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Subsurface hydrological information in rock-slide phenomena from groundwater spring monitoring.

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Frequently rock-slide phenomena are characterized by rough topography and high declivity of the slope. Due to these characteristics, the drilling of boreholes is not so common and in some circumstance expensive. Consequently, the exact information about depth of the sliding surface and about groundwater processes, groundwater levels or pore water pressure distribution are missing. Alternately, some information about the groundwater can be obtained from the physical-chemical monitoring of springs. The research highlights preliminary results, about the groundwater processes, obtained from the continuous flow-rate monitoring of a spring located in the active Piagneto rock-slide (northern Apennine). The spring has been monitored from Sept-2014 until Oct-2015 using a piezometer transducer (sampling frequency 1 h) and a triangular weir. The landslide was monitored in continuous since the 2009 using an automatic total station and some reflectors. The monitoring of the rock-slide displacements showed creep phenomena in the summer and acceleration phases from autumn to late spring, during periods characterized by high rainfall intensity; rainfall with intensity higher than 10 mm/d and duration less than 15 days can produce the acceleration of the sliding mass. Before 2014 any information about groundwater was collected. The successively spring monitoring shows the follow results: the spring flow rate is strongly variable in the time; only some rainfall events, with particular intensity and duration (generally total amount higher than 100 mm), are responsible of strong changes in the flow rate, and the flow rate starts to increase only after some hours; the snow melting events, also when there is a fast reduction of the snow thickness, don't produce high variation in the flow rate discharge; there is a strong correlation between the flow rate peaks and the rock-slide acceleration; an infiltration coefficient higher than 70% is estimated through the comparison between the volume of water of each rain event and the equivalent volume of water flowing through the spring. All the results are in agree with the high permeability of the sliding rock mass. Instead, to obtain some information about pore water distribution or groundwater levels inside the landslide the coupling between spring monitoring and 3D groundwater numerical model is necessary.