Geophysical Research Abstracts,
Vol. 11, EGU2009-3264, 2009
EGU General Assembly 2009

Monitoring water flows in a clay-shale hillslope from geophysical data fusion based on a fuzzy logic approach.

G. Grandjean (1), C. Hibert (1), F. Matthieu (1), E. Garel (2), and J.-P. Malet (3)

(1) BRGM, Bureau des Recherches Géologiques et Minières, Orléans, France (g.grandjean@bgm.fr), (2) EMMAH, UMR 1114 INRA-UAPV, Université d'Avignon et des Pays de Vaucluse, Avignon, France, (3) CNRS - University of Strasbourg, School and Observatory of Earth Sciences, Strasbourg, France

Seismic and electrical resistivity tomography allow subsurface characterization from acoustic P-waves (Vp), shear S-waves (Vs) velocities, and electrical resistivity ([U+F072]). Both geophysical methods were used to monitor water flows during a controlled rainfall experiment on a clay-shale hillslope located in the Laval catchment at Draix (Alpes-de-Haute-Provence, France). The objectives of the rainfall experiment were to analyse the water infiltration processes and identify possible water flow pathways by combining multi-method observations. The seismic data provide information on fissure density and the electrical resistivity data provide information on soil water content within the hillslope. Changes of the P-wave velocity and electrical resistivity fields with time show some similar pattern. To go further in the analysis of the water flows, a geophysical data fusion strategy based on fuzzy set theory is applied. The computed fuzzy cross-sections based on expert hypotheses show the possibility for the material to be saturated during the rainfall experiment. The data fusion process is repeated for each acquisition sets. The relative difference between the obtained fuzzy cross-sections is calculated and reveals possible location where water may be transferred within the hillslope.