

# GPR survey for the Gosukebashi fault zone in the Rokko Mountains

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A ground-penetrating radar (GPR) survey was conducted across the well-known Gosukebashi fault zone in the Rokko Mountains in order to investigate the shallow fault structures in granites. The Gosukebashi fault zone is composed mainly of the Otsuki, Gosukebashi, and Uzugamori faults from north to south. Fracture zones, originated from the granites, are developed widely along these faults. These fracture zones contain generally a lot of water, based on observation and the Sanyo-Shinkansen Construction Work Records (Osaka Shikansen Construction Bureau ed., 1972). We tested an efficiency of the GPR unit and the 35 MHz antenna for this investigation.

We carried out the GPR investigation along three survey lines across the Gosukebashi fault zone at the test sites in the Rokko Mountains and along two survey lines across the Rokko tunnel. The length of the GPR survey line is a range of 70-150 m. As we can not use a wide-angle measurement for massive granites, a velocity of electromagnetic wave in the granites was directly obtained from detection of an underground object (Rokko tunnel). The time profile can change to a depth profile, by using the velocity. The GPR unit and antennas of 35 and 100 MHz frequency were used. The GPR data were processed by high pass and low pass filtering to clear geologic features and to reduce the system noise. We carried out the migration processing for them if necessary.

The following results were obtained: (1) The detected anomalies, suggesting an existence of fracture zone (10-20 m wide), were found on the GPR images. (2) The GPR with the 35 MHz antenna allowed for favorable imaging of the 1,000 ns range at the test sites in the Rokko Mountains. (3) This corresponds with a depth profile of the extent of 57 m deep, based on the velocity of electromagnetic wave obtained from the granites (~11.4 cm/ns).

Judging from the GPR results, it is considered that the weak reflection zone is the fracture zone on the GPR profiles. Secondly, the width of the fracture zone on the GPR profile coincides with that of geological observation and the Sanyo-Shinkansen Construction Work Records. When the condition is favorable as in the case of the test sites, we can use the GPR imaging techniques of the 35 MHz antenna for understanding the subsurface structures penetrated to the extent of ~50 m in depth.