km of roads, etc.) are exposed to individual GLOF scenarios.

Reply: Following your suggestion, we summarized the count of man-made structures (buildings, bridges, km of roads, etc.) are exposed to individual GLOF scenarios. "*The*

total areas of houses, courtyards, and farmlands (around settlement) affected by Scenarios A1, A2, A3, B3, and C3 were estimated to be 23,984 m², 32,076 m², 41,038 m2, 3,820 m² and 3,918 m², respectively. In Scenarios A1, A2, A3, all 13 bridges and road with a length of approximately 35 km are within the flood zones, and in Scenarios B3 and C3, there are four bridges as well as with a length of approximately 3.6 km and 6.7 km within the flood zones. This study only assesses the potential impact of floods on these man-made structures, but the magnitude of the impact is beyond the scope of this study."

2. Section 5.2 – the uncertainties are not really addressed here; I suggest you to discuss the uncertainties of individual components (models) in your model chain and how they propagate. The (dis)advantages compared to the single model approach (e.g. r.avaflow) should be discussed.

Reply: We sincerely accept your constructive comment and have made the best effort to revise them. Uncertainty quantification is indeed a very difficult task. In the process of doing literature research in this study, it is found that there are relatively few studies on the quantification of errors in each link of the GLOF process chain, and most of the studies focus on the establishment of the simulation process and the elaboration of the results. Therefore, this part was weakened in our pre-simulation process. However, this part is very important for scientific research. In this revision, we described and highlighted potential uncertainties in the simulations in the different links of the GLOF process chain modelling by reviewing a large amount of literature, but it is only qualitatively. We know that you are a well-known expert in the field of glacial lake outburst floods, and we hope you can give some advice if we have not written well enough in this section. In any case, thank you very much for your great help in this study.

3. Terminology–you use 'eruption', 'breakout' and 'outburst' throughout the text – I suggest to unify and use only one of those (preferably 'outburst'); similarly, I suggest to use 'lake volume' instead of 'water storage'

Reply: Thank you for your advice on the writing guidelines, we standardized the terminology in the text as you suggested.

4. L140-141: please check the correctness of the calculation of the width-to-height ratio (I think you used width perpendicular to the streamline while width parallel to the streamline should be used in the calculation)

Reply: Thank you for your guidance. As you would think, we calculated the aspect

ratio using the width perpendicular to the flow line. Based on your suggestion and with reference to Prakash and Nagarajan (2017) (Figure 1), we re-measured the dam width of Bienong Co (Figure 2). The dam height of Bienong Co is smaller than its maximum water depth, we measured the distance from the inside to the outside of the dam parallel to the flow direction at a lake depth of 72 m as the dam width (Figure 2).
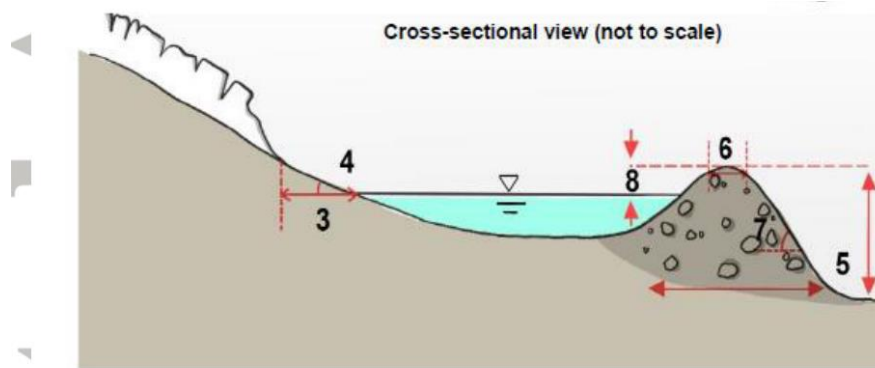

Figure 5. Factors for outburst susceptibility: (1) lake area, (2) increase in lake area, (3) lake–glacier proximity (horizontal distance), (4) slope between lake and glacier, (5) moraine width-to-height ratio, (6) width of moraine crest, (7) slope of distal face of moraine, (8) lake freeboard, (9) mass movement impact on lake, (10) Cloudburst or extreme rainfall event (11) seismicity

Figure 1 Illustration of moraine dam width in study of Prakash and Nagarajan (2017).
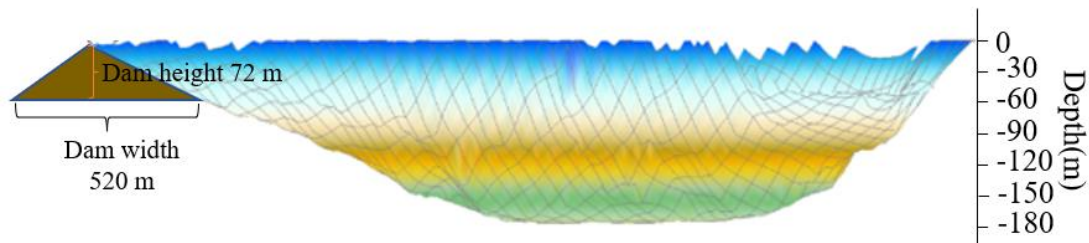

Figure 2 Dam with of Bienong Co.

5. L499-500: this shows that the two lakes are different, you don't have enough data to generalize about a difference between Himalaya and SETP

Reply: In view of the suggestion you raised, we removed the last sentence of illustrating a difference of glacial lakes between Himalaya and SETP.

Reply to Referee #2

Dear reviewer,

We are very grateful for your review and comments on this paper. You raised the issue

of the readability of this manuscript in English in your first review. Unfortunately, we did not manage to improve the language due to the significant workload in model simulation and the time constraints in the last overhaul. In this revision, we invited a native English-speaking expert to revise and improve the language of this manuscript. Thank you again for your recognition and help. I was fortunate to have been given the opportunity to visit the University of South Wales in the UK with official support from China. However, I am now experiencing problems with the visa and I am working to resolve this issue. If I ever get the chance to come to the UK I hope to come and visit you and ask for your knowledge of glacial lakes. Thank you again. Best wishes to you.

1. This paper is now fine. Previously I made some changes to the written English. There are still some small problems here and there. Please do not start sentences with 'And' (line 20; decide whether to use the present or past tense in your sentences (e.g. line 69). Line 152: 'it's' means 'it is' and is different from the possessive 'its'.

Reply: We are very sorry for our grammatical problems. In this revision, we invited a native English-speaking expert to check our language problems in the hope of making substantial improvements to the English grammar of this manuscript.

2. You should use the definite article (The) before nouns. For example, 'Bathymetric' in line 251 should have 'The' before it. There are numerous examples throughout the paper.

Reply: I am sorry that I have a poor understanding of the use of "the" in English expressions. In this revision, I will try to avoid such problems as far as possible.

3. Please cite: Harrison, S., Kargel, J.S., Huggel, C., Reynolds, J., Shugar, D.H., Betts, R.A., Emmer, A., Glasser, N., Haritashya, U.K., Klimeš, J. and Reinhardt, L., 2018. Climate change and the global pattern of moraine-dammed glacial lake outburst floods. The Cryosphere, 12(4), pp.1195-1209. This should be around line 59.

Reply: Thank you for recommending this article to us, it is very interesting and we gained a lot of knowledge from it. I have cited it in this article.