

The Cryosphere Discuss., referee comment RC3  
<https://doi.org/10.5194/tc-2020-379-RC3>, 2021  
© Author(s) 2021. This work is distributed under  
the Creative Commons Attribution 4.0 License.

## **Comment on tc-2020-379**

Ashim Sattar (Referee)

---

Referee comment on "The 2020 glacial lake outburst flood at Jinwuco, Tibet: causes, impacts, and implications for hazard and risk assessment" by Guoxiong Zheng et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2020-379-RC3>, 2021

---

The authors have analyzed the GLOF process chain of the 2020 GLOF at Jinwuco, Tibet.

It is a robust study where the causes, impacts, and implications are well presented. The authors also point out that heavy precipitation can be an important trigger of GLOF. Meteorological conditions, especially extreme rain events, may partly melt ice in the moraine dam and weaken the moraine, or cause overflow and thermal and physical erosion of the moraine, or induce a mass movement into the lake.

The effort is relevant from a scientific point of view and definitely falls under the scope of the journal. The manuscript is well structured. I highly recommend the paper and suggest some moderate changes. Hope my comments will be useful to the authors.

See below for the comments.

### **Abstract:**

I would suggest including some results of the most likely scenario presented in the study.

Line 25-30- It is strange to have such a long lag time of 5-17 days between the landslide and the GLOF event. Overtopping waves are normally short-lived, and has an instantaneous or short-lived but high impact on the damming moraine. I would recommend rephrasing this sentence.

As the lag time is over several days, overflow of the lake due to rainfall can be a cause for one of the scenarios in the study??

### **Introduction:**

I would recommend focusing on studies that reconstructed previous GLOF events

(e.g. Westoby, M.J., Glasser, N.F., Hambrey, M.J., Brasington, J., Reynolds, J.M. and Hassan, M.A., 2014. Reconstructing historic Glacial Lake Outburst Floods through numerical modelling and geomorphological assessment: Extreme events in the Himalaya. *Earth Surface Processes and Landforms*, 39(12), pp.1675-1692.

Nie, Y., Liu, W., Liu, Q., Hu, X. and Westoby, M.J., 2020. Reconstructing the Chongbaxia Tsho glacial lake outburst flood in the Eastern Himalaya: Evolution, process and impacts. *Geomorphology*, 370, p.107393.

Westoby, M.J., Brasington, J., Glasser, N.F., Hambrey, M.J., Reynolds, J.M., Hassan, M.A. and Lowe, A., 2015. Numerical modelling of glacial lake outburst floods using physically based dam-breach models. *Earth Surface Dynamics*, 3(1), pp.171-199.

Majeed, U., Rashid, I., Sattar, A., Allen, S., Stoffel, M., Nüsser, M. and Schmidt, S., 2021. Recession of Gya Glacier and the 2014 glacial lake outburst flood in the Trans-Himalayan region of Ladakh, India. *Science of The Total Environment*, 756, p.144008.)

Last para:

I would suggest introducing the event further by adding one or two sentences to emphasize the presented case study.

### **Materials and methods:**

#### **Section 3.4**

The values of breach and lake characteristics fit better in the Result section.

It remains unclear how the volume of the lake was empirically determined. Was it from a particular empirical equation or the average of all? Sorry if I missed it.

### **Section 3.5**

The flow propagation is analyzed up to 1.2 km downstream. I note that validation of the flow is difficult in the downstream part of the channel. However, it can be assumed that if the initial conditions of reconstruction (trigger and breach) were validated (which the authors have done a good job), the downstream propagation more or less will represent the flow. E.g. inundations at places shown in Fig 12 and 13, table 3, etc can be helpful here to evaluate the modeled inundation.

At places in the section, results are mentioned e.g. Line-216, Line 218, etc. I would suggest shifting it to the results section.

### **Results:**

Section 4.3 Line 310-313: As mentioned earlier the lag time between the landslide and GLOF is several days. This can be discussed.

Section 4.4. Line 319 to 321- How was the reconstructed lake volume of 13.9 M m<sup>3</sup> calculated? This can be explained in the methodology and result section 4.2 or 4.4.

Section 4.5. Line 343 – The peak discharge reaches 10.900 m<sup>3</sup>/s. It does not reflect in the hydrograph in Fig.10.

### **Discussion:**

The authors have done a great job here discussing the uncertainties in detail. This also answers some of my questions above.

I agree that reconstructing GLOF is associated with a lot of uncertainties, lack of evidence, the complexity of the triggering process, etc.

Evaluating multiple scenarios to reconstruct the process chains can however be useful to understand the event and not rule out the various possibilities.

**Figures:**

Fig-1 Township border and river colors can be changed.

Fig.2 Caption –To avoid confusion, front to back can be replaced with downstream to upstream. Similarly Left to right or right to left can be represented in terms of directions with respect to north.

Fig.3- recheck the scale of Fig. a; dates in a and b is not visible.

Fig. 10- Hp1, Hp2 , Qp1, Qp2...etc can be mentioned in the caption. The discharge represented on a negative scale? Sorry if I missed anything.

Table 1- Line 140 – Date or Data?

Overall a very nice study that includes remote sensing and complex modeling to understand GLOF events.

I highly recommend this paper with moderate revisions