J169-006 **Room: 302** **Time: May 17 11:48-12:00**

Direct effect coefficient *a* for granite is not about 0.01; it is never less than 0.04, most likely about 0.05

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We have proposed a new experimental method to infer a constitutive parameter *a*, usually called direct effect coefficient in rate- and state-dependent friction law, from shear stress-step tests (SSJ 2007 Fall meeting, C22-09). Since the parameter *a* represents the direct relationship between shear stress and slip velocity with a fixed contact state, the method was designed to minimize the change of contact state during the step of shear stress and velocity measurements as much as possible. Thus, this method does not need any evolution laws, which describe the change of contact state, in contrast to the traditional way of estimating the value of *a*. Applied on the Aji granite, this method led to the value of *a* of about 0.04, much larger than the typical range of the value of *a* of rocks estimated with traditional way. Moreover, acoustic monitoring of contact state (Nagata et al., 2008) showed that the contact state varied a little in the tests, indicating that our inferred value of *a* with the stress-step test is still a lower bound.

In this presentation, we report the result of the estimation of the exact value of *a* by correcting the effect of the change of contact state in the shear stress-step tests. The change of contact state was inferred from the change of acoustic transmissivity, which has been shown to linearly correlate with the state variable (Nagata et al., 2008). Although the sensitivity of acoustic transmissivity to the state variable cannot be obtained without knowing the value of *a*, the sensitivity can be written as a function of *a* with an assumption of log-linear dependence of frictional strength at steady-state sliding on slip velocity with a coefficient *b* because the value of *a* - *b* is known from the difference of shear stress at steady-state sliding at different velocities. Then the exact value of *a* can be obtained from the mechanical data of shear stress-step tests after correction for the state change using the acoustic data. With this method, the exact value of *a* of the samples of the present experiments (Aji granite) was estimated to be about 0.05. We have confirmed that much smaller *a* of about 0.016 is estimated with the traditional method for the same samples.

With the large value of *a* correctly estimated in this work, any existing evolution law cannot reproduce the experimental observations at all. However, this problem has been overcome by modifying an existing evolution law called Dieterich law or slowness law, based on the observation of the actual change of contact state. The revised evolution law also resolved some well-known flaws in Dieterich law to some extent, as shown in the next presentation (J169: Revised evolution law in rate- and state-dependent friction including a stress-weakening effect).