An attempt of a four-terminal measurement to the cylindrical-shape rock sample for the high-density resistivity imaging

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Recently, electromagnetic surveys were carried out around several fields for imaging heterogeneities around seismogenic zones or volcanic activities (e.g., Yoshimura et al., 2009; Nurhasan et al., 2006; Aizawa et al., 2004). Obtained resistivity images are interpreted by using several mixing laws (e.g., Archie, 1942), relationship between the porosity of rock and its connectivity. However, applicability and scalability of such interpretations have not been clarified. Laboratory experiments are essential for getting detailed information about that.
In this study, we employ a rock samples such as used in compression tests. Several studies have reported about observations of a cluster of microcracks in rock samples (e.g., Kawakata *et al.*, 1999). Accordingly, high-resolution resistivity imaging enables us to compare with distribution of microcracks in the rock sample in order to assess the applicability and scalability of mixing laws.
We have carried out feasibility studies by simulated experiments (using conductive plastic and conductive epoxy) as the first step of a laboratory experiment in the previous studies. As a result, we obtained an electric potential distribution on the surface of the sample, and succeeded to detect structure in the sample by measurements using a lot of electrodes. On the other hand, in rock experiments, electric potential distribution was not observed because a leakage current was caused by high contact resistance.
In the present work, the experimental approach was improved by a floating measurement so as to prevent a leakage current in rock experiments. Furthermore, we attempted a simple four-terminal measurement for the rock samples. As a consequence, a constant potential was observed at the surface of cylindrical-shape granite if we use 10mm×10mm square size electrodes.

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