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Evaluation of 2-year TL-ERT monitoring of a landslide (case study of Čeřeniště, Czech Rep.): towards understanding precipitation, saturation and resistivity changes.

P. Tábořík[1,2]*, F. Hartvich[1,3], T. Belov[2], L. Vlček[3] and J. Blahůt[1]

[1] Institute of Rock Structure and Mechanics, Academy of Sciences of the Czech Republic, Praha, Czech Republic
[2] Institute of Hydrogeology, Engineering Geology and Applied Geophysics, Faculty of Science, Charles University in Prague, Praha, Czech Republic
[3] Department of Physical Geography and Geoecology, Faculty of Science, Charles University in Prague, Praha, Czech Republic
* petr.taborik@post.cz

Presented contribution is aimed at present progress in application of a complex geophysical and geotechnical monitoring of the active slope deformation Čeřeniště (České Středohoří Mts.). Čeřeniště landslide is situated in the České středohoří middle-mountains (Czech massif) and belongs to the Czech Tertiary Neovolcanites. The main scarp of the studied landslide as well as toppled ridges, forming the upper part of the complex slope deformation, are - according to our geophysical survey - predisposed by tectonic structures and further affected by deep-seated gravitational processes (spreading, toppling). Central part is formed by a large platform which is followed by an active flow-like landslide composed of weathered colluvium. The main goals of the long term monitoring of the Čeřeniště landslide are i) to describe dynamics of the complex slope deformation, and ii) to reveal a connection among predispositions (tectonics, lithology), triggering factors (extreme precipitations, soil humidity changes, long-term climatic oscillations) and landslide activity. For a description of a long-term landslide activity the geotechnical measurements of displacements by means of 3-D spatial dilatometers (TM-71 3-D optical-mechanical crack gauge) have been performed at the Čeřeniště landslide since 1998. Since August 2013, it has been successively complemented by (i) extensometric measurements, (ii) geodetic measurements and (iii) repeated laser scanning. In order to identify relations between triggering factors and landslide activity, the following techniques were established (in 2013) on the landslide: (i) time-lapse resistivity measurements, (ii) hydroclimatic monitoring (precipitation, air moisture and temperature) and (iii) pore-water pressure measurements. Variations in resistivity distribution are measured by means of electrical resistivity tomography (ERT). The time-lapse resistivity survey would serve as an effective tool which can yield information on subsurface water saturation and its changes and, also, it could help to reveal relations within the system „precipitation – subsurface saturation – mass movement activation“.

Furthermore, using the monitoring of movement velocity based on repeated geodetic measurements we shall be able to determine the causal connection among precipitations, soil saturation and (re)activation of mass movements. Last but not least, the studied locality serves also as a testing site for the repeated resistivity measurements in terms of i) measuring parameters optimization, ii) different electrode configurations testing, iii) data processing optimization. Research was supported by following grant projects: IRSM internal project no. 2015/505 and GAUK 862213.