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Slow Slip Behavior along Major Plate Boundary Faults

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Time: 2:00 pm
Venue: Conference Room, 3/F, Mong Man Wai Building
Registration: Click Here

Abstract

Increasingly dense and high-resolution Earth observatory networks have revealed a spectrum of dynamic deformation behavior along major plate tectonic faults as well as in glaciated environments. In particular, episodic slow slip events (SSE), sometimes spatiotemporally accompanied by low-frequency seismic energy radiation, constitute a new mode of earthquake cycle deformation. The fault sliding process is controlled primarily by the interfacial mechanical and hydraulic properties including friction and the effects of pore pressure. This talk will introduce “slow” slip phenomena (that is, slip rate is below typical seismic rate of m/s) in various tectonic settings, including subduction megathrusts, continental strike-slip faults, mid-ocean ridge transform faults, and use numerical models based on a rate- and state-dependent friction law to investigate their physical mechanism. I will show that in subduction zones episodic SSEs arise spontaneously around the friction stability transition downdip of the seismogenic zone, where near-lithostatic pore pressure is inferred to reproduce the observed SSE recurrence patterns. By contrast, fine-scale lithological heterogeneities are necessary in order to explain the wide variability in shallow creep characteristics on strike-slip faults in California. In all the numerical models, fault gouge dilatancy is found to be strongly effective in stabilizing coseismic rupture under high pore pressure. Dilatancy-strengthening may provide an explanation for the low seismic coupling ratio (global average ~ 15%) on mid-ocean ridge transform faults and in particular for the earthquake rupture segmentation along the Gofar transform, East Pacific Rise, which is well constrained by observations from ocean bottom seismometers.

~ All are Welcome! ~

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