One-dimensional dynamical modeling of slip pulses and aftershock generation

Speaker: SU, Chien-lin

Abstract

Propagating slip pulses in earthquake ruptures (Heaton, 1990) are studied based on a one-dimensional N degree- of-freedom dynamical spring-slider system with a constant ratio of static to dynamic frictional forces. Results show that for almost all cases in the study, the rise time of ruptures at a particular site is much smaller than the duration of ruptures along the whole fault. A propagating slip pulse is generated along the fault. Hence, simulation results are in agreement with Heaton's propagating slip-pulse model.

And we propose a novel mechanism of aftershock generation by evaluating changes in the stiffness ratio (or stiffness between two blocks) of a dynamical one-dimensional spring–block model. Simulations reveal the existence of spatiotemporal event clustering (i.e., aftershocks) associated with a preceding large event (i.e., the mainshock). Therefore, we suggest that changes in the stiffness or strength of materials play an important role in aftershock generation.

References

Chen, C.C., Wang, J.H., One-dimensional dynamical modeling of slip pulses. Tectonophysics 487 (2010) 100–104.

Chen, C.C., Wang, J.H., Huang, W.J., Material decoupling as a mechanism of aftershock generation. Tectonophysics 546-547 (2012) 56–59.