MCE Seminar - Dr. Kyungjae Im, October 7, 2021

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Abstract: It has long been recognized that a sliding body on a frictional contact shows distinct slip modes – unstable slip (seismic), stable sliding (aseismic), and vibration. Understanding this behavior is relevant to engineering and earth science at all scales. Most of the time, scientists and engineers desire to avoid seismic slip since it causes damage to the sliding material. Large earthquakes occur as a result of unstable slip along tectonic plate boundaries and intraplate faults. If the slip mode could be controlled, tectonic stress could be released aseismically without causing earthquakes. There is evidence that this can happen in response to geothermal injections. Slow slip events can also happen spontaneously. A growing body of observations worldwide has documented slow slip events that radiate no detectable energy, eventually in the form of tremors. However, the mechanisms that govern these slow slip events and their characteristics remain poorly known. Here we show, based on numerical simulations and experimental friction laws, that slow slip events can be explained by a transition from rate-weakening frictional sliding at low slip rates toward rate-neutral or rate-strengthening behavior at higher slip rates.

Bio: Dr. Im is currently a postdoctoral scholar at the Division of Geological and Planetary Sciences, California Institute of Technology, working on the mode of frictional slip and induced earthquake. He received his Ph.D. in the Pennsylvania State University from the energy and mineral engineering department in 2019. His research interests are focused on static and dynamic motion of frictional contact and transport properties of natural fault.