Review to the manuscript

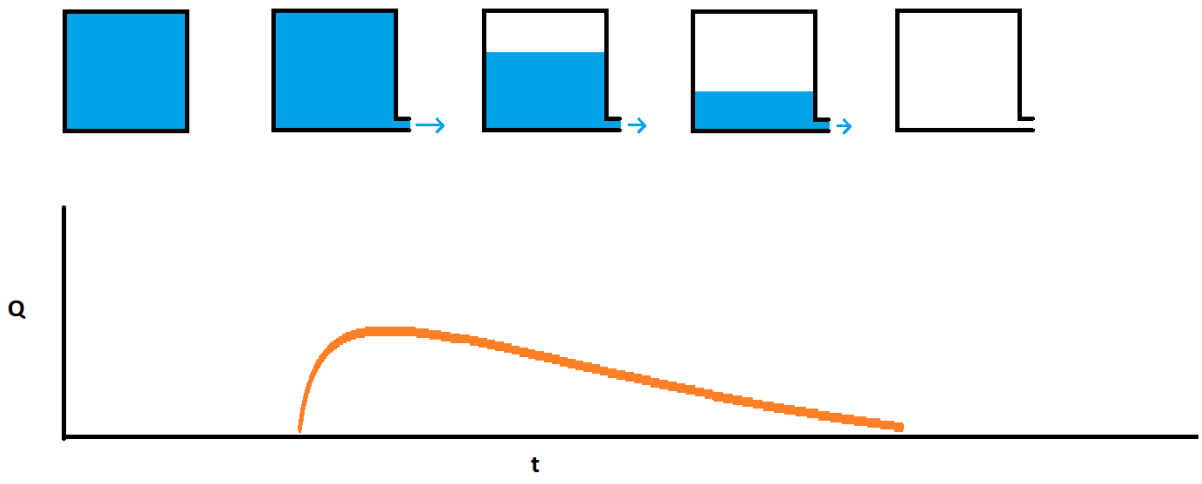
“Periodic Glacial Lake Outburst Floods threatening the oldest Buddhist monastery in north-west Nepal“

submitted by Jan Kropáček et al. to NHESSD

Presented manuscript deals with the repeated GLOFs from supraglacial lake in the north-west Nepal, using remotely sensed data, field data, data from climatological reanalysis and flood modelling. I found this topic actual in the frame of ongoing climate change and glacier retreat in Himalayas, and surely fitting into the scope of NHESS. Paper is mostly understandable, language is clear, nevertheless, I suggest some final polishing. Text is accompained by five tables and eleven illustrative figures. List of references contains 40 records.

From my point of view, the weakest point of the manuscript is the flood modeling, which I consider to be the one of the aims of this work. With all due respect to the authors, crucial input data (flood hydrograph and peak discharge) seem speculative and even wrong. Firstly, I fundamentaly disagree with the approximation of outflow hydrograph with the Gaussian normal distribution in this case study. Considering the likely mechanism of the flood (lake drainage through the subglacial tunnel), Gaussian normal distribution-like hydrograph is not related to reality anyhow. Such hydrograph should be characterised by steep rising limb and slightly decreasing falling limb reflecting decreasing hydrostatic pressure (see Fig. 1). In addition, please explain, why authors did not use the only relevant field data describing potential flood hydrograph: “The stream level in the village rose early in the afternoon and stayed high for several hours.“ Modelled hydrographs do not reflect this description. I strongly suggest considering the change of input hydrographs for flood modelling in order to get more reliable results.

Figure 1. Schematic hydrograph for tunnel drainage.



Secondly, if the authors had the opportunity to see 2011 GLOF in the field, I see many ways, how to estimate the peak discharge much more precisely (even retrospectively), rather than using the empirical equation developed by Clague and Mathews (1973), e.g., by measuring cross profile across the river, marking the water level during the flood. Compared to highly precision approach, which is used to estimate the volume of the supraglacial basin (which also likely changed significantly since 2011) and 1 m resolution DEM, this may distort resulted modelled flood considerably. I suggest to compare obtained results (flow depth at measured profiles) with the field evidences in order to verify the modelling results, or even to calibrate the model.

To be honest, I have some doubts about the suitability of the usage of a given flood model itself for this case study. According to the Figure 1, the distance between the lake and the village is about 5 km with vertical difference of 1 500 m (mean slope cca 17°). If I understand well to the Figure 8, it is seen, that escaped water from the lake has occured at Profile 5 more than 2 hours later, resulting in mean velocity of the flow less than 0,7 m/s. According to my experience, this is unrealistically low, especially for extraordinary events even transformed into the debris flows. Also flow captured on Figure 5a seems to have higher velocity. Calculated travel time 3 hours also seems unrealistic to me. The authors should at least give more detailed description of the model in methodological section to justify these highly questionable results.

I also need the authors to relate obtained results to the broader hydrological context of Halji river (mean discharge of the river, ratio of peak discharge to mean discharge, …). I would appreciate more photos from the field (or larger photos than 6 in 1).

Some specific comments:

P6937: I suggest to use word “Repeated“ rather than “Periodic“; described GLOFs are not periodic in a strict sense

P6940L14: (a.s.l.) replaced by Fig. ??

P6941L20: the magnitude of recent event often seems higher then magnitude of earlier events, especially for unexperienced observers

P6941L13: Please, rearrange the description within the entire section chronologically

P6948L15-20: this part seems to me not to be a result

P6949L1: interesting paragraph, please, indicate (discuss) some (future) hazard implications

P6951L12: I suggest to use the term “hazard“ or “threat“ rather than “risk“, which is not the subject of the article

P6962: Please, omit minus value on the precipitation axis

Due to the above mentioned drawbacks, I cannot recommend publication of the manuscript in its present form and I suggest **major revision**. I encourage authors to submit the revised version of their manuscript. In case of any questions, please contact me at emmera@natur.cuni.cz

Yours Sincerely

Adam Emmer

Charles University in Prague, Faculty of Science,
Department of Physical Geogprahy and Geoecology
Albertov 6, 128 43, Prague 2, Czech Republic