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Crystalline rocks time-lapse behavior via geophysical methods

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Geophysical methods (such ERT) as a tool for monitoring the processes and time-related changes in geological environments have made great progress in recent years and have become standard for observing natural phenomena. These methods are often simple to use and provide high-quality results that are well interpreted.

Our research is based on observing time-lapse changes of the physical parameters (conductivity, IP or elastic parameters) of joints systems (mostly in crystalline massifs). The primary aim is to develop a monitoring system mostly for the needs of deep repositories of nuclear waste. Geophysical research of such repositories has so far dealt only with one-off research (no time-monitoring) of potential host rock´s properties. Contrary to this, our developed system and methodology is unique in continuously measuring the physical properties of the rock massif. This system will be permanently fixed in the field and by observing changes in measured data reports if any remarkable occurrence in the EDZ zone is or was happening (for example, opening or closing of the joints or micro-fractures).

In our research, we are trying to get complex insight in the time-lapse behavior of granite massif (our field base is at the Bedrichov gallery in Jizera Mts.). We got very dense ERT data, which was continuously measured during two months, every six hours. We have found very interesting short and long-term changes in measured resisitivites. Right now we are trying to nail down the particular geological phenomena connected with these changes and narrow our interpretation – we did our laboratory measurement (resistivity dependence on the water saturation and sample´s disruption), we are comparing our results with dilatometers and 3D geophones placed close to our field base.