

Interactive comment on “Three-dimensional hydrodynamic lake simulations of avalanche-generated impulse wave dynamics for potential GLOF scenarios at Lake Palcacocha, Peru” by Rachel E. Chisolm and Daene C. McKinney

Anonymous Referee #3

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General remark I appreciate that several research teams work in this area and different techniques could lead to better understanding of process related to natural hazards. I believe that such paper about modelling will be very useful, nevertheless if there were already published quantifications which might be used to verify the presented model, they should be used. I will understand if such verification will be already to large extension of submitted paper, but in this case it should be considered in the Discussion. I mean the: height of the wave overtopping the dam in 2003 (8 meters)

C1

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or estimation of landslide volumes on the inner parts of lateral moraine (see papers Vilímek et al., 2005 and Klimeš et al. 2016).

Specific comments: P1 L29: I suggest: “.....a large number of these lakes pose a hazard or risk...” This is general sentence about GLOFs worldwide, not only about Palcacocha lake.

P2 L18: not only moraine-dammed lakes could be mentioned here, but also bedrock-dammed lakes (due to possible dam overtopping).

P2 L19-23: do not forget about rock-slides or rock-avalanches here,

P3 P3-4: this sentence should consider not only overtopping of moraines, but also breaching of moraines and overtopping of bedrock dams.

P4 L5: the steepness should be specified (inner and outer slopes). And be careful, because the current moraine holding the water behind (in lake frontal part), which you named “smaller moraine” on P4 L8 is rather different (in the steepness and not only) from the older one which was in function before 1941. This is clear for those who know the area personally, but not for all. I strongly suggest you to add a photo, on which you can explain the situation (like FIG. 1, perhaps better taken from the right lateral moraine). There exist another publication directly from the area of interest (Novotný and Klimeš, 2014), where you will find parts dedicated to steepness of slopes; for instance: “Investigations of mechanical and strength properties showed that the inner moraine slopes maintain temporal slope stability despite their steep dip (very often above 50°), which exceeds the dip of tested strength parameters. Their values are around 40° “.

P8 L23: I like the fact that you consider the lake bathymetry and surrounding topography, but it is at least necessary to add the citation or better to show a bathymetry map.

P8 L29: this is inaccurate. At least some data we have from one event from March

19th 2003.

P31 L31-32: Sure, the discrepancy in volume estimation is a problem, but why should be difference in moraine-dammed and bedrock-dammed lake in the sense of dam overtopping. Please explain. The only difference I see is in the potential for moraine erosion during the overflow compared to the bedrock. (To be precise the Lake 513 has a small moraine on the top of the bedrock-dam.).

P15 L37: Another sentence where the bathymetry map should be cited (or better included).

P 16 L18 This is OK for me, but there is probably one more issue which might be considered in the Discussion. Water will overtop the basal moraine first (you called them “small moraine”) and soon it will reach the breakthrough (from 1941) in the former frontal moraine, which is rather narrow for the fluent continuation of the flood wave. (This is another reason why the photo should be included – perhaps taken from the right lateral moraine, that the former outburst will be clear visible).

P16 L31 Please consider, that the current dam of the Palcacocha Lake is rather wide in the foundation, compared to the typical narrow and high moraines from some other lakes which could be rather easily eroded during the overflow (or outburst).

P17 L19 Better to add the volumes for small and medium avalanches.

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Fig. 1.

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