Abstract

The great socioeconomic impact of the landslides in general is translated in the necessity of studies that investigate their causes and consequences, and determine the present conditions of stability.

This tesina is framed in an European project called IMIRILAND · Impact of large Landslide in the Mountain Environment: Identification & mitigation of Risk " that tries to analyze the stability of several slopes located in Italy, France, Andorra, Switzerland and Austria.

The geographic location is in Andorra, concretely in the slope of Encampadana, slope that presents a type of an uncommon instability, associated generally to zones influenced by glaciers, actually denominated "deep-seated gravitational deformation".

The objective of the tesina is to determine the conditions of stability of the Encampadana slope, as well as the validity of the hypothesis of its formation due to the erosion glacier.

For this analysis it will be made an ample and detailed study with one of the consolidated techniques around the world in the evolution of the state of slopes: the Method of Finite Elements (MEF), using the program called DRAC, property of the Department of Engineering of the Land of the Polytechnical University of Catalonia (UPC).

This program has the particularity of being able to introduce elements that simulate the behavior of the joints that exist frequently in rocks formed by a high tectonic activity and which they can be a determining factor at the time of establishing the characteristics of the stability of a slope.

The first step has consisted of compiling information with the intention of understanding better the reality of the studied place, as well as the possible mechanisms that takes that place.

Next, idealize the context with an hypothetical evolution of the formation of the slope, and making a bidimensional model of a section of this with the identified characteristics in the field studies. The existence of a family of discontinuities and a nucleus of material of more plastic properties take in this point a special interest. Given to the relative ignorance of the dynamics and geomorphology of the movement, is made the analysis with an ample fan of possible cases in which study the modifications essentially in these two variables. A parametric analysis of the properties is that determine the behavior of these joints is included, and variations of the erosive effect produced by the glacier, too.

The obtained results show the relative importance to us of the effect of the glacier in this slope, that can get to be a determining factor of the instability due to the rapidity whereupon it influences in the existing movement in the lateral fruit of his formation. Therefore the glacier has a contribution quantitatively inferior in displacements to the produced ones by the formation, but being able to get to be determining due to the favorable disposition of the joints and to the general tendency of the slope at the moment at which its influence takes place.

Also they contribute information of the sensitivity of the parameters that determine the behavior of the joints and the material.