Geophysical Research Abstracts, Vol. 8, 06063, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06063

Seismic noise investigations of the Super-Sauze mudslide (South French Alps): field measurements and numerical modelling

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In order to better understand the behaviour and to predict the evolution of a landslide, it is of primary interest to image its internal structure. Several active geophysical methods are able to provide this information, but were rarely applied in the past in 3 dimensions. The main disadvantages of methods like seismic reflection or electrical tomographies are that there are heavy to set up and require for some heavy processing tools to implement. Moreover, in the particular case of soil landslides, their respective sensitivity and resolution are not always adequate to detect sliding surfaces. The passive methods requiring light instrumentation and processing can represent an interesting alternative, particularly for difficult accessible landslides. In this study, we present seismic noise investigations carried out on a mudslide in the South French Alps, highlighting the interest and the limitations of the methods to correctly image the sliding surface. These studies were composed of H/V measurements, fast and easy to conduct and of seismic noise arrays, heavier to deploy and interpret, but which provided S-waves velocity profiles versus depth. The comparisons between other geophysical investigations and geotechnical boreholes proved the applicability of such passive methods in smooth 3D structures. To investigate the reliability of H/V and array results, a numerical modelling study of the ambient seismic noise response of a 2D structure was performed using an explicit finite-differences scheme. The studied structure, which presents large geometrical changes, corresponds to one of the investigated profile perpendicular to the mudslide. This numerical study is of great help to assess limitations of the seismic noise method in this context.