Gouge friction on a meter-scale laboratory fault

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National Research Institute for Earth Science and Disaster Resilience (NIED) has been conducting friction experiments with meter-scale rock specimens using a large-scale shaking table. We have presented a result that the work rate at which the meter-scale rock friction starts to decrease is one order of magnitude smaller work rate than that of the centimeter-scale one (Yamashita et al., 2015, Nature). Mechanical, visual and material observations suggested that the difference of frictional properties between centimeter and meter scale is caused by slip-evolved heterogeneous stress concentration on gouge bumps generated with the frictional slip. We confirmed that numerical simulation based on the observations is fully consistent with the experimental results. However, it should be noted that the natural fault zone generally involves gouge layer in it. Therefore, it is crucial to investigate which the scale dependence of frictional property can be seen or not under such a condition. To answer this question, we conducted meter-scale gouge friction experiments using the large-scale shaking table. We used metagabbro blocks from India as driver blocks. The contacting area was 1.5 m long and 0.1 m wide. As the simulated gouge, we ground metagabbro blocks by the jet mill, so that the average diameter of the gouge particle is approximately 10 μm and the maximum diameter of that is less than 200 μm. We roughened the fault surface by sandblasting after polishing the surface so that the fault surface can grip the gouge particles. We distributed the simulated gouge with a thickness of 3 mm on the fault and then sheared at a constant or step-change velocity after applying normal stress up to 6.7 MPa at maximum. We will present basic experimental results at the meeting.

Keywords: Frictional property, Gouge, Large-scale laboratory experiment