

The measurement of seismic wave velocity of fault gouge under one dimensional consolidation pressure

Daisaku Kawamura[1]; Tsutomu Nishikawa[1]; Koichi Nakagawa[2]

[1] Geosciences, Osaka City Univ; [2] Geosci., Osaka City Univ.

We had made a laboratory experiment which seismic wave velocities through fault gouge were measured under one dimensional consolidation pressure. Consolidation pressure applied in several increments from 300kPa to 500MPa. Fault gouge samples were collected from outcrops of typical active faults, such as Atotsugawa-, Yanagase- and Medium Tectonic Line, in Japan. The used seismic wave measurement system is able to obtain velocities of P-wave and S-wave along two directions of vertical and horizontal in a consolidation cell. The samples were prepared under pre-consolidation pressure of 300kPa, and specimens were trimmed in a cylindrical shape, 50mm in diameter and 60mm in height after the pre-consolidation.

The results of this experiment can be conclude as follows:

1. The vertical P-wave velocities increased with the consolidation pressure, from 1950m/sec at 300kPa to 3340m/sec at 100MPa. For the vertical S-wave velocities, from 200m/sec at 300kPa to 1320m/sec at 200MPa. For the horizontal P-wave velocities, from 1950m/sec at 300kPa to 3000m/sec at 100MPa.
2. P-wave and S-wave velocities decreased rapidly at early stage of loading cycles in the range of relatively lower consolidation pressure.
3. It can be suggested that the shear modulus of fault gouge increase with increasing the density.
4. S-wave velocities decreased at early stage of loading because the structure in the fault gouge was broken by new loading pressure.