ESC2016-269, 2016
35th General Assembly of the European Seismological Commission
© Author(s) 2016. CC Attribution 3.0 License.

35th General Assembly of the European Seismological Commission
4–10 September 2016
Trieste

Scenario events in central Italy for seismic response analysis: the case study of the Fucino plane

Maria D'Amico (1), Francesca Pacor (1), Giuliano Milana (2), Paolo Boncio (3), Daniela Famiani (2), Bruno Pace (3), and Giovanna Cultrera (2)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Milan, Italy , (2) Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy , (3) University of Chieti-Pescara, Dip. DiSPUTer, Chieti, Italy

We present the results of ground motion simulations for the Fucino plane (Abruzzo, Central Italy) aimed to generate seismic input at outcropping bedrock in a wide frequency ranges (0.1-20 Hz), suitable for local seismic response analysis. The study area, characterized by high levels of seismic hazard, was struck in the 1915 by a destructive event (Avezzano earthquake; Imax = XI MCS, Mw $\sim$ 6.8), which caused widespread building damages, thousand of casualties and environmental effects as ground displacement. The Fucino plane covers a surface of about 160 km2 and is constituted by a lacustrine basin bounded by several seismogenic sources potentially able to generate seismic events of moderate-to-large magnitude. During the development of a recent Italian research project (FIRB – Abruzzo), aimed to perform high-resolution seismic hazard analysis in the Abruzzo region, several geophysical and geotechnical investigations have been conducted making available a quantity of data for site characterization.
In this work we perform a set of physics-based scenario events modelling, trough a hybrid deterministic-stochastic approach, 3 seismogenic sources in the magnitude range 6.0 - 6.8 and located in correspondence of the North-western edge of the Fucino basin. The synthetic ground motion is generated over a grid of phantom receivers covering the study area, making different assumptions regarding to the rupture processes (nucleation points, rupture velocities and slip distribution).
As in this area no strong-motion observations exist, we establish some evaluation criteria to assess if our simulations are consistent with median values and standard deviations of empirical ground motion prediction equations (GMPEs). Therefore, we compare the different scenario-events against a set of GMPEs, which are representative of the seismotectonics settlement of the area, as well as of the simulated magnitude-distance range.
After validating, the modelling outcomes are analyzed and discussed in terms of ground motion variability, and a subset of waveforms is extracted from the entire dataset of synthetic accelerograms on the base of statistical quantiles of the probability density functions computed at each phantom site.
Empirical transfer functions, inferred by local seismic response analysis, are also applied to the pseudo spectral acceleration to correct the synthetic ground motion to stiff and soft soil conditions.
As final step, we test some assumptions regarding to the rupture process of the 1915 Avezzano earthquake, attempting to reproduce the damaging pattern outlined by the observed macroseismic intensity points distribution.

Key words: physics-based simulations, scenario-events, seismic site response, Central Italy