Ground motions relations for Portugal Mainland using a stochastic finite fault modeling

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Predictions of strong motion in Portugal make the use of well-founded physical models imperative. This work presents a non-stationary stochastic seismological model, based on a random vibration theory and a finite fault modeling, for calculating response spectra and synthesizing strong ground motion acceleration records for Portugal Mainland, for magnitudes greater that 6.0.

The model parameters calibration has been done with a dataset that includes horizontal components of ground acceleration records (hard sites) obtained by the Portuguese digital accelerometer network. Validation and comparison are entirely in terms of 5% damped pseudo absolute response spectra for acceleration.

The demonstrated agreement between model and data for low to moderate events in Portugal provides strong grounds for accepting the stochastic-process model predictions and to use it as the basis for characterization of stronger earthquakes considering a finite fault rupture modeled as a sum of a number of point sources distributed spatially and temporally.

The regional calibrated model was implemented to simulate ground motion over a magnitude, distance and site category grid. The synthetic data were then used to regression analysis resulting in region-and-site-specific attenuation relations for use in either deterministic or probabilistic seismic hazard simulations for Portugal Mainland.