

Harrison et al. suggest that an observed increase in glacial lake outburst floods from moraine-dammed lakes beginning around 1930 is in response to post-Little Ice Age warming. The authors therefore predict increased GLOF frequencies in coming decades in response to anthropogenic climate warming. The study is of wide and significant interest and is a valuable compilation of data that would be well received in this field. My main concern is that the paper contains contradictory statements regarding the observed increase in GLOFs and the role of reporting bias (specific comment 6), which is acknowledged as a problem but also dismissed without detail of any investigatory analysis. The bias requires more attention in order to justify the conclusions made by the paper.

Specific comments

1. Climate change is mentioned numerous times in the introduction, but the reader doesn't get a sense of what aspects of climate change are important in the context of glacier thinning/retreat leading specifically the formation of moraine dammed lakes. Additionally, what about critical stages in lake formation whereby lake development can proceed independently of warming temperatures. Be more specific about the type of glaciers susceptible to lake development and provide details of the lake evolution process. Projections of increased GLOF frequency in the future can then be grounded in this literature.
2. I was surprised not to see comparisons made with Carrivick et al. (2016) who also observed a reduction in the number of glacier floods in recent decades (although not exclusively considering moraine-dammed lakes).
3. L121. Suggest changing to: '...which can lead to moraine failure...' because it's not inevitable.
4. L146 State how many events were not considered based on this filter.
5. L225. Please add citations supporting a 20 year lake growth period.
6. There could be no significant change in GLOF frequency across the whole study period and the changes observed be simply down to observation bias. There are contradicting statements to this effect, which require clarification in the paper:
L354-360 It is stated that GLOF frequency increased dramatically and significantly around 1930 globally and 1930-60 regionally, and that there was 'no obvious reason for an abrupt improvement in GLOF reporting in 1930'. However, the incompleteness of the record is then acknowledged as a 'pervasive factor throughout the early period'.
L650-653 it is stated that the upsurge in GLOF events per year (which is spatially variable) likely reflects 'an increase in reporting, especially in the early part of the record, rather than a change in GLOFs, at least until the 1970-90s after which the GLOF rate reduces.' While it's stated that you find no obvious reason for the abrupt improvement in reporting, no detail about this analysis is given. Since the whole premise of the study is based on a change in GLOF frequency, you need to be confident there is no reporting bias in the results presented, or that if there is (as would be assumed) how it was investigated and considered throughout the study. At the moment it's not clear how it affects the results and conclusions and that the trends observed are due to post-LIA warming, rather than a bias, or combination of both (and

if so the contributions of each). While contemporary reporting is complete in some regions (European Alps), there are still likely notable omissions in parts of the Himalaya.

Technical corrections

L74 ‘...consequence of climate change...’? To be consistent throughout.

L80 ‘Carrivick’ – check throughout

L128-130 Commas required here and in some other places.

L145-146 This sentence is just a repeat of the first.

L147 ‘...and attributed to moraine dam failure...’

Regions where moraine dammed lakes are found to form?

L165 ‘...Alps, no...’

L402 ‘supraglacial ponds’?

Figure 4 Missing y-axis label. State the proportion of GLOFs with timing information.

References

Carrivick, J.L. and Tweed, F.S. 2016. A global assessment of the societal impacts of glacier outburst floods. *Global and Planetary Change*. **144**, 1-16.