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Experimental characterization of the influence of water precipitations on changes of temporary groundwater in slopes, aimed to evaluation of triggering conditions for debris flow

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A fundamental problem in Earth Sciences is to understand how the landscape responds to changes in climate and weather. From this point of view, the surface phenomena, in particular debris flow, may be considered good indicators of the changes taking place around us. Due to the many variables involved, very often these phenomena are interpreted only in statistics terms and their trigger thresholds based on the duration/intensity of rainfall. This approach is certainly interesting, but does not help to understand fully the causes of initiation of debris flow, nor the hydrogeological conditions in a slope as a result of a specific rains. Several evidences show that only a certain amount of rainfall infiltrates into the ground: most runout, evaporates and simply "hydrous" the upper part of the soil by increasing water content and then decreasing negative pressure created by evaporation in the first decimetres of the soil. In this case we speak of the collapse of the suction, frequently attributed as a major cause for superficial landslide.
This study want to detect characteristic test site for the principal situation usually subject to debris flow in the north-western Italy, through an analysis of past events and identification of areas susceptible to superficial landslide (neglecting falling). In these areas will be planted on the field a laboratory capable of measuring both the weather events that variations of water in soil. In particular, it is planned to install weather stations, electric piezometers, soil moisture profiler at various depths in the soil and to study the variation of these parameters in real time and for long periods. The aim is to understand their relationship and develop a geological and technical model able to predict how the field responds to the weather. In the meantime, we intend to see if we can use non-fixed equipment to assess the properties of the soil, particularly using permeameter and geophysical surveys (electrical tomography), which were among the methods more cited in literature to obtain information on the parameters of our interest (soil moisture and hydraulic conductivity). If the model results successful in reconstructing the changes of water content in soil, it will be taken to check which are the weather conditions less favourable for the stability for the different types of slopes. Thus, it could be reached the definition of special weather conditions that, if happens, would be particularly likely to trigger instability for superficial phenomena extended over homogeneous areas.