INITIATION OF THE 2014 MW7.3 PAPANOA, MEXICO EARTHQUAKE INDUCED BY A PROCEEDING SLOW SLIP

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Slow slip events (SSEs) accommodate a fraction of the long-term geological loading at the depth of the the brittle-ductile transition, separating inter-seismically locked from continuous creeping parts of the megathrust. Recent geodetic analysis reveals that a slow slip event occurred just before the mainshock of the 2014 Mw7.3 Papanoa, Mexico earthquake [Radiguet et al., 2016]. This preceding SSE is thought to have caused substantially enough Coulomb stress changes in the hypocentral region to eventually trigger the mainshock. However, geodetic inversions lack resolution at depth and may only provide limited information on the dynamic stress evolution leading from slow slip to spontaneous dynamic earthquake rupture.

Here, we couple a quasi-dynamic slow slip cycle model with dynamic rupture and seismic wave propagation simulations to investigate potential triggering mechanisms linking the preceding SSEs and megathrust earthquakes exemplary for the Papanoa earthquake. The quasi-dynamic slow slip model utilises the Boundary Element Method (BEM) in the framework of laboratory-derived rate-and-state friction [Li and Liu, 2016; 2017] and is specifically suitable for complex 3D fault geometries. SSEs spontaneously appear at 40 km depth close to a pronounced fault kink of the subducting Cocos plate. A maximum slip of $\sim$25 cm is accumulated in between 20 and 43 km depth across the subduction interface. We export the transient shear stress perturbations generated by the deep SSEs as initial conditions for dynamic earthquake rupture simulations using the openly available software SeisSol (www.seissol.org). Based on the coupled approach, we will discuss if megathrust dynamic rupture can be constrained by fault stress perturbations generated by models of preceding SSEs.