S142-019 **Room: IC** **Time: May 30 15:30-15:45**

Scaling of Fracture Energy: Laboratory Measurements by High-velocity Rotary Shear Apparatus

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We introduced a rotary shear apparatus for high slip velocity friction experiments. Basic architecture is similar to the original one designed by Professor Toshihiko Shimamoto [Shimamoto and Tsutsumi, 1994]. We improved two aspects from the original one: Servo-controlled sliding velocity and capability of water saturation during the experiments. In this talk we focus the former feature and investigate the fracture energy measured in the laboratory.

We used a set of two granite cylindrical specimens with a diameter of 25mm. In order to achieve a realistic situation, we used the PS10 seismogram observed at 3km away from the high slip region of the 2002 Denali, Alaska earthquake [Ellsworth et al., 2004]. Since this earthquake was of strike slip type with surface breaks, the surface displacement close to the fault trace can be considered as the fault slip itself. In the experiments, keeping the original shape of waveforms (1.4m/s peak velocity and 3s pulse width), we changed the amplitude and pulse width, which virtually created different size of earthquakes with different stress drops.

In the experiments, we controlled the slip velocity (between 0Hz and 50Hz within an error of 2%) to reproduce the PS10 seismogram and measured the shear stress keeping the constant normal stress of 0.5MPa under room humidity condition. Rather low normal stress is to prevent the melting of the samples during the experiments. From the stress-slip curves, we measured the fracture energy by integrating these curves. Since we can measure the absolute stress in addition to relative stress change that can be estimated from seismological observations, we measured both total and relative fracture energies. Relative fracture energy sometimes called breakdown work [Cocco et al., 2006].

In this experiments, since the area of fault and elastic constants of the fault material are the same, we can consider the amount of slip as seismic moment. And we measured the fracture energy as a function of seismic moment. The result shows that total fracture energy proportional to the seismic moment with a coefficient of 0.3 [MJ/m]. And relative (seismological) fracture energy also proportional to the moment with a coefficient of 0.15 [MJ/m]. This feature suggests that fracture energy can be another index to characterize the earthquake size.