During my 3-month visit at ERI I worked on the modeling of plasticity of fault gouge and examined how the inelastic gouge compaction and dilatancy in undrained condition during dynamic rupture propagation can significantly affect the fault weakening and strengthening. This model proposed that the fault strength may weaken significantly ahead of rupture front due to gouge compaction from shear stress concentration carried by rupture front, which is different from the existing dynamic weakening mechanisms that require slip to occur. Pre-rupture weakening leads to small strength drop and limits the inelastic shear strain in the fault damage zone. The gouge dilatancy during rapid sliding strengthens the fault, promoting slip pulses. I gave a seminar "Dynamic Fault Weakening and Strengthening by Gouge Compaction and Dilatancy in a Fluid-Saturated Fault Zone" at ERI on May 13, 2016 and presented these results.

The second project I worked on at ERI related to dynamic models of subduction zone earthquakes with the rate-and-state friction and inelastic Coulomb wedge failure. We found that the velocity strengthening at the shallow portion of the subduction plate interface further enhances the overriding wedge failure because of the increase of basal friction, a result proposed firstly by Wang and Hu (2006). As in our previous results, the enhanced wedge failure gives rise to slow rupture velocity, deficiency in high-frequency radiation, and efficient seafloor uplift more landward from the trench. I gave several seminars on these results at ERI (as a Danwakai talk), Ohsaki Research Institute, NIED, Tohoku University, Hokkaido University, the DPRI of Kyoto University, and Korea Institute of Geoscience and Mineral Resources (KIGAM). I thank many friends and colleagues for the discussion and feedback and social activities after the seminars.

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