Geophysical Research Abstracts
Vol. 15, EGU2013-4994, 2013
EGU General Assembly 2013

Glacier lake outburst floods – modelling process chains

Yvonne Schaub, Christian Huggel, and Wilfried Haeberli
University of Zurich, Geography, Zurich, Switzerland (yvonne.schaub@geo.uzh.ch)

New lakes are forming in high-mountain areas all over the world due to glacier recession. Often they will be located below steep, destabilized flanks and are therefore exposed to impacts from rock-/ice-avalanches. Several events worldwide are known, where an outburst flood has been triggered by such an impact. In regions such as in the European Alps or in the Cordillera Blanca in Peru, where valley bottoms are densely populated, these far-travelling, high-magnitude events can result in major disasters.
For appropriate integral risk management it is crucial to gain knowledge on how the processes (rock-/ice-avalanches - impact waves in lake - impact on dam - outburst flood) interact and how the hazard potential related to corresponding process chains can be assessed.

Research in natural hazards so far has mainly concentrated on describing, understanding, modeling or assessing single hazardous processes. Some of the above mentioned individual processes are quite well understood in their physical behavior and some of the process interfaces have also been investigated in detail. Multi-hazard assessments of the entire process chain, however, have only recently become subjects of investigations.

Our study aims at closing this gap and providing suggestions on how to assess the hazard potential of the entire process chain in order to generate hazard maps and support risk assessments. We analyzed different types of models (empirical, analytical, physically based) for each process regarding their suitability for application in hazard assessments of the entire process chain based on literature. Results show that for rock-/ice-avalanches, dam breach and outburst floods, only numerical, physically based models are able to provide the required information, whereas the impact wave can be estimated by means of physically based or empirical assessments. We demonstrate how the findings could be applied with the help of a case study of a recent glacier lake outburst event at Laguna 513 in Carhuaz, Cordillera Blanca, Peru, where on April 11th 2010 an ice-avalanche of approx. 300'000m3 triggered an outburst flood which travelled 23 km to the city of Carhuaz.