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New Time-independent and Time-dependent Seismic Source Models for the Calabria Region (Italy) for the Probabilistic Seismic Hazard Maps

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The present study is carried out in the framework of the S2-2014 COBAS Project "Constraining Observations into Seismic Hazard" co-funded by the Civil Protection Department of the Presidency of Council of Ministers (DPC) within the general agreement DPC-INGV for the period 2012-2021. The two areas identified as priority areas in the first phase of the activities by the 2012- 2021 Agreement DPC-INGV, namely the Po Plain and the Southern Apennines from Molise-Lazio to Basilicata-Calabria borders, require different strategies for calculating "the best seismic hazard". In this study we develop new time-independent and time-dependent seismic source models for the Calabria region starting from the new version of the DISS (Database of Individual Seismogenic Sources). This version of the Database DISS contains remarkable and notable new data and information on the seismogenic sources and their parameterizations in the Calabria region.
The probability of the earthquake occurrences is calculated by developing models of seismicity-derived hazard sources, and models of earthquakes on faults/seismogenic sources. Mainly the four different classes of earthquake source models are developed to be included into the PSHA maps: (1) shallow crustal background seismicity (2) special zone that account for deep background seismicity (many earthquakes deeper than 30 kilometers occur beneath the Calabrian Arc and may have caused considerable damage in the Calabria region; these earthquakes have different ground-motion properties than shallow earthquakes) (3) uniform background source zones (4) finite faults/seismogenic sources as defined in the previous activity. The first three models are based on the earthquake catalog and characterize the hazard from earthquakes Mw>4.7. In most cases, the faults contribute most to the hazard for earthquakes larger than Mw5.5. The earthquake occurrence for the faults are modeled both as a Poisson time-independent process and introducing the various renewal-type stochastic models (Brownian Passage Time, BPT and BPT+DCFF) together with the numerous rupture sources (full-rupture and floating partial ruptures) for the possible earthquake rupture forecasting in the Calabria.
Ground Motion Predictive Equations are adopted among those properly address the seismotectonic features of the region (active shallow crustal regions, continental, subduction zones etc.) considered for hazard assessment during the EU-SHARE project. The mentioned ingredients are handled through logic tree branches for the probabilistic seismic hazard assessment and the final results will be presented in terms of peak ground acceleration (PGA) and spectral ordinates of response spectra with damping % 5 (Spectral Acceleration) on rock having 81%, 10%, 5% and 2% probability of exceedance for a time period of 50 years starting in 2015.