Geophysical Research Abstracts, Vol. 9, 01489, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-01489

Geophysical tomographies fusion by fuzzy logic for imaging the geomechanical behaviour of mudslides

G. Grandjean (1), J.P. Malet (2), A. Bitri (1), and O. Meric (3)

(1) ARN-BRGM Orleans (g.grandjean@brgm.fr), (2) GEOPHEN-University of Caen Basse Normandie, (3) LIRIGM-University of Grenoble

Geophysical methods such as seismic surveying or electrical resistivity imaging appear to be well-adapted to investigate landslide's structure and understand related mechanisms. They allow direct and non-intrusive measurements of acoustic (P), shear (S) waves velocity and electrical resistivity, three physical parameters considered as essential to define the properties of reworked moving materials. Both methods were applied at the "Super-Sauze" site, in the French South Alps, where a typical example of an intra-material mudslide can be observed. Measurements were taken simultaneously along a profile of 325 m in length, perpendicularly to the axis of the mudslide. The P and S-wave velocity fields, as well as the electrical resistivity field, were inverted from recorded data according to suitable algorithms. P and S-wave velocities as well as resistivity tomographies are presented and discussed in term of reliability. Preliminary interpreted results show a correlation between the seismic velocities and electrical resistivity data, confirming that the simultaneous use of both methods gives complementary information on the geomechanical behaviour of the landslide. The seismic data provide information on the variations of fissure density and on the presence of deformed material whereas the electrical resistivity data provide information on the variations of water content within the mudslide. In order to go deeper into the interpretation of the geomechanical behaviour of the mudslide from geophysical data, a data fusion strategy based on fuzzy subsets theory is developed. The computed fuzzy cross-sections show the possibility of geomechanical hypotheses to be realized in specific areas of the tomographic cross-sections highlighting the places where plastic or solid-body deformations could occur. This information is consistent with the geotechnical data and the borehole inclinometer measurements available for the mudslide.