Geophysical Research Abstracts
Vol. 15, EGU2013-1991, 2013
EGU General Assembly 2013

Channelized debris flow hazard mitigation through the use of flexible barriers: a simplified computational approach for a sensitivity analysis.

Andrea Segalini (1), Anna Maria Ferrero (2), and Roberto Brighenti (1)

(1) Università degli Studi di Parma, Dept. of Civil and Environmental Engineering and Architecture, DICATeA, Parma, Italy (andrea.segalini@unipr.it, +390521905924), (2) Università di Torino, Dept. of Earth Science

A channelized debris flow is usually represented by a mixture of solid particles of various sizes and water, flowing along a laterally confined inclined channel-shaped region up to an unconfined area where it slow down its motion and spreads out into a flat-shaped mass. The study of these phenomena is very difficult due to their short duration and unpredictability, lack of historical data for a given basin and complexity of the involved mechanical phenomena. The post event surveys allow for the identification of some depositional features and provide indication about the maximum flow height; however they lack information about development of the phenomena with time. For this purpose the monitoring of recursive events has been carried out by several Authors. Most of the studies, aimed at the determination of the characteristic features of a debris flow, were carried out in artificial channels, where the main involved variables were measured and other where controlled during the tests; however, some uncertainties remained and other scaled models where developed to simulate the deposition mechanics as well as to analyze the transportation mechanics and the energy dissipation. The assessment of the mechanical behavior of the protection structures upon impact with the flow as well as the energy associated to it are necessary for the proper design of such structures that, in densely populated area, can avoid victims and limit the destructive effects of such a phenomenon. In this work a simplified structural model, developed by the Authors for the safety assessment of retention barrier against channelized debris flow, is presented and some parametric cases are interpreted through the proposed approach; this model is developed as a simplified and efficient tool to be used for the verification of the supporting cables and foundations of a flexible debris flow barrier. The present analytical and numerical-based approach has a different aim of a FEM model. The computational experiences by using FEM modeling for these kind of structures, had shown that a large amount of time for both the geometrical setup of the model and its computation is necessary. The big effort required by FEM for this class of problems limits the actual possibility to investigate different geometrical configurations, load schemes etc. and it is suitable to represent a specific configuration but it does not allow for investigation of the influence of parameter changes. On the other hand parametrical analysis are common practice in geotechnical design for the quoted reasons. Consequently, the Authors felt the need to develop a simplified method (which is not yet available in our knowledge) that allow to perform several parametrical analysis in a limited time. It should be noted that, in this paper, no consideration regarding the mechanical and physical behavior of debris flows are carried out; the proposed model requires the input of parameters that must be acquired through a preliminary characterization of the design event. However, adopting the proposed tool, the designer will be able to perform sensitivity analysis that will help in quantify the influence of parameters variability as commonly occurs in geotechnical design.