



Interactive
Comment

Interactive comment on “Periodic Glacial Lake Outburst Floods threatening the oldest Buddhist monastery in north-west Nepal” by J. Kropáček et al.

J. Kropáček et al.

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General comment 1: In section 3.4, how was the required minimum stereo matching score of 0.3 determined? Is this simply standard practice, or should there be a supporting reference?

Answer: The threshold value was tuned in order to receive the best results over glaciers which feature high saturation in the images.

Change in manuscript: We added the following sentence to justify the selected value: ‘This threshold proved to be most adapted to keep elevation pixels of fair quality in

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areas of high saturation.’

General comment 2: In section 4.6, the topic of the second paragraph is whether or not the supra-glacial lake can be filled merely by precipitation. The paragraph doesn't seem to answer that question, though, as it doesn't discuss the maximum expected precipitation on the glacier. Section 3.5 indicates that precipitation rates were studied, but no real answer to the question emerges until the second paragraph of section 5.

Answer: We calculated single liquid precipitation totals from the hourly precipitation data (HAR dataset) to see what is the discharge of an extreme precipitation into the lake.

Changes in manuscript: The following sentence was added to the end of the section 3.4: ‘Further, single liquid precipitation totals were calculated from the hourly precipitation data to see what is the discharge of an extreme precipitation into the lake.’ The respective paragraph in the chapter 4.4 was changed in the following way: ‘The cumulated liquid precipitation gives us an idea if the supra-glacial lake can be filled by mere precipitation amount received in the drainage basin of the lake. The theoretical runoff from liquid precipitation into the lake basin during the period in the respective summer season prior the GLOFs ranges from $0.50 \cdot 10^6$ m³ to $0.93 \cdot 10^6$ m³. This is a maximum value since it disregards any re-freezing in the glacier. The upper value corresponds to 88% of the maximum filling volume of the lake. The upper value corresponds to 88% of the maximum filling volume of the lake. The maximum liquid precipitation event in the period 2001 - 2013 occurred on 19 September 2010 and it amounts to 60.2 mm. Disregarding refreezing, evaporation etc., this precipitation event could generate a run-off corresponding to 8.3% of the lake basin volume.’

General comment 3: I think the paper would benefit from a more generous exploration of potential mitigation measures.

Answer: A paragraph describing the possible mitigation measures was added to the end of the Discussion.

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Change in manuscript : The following paragraph was added: 'This implies that in the near future a similar or even larger GLOF event can occur. Suitable mitigation measures should be therefore considered such as an artificial drainage of the lake. An adequate measure would be a construction of a drainage tunnel through the bedrock \citep[e.g.][]{{Reynolds1998}}. This solution is clearly unfeasible taking into account the remoteness of the place, lack of resources and the absence of an access for the heavy machinery. A further obstacle is the ice bottom of the lake which would complicate the construction of the tunnel entrance. An installation of a siphon made of plastic tubes would be more feasible \citep[e.g.][]{{Vincent2010}} however due to the low gradient of the eastern slope of glacier barrier, such pipe would have to be longer than 400 m. It seems more realistic to protect the village by measures along the downstream part of Halji Khola. The existing gabion walls protecting the riverbank in the village and upstream should be further reinforced. The common gabions used so far seem to be weak as appeared during the 2011 event. Larger gabions made of a thicker wire would have a better chance to resist a large flood. Connection of the gabions and their anchoring would further improve the situation'

4. Minor editing notes:

a. 'instable' has been changed to 'unstable'. b. 'off-shelf' has been changed to 'off-the-shelf' c. The sentence was replaced by the following one as suggested by the referee: ' Each pixel value determined to be an outlier using the 5\% and 95\% quantiles was replaced by the mean of the values of all adjacent non-outlier pixels.'

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