Abstract

Translational and rotational slides, as well as earth flows, are common landslides in the northern part of the Llobregat river basin in the eastern Pyrennees, north east of Spain. In order to perform an stability analysis of natural slopes it is necessary to study the effect of some factors as the water table level, the geotechnical properties of the materials involved, and the slope geometry. In this work three earth flows are studied, which are in the same geological formation, and closer to each other: La Nou, Can Pujals and Malanyeu.

Firstly, the three movements were studied at the field to know its geomorphology. Samples were obtained to perform laboratory tests to obtain the geotechnical properties of the material, mainly its residual shear strength.

A preliminary analysis of the three earth flows is carried out using the program STABL, which permits the performance of stability analysis in 2D using limit equilibrium methods. A sensitivity analysis of the water table position and strength of the material is presented.

As STABL considers that the slope is unbounded in the direction normal to the movement, it is suited for study movements that are not confined in transversal direction. However, the earth flows studied here are narrow. Therefore, a second stability analysis is performed using STABL and including the effect of the lateral friction through the introduction of a parameter that takes into account the width of the movement and the position of the sliding surface, as well as the position of the water table. This parameter acts as an increase of cohesion in the Mohr-Coulomb failure criterion of the material.

The results from the two analyses are compared for each landslide in order to observe the effect of considering the stabilizing effect of the lateral friction. To evaluate the consistency of the results a comparison with actual measurements of the movements during the last years is made.

Finally the relation between the return period obtained from chronologic registers and the susceptibility (expressed as the inverse of the safety factor) for each of the three movements is studied.