Geophysical Research Abstracts
Vol. 12, EGU2010-9921, 2010
EGU General Assembly 2010

A procedure for objective preliminary assessments of outburst flood hazard from glacial lakes in Aosta Valley

Germain Bal (1,2), Alberto Godio (2), and Alex Theodule (1)

(1) Fondazione Montagna sicura - Courmayeur - Aosta Valley - Italy), (2) Dep. Eng. Land, Environment and Geotechnologies – Politecnico di Torino – C.so Duca degli Abruzzi, 24 – I 10129 Torino - Italy

GLOFs represent a major natural hazards in glaciated mountain regions, because of their fair-reaching capacity and of the difficulty in detecting source areas (especially in case of internal water pockets) and in forecasting the breakdown moment. GLOFs hazard is probably increasing because of the current glaciers retreat, and its prevention and management requires a multi-disciplinary approach, in order to (i) detect dangerous sites, (ii) assess danger, (iii) define and measure triggering factors and parameters and (iv) assess potential reaching areas so to define risk. Such a study was carried out in Aosta Valley, a mountainous territory with more than 200 glaciers covering an area of about 130 km2 (about 5% of the whole territory). The aim was double: to inventory and analyse all existing glacial lakes focusing on the newborn lakes and on potentially dangerous sites; to test surveying and modeling methods to be applied for hazard mapping and prevention. First, an inventory was compiled by means of GIS analysis of ortophotos (taken in 2005). The images were compared with previous ones to detect morphological evolution. Ground-based and helicopter surveys were also carried out. Historical data have been analyzed in order to recognize most dangerous sites and situations and to classify most recurrent phenomena.

In case of recognized dangerous situations, some parameters are needed in order to evaluate the potential water volume and runout distance. Ground-penetrating radar (GPR) technique was tested to detect the presence of glacial internal cavities and water pockets on a well known situation (a glacier with well known collapse cavities). The same technique was also used to measure the bathymetry of a glacial lake. The technique was carried out successfully, allowing to estimate with a good resolution the lake depth and bottom morphology; encouraging results were also obtained in detecting glacial cavities and drainage channels.

To perform the downstream runoff consequent to the sudden drainage of a moraine-dammed lake, a numerical simulation technique was applied using the HEC-RAS code . Water volume was estimated by means of bathymetric GPR surveys, and a slow complete breakdown of the moraine dam was assumed. Although time-demanding, this technique allows to estimate the downvalley consequences of a flood caused by a GLOF, and thus it is useful in hazards and risk mapping and management.

Present study allowed to apply a methodology for the assessment and mapping of GLOFs hazard. This methodology combines a traditional approach (historical and geomorphological analysis) with modern techniques (GPR, numerical modelling), which have been tested and applied in real glaciers sites.