



Groundwater—Surface waters interactions at slope and catchment scales: implications for landsliding in clay-rich slopes

Vincent Marc (1), Catherine Bertrand (2), Jean-Philippe Malet (3), Nicolas Carry (2), Roland Simler (1), and Federico Cervi (4)

(1) EMMAH—Environnement Méditerranéen et Modélisation des Agro-Hydrosystèmes, INRA UMR 1114, Université d'Avignon et des Pays de Vaucluse, Avignon, France, (2) Chrono-Environnement CNRS UMR 6249, Université de Franche-Comté, Besançon, France, (3) Institut de Physique du Globe de Strasbourg, CNRS UMR 7516, Université de Strasbourg/EOST, Strasbourg, France, (4) University of Bologna, Department of Civil, Chemical, Environmental and Materials Engineering (DICAM), Bologna, Italy

Understanding water infiltration and transfer in soft-clay shales slopes is an important scientific issue, especially for landsliding. Geochemical investigations are carried out at the Super-Sauze and Draix-Laval landslides, both developed in the Callovo-Oxfordian black marls, with the objective to define the origin of the groundwater. In situ investigations, soil leaching experiments and geochemical modeling are combined to identify the boundaries of the hydrological systems. At Super-Sauze, the observations indicate that an external water flow occurs in the upper part of the landslide at the contact between the weathered black marls and the overlying formations, or at the landslide basement through a fault network. Such external origin of water is not observed at the local scale of the Draix-Laval landslide but is detected at the catchment scale with the influence of deep waters in the streamwater quality of low river flows. Hydrogeological conceptual models are proposed emphasizing the role of the interactions between local (slope) and regional (catchment) flow systems. The observations suggest that this situation is a common case in the Alpine area. Expected consequences of the regional flows on slope stability are discussed in term of rise of pore water pressures and physicochemical weathering of the clay shales.