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Long-term monitoring of rock mass properties in the underground excavation

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It is generally agreed today that hazardous waste should be placed in repositories hundreds of meters below the Earth's surface. In our research we deal with the long-term monitoring of the underground excavation by seismic and electrical resistivity measurements.
Permanent measuring system was developed and installed at the Bedřichov gallery test site (northern Bohemia). The gallery was excavated using TBM (Tunnel Boring Machine) in granitic rocks. Realized repeated measurements include ultrasonic time of flight measurement and electrical resistivity tomography (ERT). The seismic measurements are performed by pulse-transmission technique directly on the rock wall using one seismic source and three receivers in the distances of 1, 2 and 3 m. The main emphasis is devoted to P-waves; however, recording of full waveform enables analyzing of S- waves and other types of waves as well. The comparison of repeated measurements is used for an assessment of changes in seismic velocities with very high-accuracy. The repetition rate of measurements can be selected from seconds; however such fast changes in the rock mass are unexpected. The ERT measurement is performed on the same rock wall using 48 electrodes. The spacing between electrodes is 20 centimeters. The conductivity of undisturbed granitic rocks is extremely low. Therefore the observed local increase of conductivity can be associated with joints and fractures saturated with water, resulting in their ionic conductivity. Repeated ERT measurement can reveal some changes in the rock mass. Due to time requirements of ERT measurement the repetition rate can be about three hours.
The data collected by measuring system is transferred by means of computer network and can be accessed via internet.
This contribution deals with preliminary results gained so far during the testing of developed monitoring system.
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