CONSTRAINING COSEISMIC FRICTIONAL PROPERTIES DURING THE 2012 NICOYA M7.6 EARTHQUAKE FROM NEAR-FIELD OBSERVATIONS AND 3-D NUMERICAL SIMULATIONS

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As key elements in earthquake source physics, frictional properties on faults play critical roles in controlling rupture generation and propagation, and thus may significantly impact ground shaking intensities. However, estimation of in-situ frictional properties remains challenging, mainly hampered by inadequate near-field observations and intrinsic trade-offs between parameters. Here, we determine frictional properties on the megathrust ruptured in the 2012 Nicoya Mw 7.6 earthquake by conducting 3-D dynamic rupture simulations with constraints from kinematic source models and records on local GPS network installed on the Nicoya Peninsula. We adopt a linear slip-weakening law in dynamic rupture simulations. Through prescribing a wide range of frictional parameters, we compare the source parameters in our models with kinematic source models and our synthetic surface responses with near-field GPS records. Our best-fit model indicates a low fracture energy $\sim 0.43 \times 10^6 J/m^2$, with an average critical weakening distance of 0.25m and an average strength drop of 3.4MPa. Synthetics in the best-fit model show great consistency with GPS records in static offsets and vertical velocity waveforms. The determined frictional parameters are expected to be further applied in near-field ground motion prediction from spontaneous rupture simulations, thus serving for seismic hazard assessment.