

## ***Interactive comment on “Assessing downstream flood impacts due to a potential GLOF from Imja Lake in Nepal” by M. A. Somos-Valenzuela et al.***

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### General comments

This paper assessed the downstream inundation using a 2-dimensional debris flow model based on the 40m interval contour topographic maps. Some of the terraces along the river valley are at less than 20m height from the river bed. The inundation result in those terraces will be less realistic. It can be improved with the high accuracy DEM.

The GLOF destructed terrace slope along the river valley in the high elevation region are more unstable due to rain/snow/wind erosion. The growth rate of vegetation is very slow in the high elevation region and once the slope has been disturbed and possibility

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of continuous erosion than the stabilization. The lesson should be learnt from the continuous damages on the river terraces along the downstream of Dig Tsho after the GLOF of 1985.

### Specific comments

Is lowering of lake level the only solution or have some other options to reduce the hazard and risk level of the downstream villages from the potential glof?

There is already lake lowering example of Tsho Rolpa in Nepal, which was supposed to reduce 20m lake level but reduced only 3m in 2000 and never attempted for further reduction of lake level. But there are very good examples from Raphstreng Tso and recently Thorthormi Tso lake lowering in Bhutan by manual excavation.

### Technical corrections

Page 13021, line 23-25. "These conflicting classification are confusing and can be misleading to the general public and communities downstream, who are the stakeholders these studies are meant to assist."

Could you please reflect your opinion about the classification of the lake?

Page 13023, line 20-22, "34.1±1.08 million m<sup>3</sup> of water could drain from the lake was if the lake surface elevation decreases 35m from 5010 to 4975m (the elevation of the valley floor below the lake)."

Sakai et al., 2007 mentioned that the relative height of the foot of the left end moraine in relation to the lake surface level was only 30m. Lake level should not be drained below the surface level, please make it clear.

Page 13024, line 2-4, "Other factors that may trigger a GLOF from Imja Lake include hydrostatic pressure or seismic effects causing a failure of the moraine dam."

What about the torrential rainfall like as in 1993 and others in Nepal at Imja moraine and/or lake, which can damage the moraine and trigger a GLOF.

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Page 13025, line 9, “Table1 was taken from the bathymetric survey results of Somos-Valenzuela et al. (2014)”

Mention here the year of bathymetric survey.

Page 13031, line 15-17, “The reason for the differences here is most likely the use of the significantly smaller Imja Lake volume in the ICIMOD calculations due to the bathymetry used.”

Do you mean the discharge and flood arrival time scenario depends on the volume of the water?

Page 13027, line 19-20. “Lowering the lake level by 3m does not resulting a significant change in the failure time and only a 13.8% decrease in the peak discharge”.

Page 13034, line 17-21. “Inundation reducing scenarios were analyzed and an alternative under design, lowering the lake at least 3m, was found not to have significant flood reduction benefit. The results indicate that the lake needs to be lowered about 20 m in order to completely reduce the impacts that a GLOF could have at Dingboche and further downstream.”

Page 13033, line 25-29. “An outlet channel was constructed at Tsho Rolpa and 3 m lowering was achieved; however, the design called for lowering the lake by 20 m which was never attempted because of funding limitations (Rana et al., 2000; Mool et al., 2001). Our results show that lowering Imja Lake 3 m would not lead to a significant inundation reduction downstream.”

You had clearly mentioned that the Imja lake lowering by 3 m would not result to a significant inundation reduction downstream but the UNDP Imja Lake project is lowering the lake by 3m to achieve significant risk reduction downstream (UNDP 2013). This is contradiction in analysis and result. You are very much aware on the outlet construction at Tsho Rolpa as well.

You are very much aware of funding limitations to meet the design in lowering the lake

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level in Tsho Rolpa. The UNDP Imja Lake project is also repeating the same story as in Tsho Rolpa by reducing 3m lake level in Imja Tsho. Would you like to recommend any other options to prevail optimum risk reduction from potential GLOF in Himalaya?

Make lowercase for the initial of second and third word in:

Table 1.

eg; Current Conditions - Current conditions

Lake Lowering - Lake lowering

Table 2.

Mean Prediction Error - Mean prediction error

Uncertainty Band - Uncertainty band

Breach Width - Breach width

Failure Time – Failure time

Peak Discharge – Peak discharge

Failure Time – Failure time

Similarly correct in table 3, 4 and 5 and legend of figures 2 to 8 and at axis if exist.

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