

DC potential imaging of a granite surface

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To reveal resistivity structure of small-scale (~10 cm) rock samples is an important topic for the purpose of deciphering results of geophysical explorations, but considered to be difficult so far. It is difficult to inject electric current into a resistive rock sample and to measure the potential distribution on it. It is also difficult to prevent leakages, which makes it almost impossible to measure the electrical potential on a highly resistive rock samples. In addition, there are a few materials that can be attached on the surface of a rock sample in arbitrary shape as electrodes with conduction performance. For these reasons, simultaneous measurements of electrical potentials at multiple points on a rock sample have not been achieved.

We have developed an experimental set-up to achieve the potential measurement of rock samples as follows. Potential of the rock sample with very high resistance was measured by using an electrometer with extremely high input impedance. Leakage current was prevented by “floating measurement”, in which circuits of measurements are separated from the ground. The high-density electrode arrangement on the rock sample surface is achieved by using electrodes made from conductive epoxy, which is not conventionally used as electrode.

Using these methods, we measured potential distribution on the granite surface into which direct current was injected. Obtained results agree roughly with numerical simulations, meaning the new experimental set-up reasonably works.

Keywords: electrical resistivity of rocks, laboratory tests, electrometer with extremely high input impedance, floating measurement, conductive epoxy