DEVELOPMENT OF GROUND MOTION ATTENUATION RELATIONSHIPS FOR SOUTHERN ITALY BASED ON ATTENUATION MODELS AND STOCHASTIC SIMULATIONS

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Abstract

The evaluation of the expected peak ground motion caused by an earthquake is an important problem in earthquake seismology. It is particularly important for regions where strong-motion data are lacking. With the approach presented in this study of using data from small earthquakes, it is possible to extrapolate the peak motion parameters beyond the magnitude range of the weak-motion data set on which they are calculated. To provide a description of the high frequency attenuation and ground motion parameters in southern Italy we used seismic recordings coming from two different projects: the SAPTEX (Southern Apennines Tomography Experiment) and the CAT/SCAN (Calabria Apennine Tyrrhenian – Subduction Collision Accretion Network). We used about 10,000 records with magnitudes between M=2.5 and M=4.7. Using regression model with the large number of weak-motion data, the regional propagation and the absolute source scaling were determined. To properly calibrate the source scaling it was necessary to compute moment magnitudes of several events in the data set. We computed the moment tensor solutions using the "Cut And Paste" and the SLUMT methods. Both methods determine the source depth, moment magnitude and focal mechanisms using a grid search technique. The methods provide quality solutions in the area in a magnitude range (2.5-4.5) that has been too small to be included in the Italian national earthquake catalogues. The derived database of focal mechanisms allowed us to better detail the transitional area in the Messina Strait between the extensional domain related to subduction trench retreat (southern Calabria) and the compressional one associated with continental collision (central-western Sicily).

Stochastic simulations are generated for finite-fault ruptures using the derived propagation parameters to predict the absolute peaks of the ground acceleration for

several faults, magnitude, and distance range, as well as beyond the magnitude range of the weak-motion data set on which the input parameters are calculated. Finally we derived a functional form for a predictive relationship valid in the study area.