EGU2020-1050
https://doi.org/10.5194/egusphere-egu2020-1050
EGU General Assembly 2020

Improving the Co-seismic Slip Distributions of Synthetic Catalogs With Real Observations

Hafize Başak Bayraktar[1,2], Antonio Scala[1], Gaetano Festa[1], and Stefano Lorito[2]
[1]Department of Physics "Ettore Pancini", University of Naples, Naples, Italy.
[2]Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Roma 1, Rome, Italy.

Subduction zones are the most seismically active regions on the globe and about 90% of historical events, including the largest ones with the magnitude M>9, occurred along these regions (Hayes et al., 2018). Most of these events were followed by devastating tsunamis with, in some cases, perhaps unexpected wave height distributions. Observation of events in the megathrust environment reveals that some earthquakes are characterized by slip concentration on the very shallow part of the subduction zone. This shallow slip phenomenon was repeatedly observed in the last two decades for both ordinary megathrust events (e.g. 2010 Maule and 2011 Tohoku) and tsunami earthquakes (2006 Java and 2010 Mentawai). Shallow ruptures feature depleted short–period energy release and very slow rupture velocity possibly due to the presence of (hydrated) sediments (Lay et al., 2011; Lay 2014; Polet and Kanamori, 2000). Associated long rupture durations have been explained with fault mechanics-related rigidity and stress drop variation with depth (Bilek and Lay, 1999) or, more recently, with lower rigidity of surrounding materials (Sallares and Ranero, 2019).

The characteristics of co-seismic slip distribution have an important impact on tsunami hazard. There are numerous methods that have been proposed to generate stochastic slip distributions, also including shallow slip amplification (Le Veque et al., 2016; Sepulveda et al., 2017; Scala et al., 2019). However, these models need to be calibrated against slip models estimated for real events.

Here, we investigate similarities and differences between the synthetic slip distributions provided by Scala et al. (2019) and a suite of 144 slip models of real events that occurred in different subduction zones (Ye et al.,2016). In particular, Scala et al. (2019) model features shallow slip amplification in single events, whose relative probabilities are balanced to restore cumulative slip homogeneity on the fault plane over multiple seismic cycles. This study also aims to improve and/or calibrate this model to account for the behavior observed from real events.