Geophysical Research Abstracts
Vol. 19, EGU2017-8694, 2017
EGU General Assembly 2017

A study of the 1963 Vajont landslide zonation by means of Lagrangian block modelling

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The 1963 landslide detaching from Mt. Toc (North-East Italy), that crashing on the underlying Vajont reservoir caused a huge wave that killed over 2000 people, is a well-known event that has been extensively and deeply investigated. Recently, studies appeared in the literature suggesting that the landslide dynamics can be explained in terms of a zonation of the moving mass.
In this work, an additional support to the zonation hypothesis is given by focusing on the friction coefficient of the sliding surface, which is one of the chief parameters influencing the slide motion. Numerical simulations of the Vajont slide found in the literature assumed a homogenous value of the friction coefficient. We have systematically investigated a set of heterogeneous configurations. More specifically, we have divided the sliding surface into a number N of zones, and let the corresponding friction coefficient vary in the range 0-0.5. For each configuration we have run the numerical simulation via the Lagrangian block-based code UBO-BLOCK2 and have evaluated the configuration goodness by computing the misfit between the observed and the simulated deposits. The number of simulations required by this approach increases exponentially with the number N of zones.
The main finding of this research is that a 4-sector zonation provides the best results in terms of deposit misfit. The zones can be roughly described as west-downhill (WD), west uphill (WU), east downhill (ED) and east uphill (EU). It is found that motion is mainly determined by friction in zones WD and EU, that friction coefficients in zone WD is remarkably smaller than in zone EU and that misfit is rather insensitive to the values of the friction coefficients in zones WU and ED.