

Dear authors,

I have read your article “Predicting outflow induced by moraine failure in glacial lakes: the Lake Palcacocga case from an uncertainty perspective” published in NHESSD with interest. I think, that presented paper deals with the highly actual topic of GLOFs in the Cordillera Blanca of Peru, provides approach for the simple quantification of hydrological characteristics of potential GLOFs following moraine dam failure and surely deserves attention in the scientific journals such as NHESS. Generally, I like the presented methodological approach, but, with all due respect, I fundamentally disagree with its application to the specific case of Lake Palcacocha.

Please, let me explain why:

(1) moraine dam of lake Palcacocha failed in 1941; today's dam is characterized by gentle slope of downstream face of the dam (8°) and in combination with huge dam body mass (width) and implementation of remedial works reinforcing the outlet against the erosion and increasing dam freeboard, I find the failure of today's dam of Lake Palcacocha as a highly unlikely scenario, unlike the dam overtopping (see also Emmer and Vilímek, 2014);

(2) in this specific case of Lake Palcacocha, significant specifics such as dam geometry influenced by previous dam failure and implemented remedial works must be considered when thinking about potential dam failure in future, nevertheless, none of presented methods for the estimation of peak flow and failure time (Table 1) reflect this condition (I dare to say, that these methods are not designed for potential failure of already failed and in addition also remediated dam), therefore I found these results based on unrealistic assumptions; to realize the improbability of Lake Palcacocha dam failure it is illustrative to realize, that even during catastrophic 1941 flood, the breach did stop at current level, for further (deeper) breach, the peak discharge, therefore, would have to be greater than it was in 1941;

(3) notwithstanding, if we think about potential dam failure of today's dam of Lake Palcacocha, it emerges, that dam failure (breach) could be only initiated by extreme high volume fast slope movement (icefall, rockfall, rock avalanche, ...) into the lake, producing displacement wave large enough to initiate erosion of the dam, despite its rather flat geometry and implemented remedial works; it was shown by Kershaw et al. (2005) at Queen Bess lake case study, that such scenario leads to the two phases outburst flood, of which first phase following dam overtopping was characterized by higher peak discharge than second phase (dam failure); dam overtopping is, therefore, in any case, more actual and also likely GLOF scenario for Lake Palcacocha and **I suggest to concentrate on dam overtopping rather than on speculative dam failure**, which would have to be preceded by dam overtopping with probable higher discharge than dam failure itself.

Beside this from my point of view fundamental lack of presented paper, I also have also few specific comments:

P5972L2: “glacial lake outburst floods” (see also Richardson and Reynolds, 2000)

P5972L22: “flood risk” depends on several factors, not only capacity of the reservoir

P5972L22: I'm not sure about the term “natural earthen dam”

P5980L16: I suggest not to include “Study area” section as a part of the Methodology section

P5981L20: “Absence of bedrock and the prevailing presence of poor cohesion materials are likely in the Lake’s moraine; such conditions might lead to formation of large-scale breaches.” – How do you know, that there is absence of bedrock ?? please, provide references

P5982L2: “The likelihood of such an event is unclear, but uncertainty of the internal moraine structure does not allow us to reject the possibility of a massive breach.” - May I recommend to focus on realistic scenario for the given lake (dam overtopping in case of Lake Palcacocha), or to focus on lakes, for which dam failure is realistic scenario

P5987L8: The list of references seems incomplete to me – I miss key papers focusing on the broader environmental as well as social context of phenomenon of outburst floods in the Cordillera Blanca (e.g., Lliboutry et al., 1977; Zapata, 2002; Reynolds, 2003; Carey, 2005; Carey et al., 2012) and also some papers focusing on the GLOFs hazard estimation (e.g., McKillop and Clague, 2007a,b; Wang et al., 2012; Emmer and Vilímek, 2013, 2014), or general aspects of GLOFs (Clague and Evans, 2000; Richardson and Reynolds, 2000)

To briefly conclude my comments – **I cannot recommend application of the presented approach to the Lake Palcacocha case study.** Nevertheless, I encourage the authors to submit revised version of their manuscript. In case of any question, please, do not hesitate to contact me at: emmera@natur.cuni.cz

Kind regards

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