A Bayesian Seismic Hazard Analysis for the city of Naples

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In the last years many studies have been focused on determination and definition of the seismic, volcanic and tsunamogenic hazard in the city of Naples. The reason is that the town of Naples with its neighboring area is one of the most densely populated places in Italy. In addition, the risk is increased also by the type and condition of buildings and monuments in the city. It is crucial therefore to assess which active faults in Naples and surrounding area could trigger an earthquake able to shake and damage the urban area. We collect data from the most reliable and complete databases of macroseismic intensity records (from 79 AD to present). For each seismic event an active tectonic structure has been associated. Furthermore a set of active faults, well-known from geological investigations, located around the study area that they could shake the city, not associated with any earthquake, has been taken into account for our studies.

This geological framework is the starting point for our Bayesian seismic hazard analysis for the city of Naples. We show the feasibility of formulating the hazard assessment procedure to include the information of past earthquakes into the probabilistic seismic hazard analysis. This strategy allows on one hand to enlarge the information used in the evaluation of the hazard, from alternative models for the earthquake generation process to past shaking and on the other hand to explicitly account for all kinds of information and their uncertainties. The Bayesian scheme we propose is applied to evaluate the seismic hazard of Naples. We implement five different spatio-temporal models to parameterize the occurrence of earthquakes potentially dangerous for Naples. Subsequently we combine these hazard curves with ShakeMap of past earthquakes that have been felt in Naples. The results are posterior hazard assessment for three exposure times, e.g., 50, 10 and 5 years, in a dense grid that cover the municipality of Naples, considering bedrock soil and including the site amplification.