Geophysical Research Abstracts
Vol. 18, EGU2016-8641, 2016
EGU General Assembly 2016

Ground-motion signature of dynamic ruptures on rough faults

P. Martin Mai, Martin Galis, Kiran K.S. Thingbaijam, and Jagdish C. Vyas
King Abdullah University of Science & Technology, Earth Sciences, Physical Science & Engineering, Thuwal, Saudi Arabia (martin.mai@kaust.edu.sa)

Natural earthquakes occur on faults characterized by large-scale segmentation and small-scale roughness. This multi-scale geometrical complexity controls the dynamic rupture process, and hence strongly affects the radiated seismic waves and near-field shaking. For a fault system with given segmentation, the question arises what are the conditions for producing large-magnitude multi-segment ruptures, as opposed to smaller single-segment events. Similarly, for variable degrees of roughness, ruptures may be arrested prematurely or may break the entire fault. In addition, fault roughness induces rupture incoherence that determines the level of high-frequency radiation.
Using HPC-enabled dynamic-rupture simulations, we generate physically self-consistent rough-fault earthquake scenarios (M∼6.8) and their associated near-source seismic radiation. Because these computations are too expensive to be conducted routinely for simulation-based seismic hazard assessment, we thrive to develop an effective pseudo-dynamic source characterization that produces (almost) the same ground-motion characteristics. Therefore, we examine how variable degrees of fault roughness affect rupture properties and the seismic wavefield, and develop a planar-fault kinematic source representation that emulates the observed dynamic behaviour. We propose an effective workflow for improved pseudo-dynamic source modelling that incorporates rough-fault effects and its associated high-frequency radiation in broadband ground-motion computation for simulation-based seismic hazard assessment.