HOW CAN DYNAMIC RUPTURE MODELERS PRODUCE USEFUL INSIGHTS FOR SEISMIC HAZARD ASSESSMENT PRACTITIONERS?

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For years the ground motion prediction (GMM) in seismic hazard (SHA) has been based on ground motion (GM) records, limited at large Mw and in near-field. In practice, close to faults, SHA relies on extrapolations of seismic sources (magnitudes and rupture scenarios) and GM. Thus, significant uncertainties (GM variability) remain in the GMM. These motivate the need for physics-based (PB) SHA. We face several challenges and strategies related to different aspects of rupture dynamics and seismic wave propagation. 2 common needs are clear: validation against data and an evaluation of uncertainties on results. While the first should be achieved naturally, the second may change our habits as a community. I will discuss several of them pointing out critical points. First, in terms of seismic sources, EQs cycle and multi-fault rupture physics could be used to constrain the Mw (frequency and max) relevant to the SHA. Second, in terms of GMM, numerical simulations need validation against data before used for prediction. I will discuss paradox and challenges behind this (involving more than rupture physics). We should tackle 2 milestones routinely in our source inversions and rupture dynamics models of past EQs. 1) Identifying parameters controlling the GM (rupture velocity variations and directivity, distances from faults and asperities, rupture details, stress variations). 2) For blind prediction, generic parametric set up and scaling laws for dynamics need to be defined (absolute stress conditions, scaling for mean parameter values, and their variability). Finally, it is crucial to constrain uncertainties if we want our results used in SHA. For this we must change our current practice to document the negative results in the same way we do with positive results.