

## Frictional properties of Shionohira Fault Gouge

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The April 11, 2011 Fukushima-ken Hamadori Earthquake created co-seismic surface ruptures trending in the NNE-SSW direction from Tabito-Nameishi to northwestern Isizumi-Tsunaki in Tabito-cho, Iwaki City, Fukushima Prefecture, which were newly named as the Shionohira Fault by Ishiyama et al. (2011). However, the same N-S trending lineaments were recognized to exist even though no surface ruptures occurred from the south of Tabito-Nameishi to the boundary between the Fukushima and Ibaragi prefectures. In an attempt to elucidate the differences of active and non-active segments of the Shionohira fault, results of low and high-velocity friction experiments on the fault gouges sampled from two surface outcrops of active segment are discussed in this report.

All experiments were conducted using a rotary-shear low to high-velocity frictional testing apparatus at the State Key Laboratory of Earthquake Dynamics, Institute of Geology, China Earthquake Administration. The apparatus is capable of producing slip rates of 60 mm/year to 2.1 m/s on a pair of cylindrical specimens of 40 mm in diameter, and temperature and pressure up to 500 degree in centigrade and 70 MPa by using TiAlCr alloy piston.

Gouge samples were taken from the thick fault gouge in crystalline shist of several tens of centimeter at Betto outcrop, and gouge from the contact between sandstone and crystalline shist at Shionohira outcrop. They were dried in an oven for 20 hours at 60 degree in centigrade and were gently disaggregated to make gouge powder. Gouge particles <150 micro meter were selected for experiments using a 100-mesh sieve to avoid having too large particles in thin gouge layer. Wet and dry gouge experiments have been conducted at the initial compression of fault gouge samples from 1 to 5 MPa, at slip rates from 0.0002 mm/s to 2.1 m/s and at normal stresses of 1.0 to 2.0 MPa. Friction strengthening or weakening behavior is also examined.

The results revealed high friction coefficients of around 0.6 to 0.8 under non-porous conditions, but very low coefficients of around 0.1 to 0.2 under porous conditions for both outcrop samples. The results also indicated the sample taken from the active segment of Shionohira fault to show a velocity strengthening behavior whereby the friction coefficient became slightly higher as velocity increased.

Keywords: friction properties, fault gouge, Shionohira fault, friction coefficient, low and high velocity friction experiment, Fukushima-ken Hamadori earthquake