

Lateral variation in seismic velocity around a fracture zone by a dense seismic observation and high frequency sampling

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We precisely observed seismic wave velocity, and estimate a one-dimensional velocity structure and lateral variation in velocity structure around a fracture zone in the Mizunami Underground Research Laboratory (MIU), Gifu Prefecture, Japan. Two vertical shafts were excavated to 500m from the ground level (GL), and four horizontal research galleries were excavated at an interval of 100m; GL-100m, -200m, -300m, -400m, connecting the two shafts. The excavation work for a new horizontal gallery is made at GL-500m by using blasts. We observe the vibrations of blasts at a dense seismic observation with 10,000 Hz sampling. The observation composed of 9 pairs of three component accelerometer and one component velocity-type seismometer at the horizontal interval of about 20 m.

We estimated 5400 ± 30 m/s in the Toki Granite, a Late Cretaceous intrusion, and 2430 ± 40 m/s in Miocene sedimentary rocks of the Mizunami Group. These velocities correspond to 2 % and 26 % water contents, respectively, on the assumption that only water exists in pores by comparing the observed velocities with the velocities by a rock test. We also found lateral variation in seismic velocity associated with the fracture zone which trends NNW-SSE with a subvertical dip. We present in detail the velocity structure associated with the fracture zone.