LOW FREQUENCY MODELING OF GROUND MOTION IN THE LOWER TAGUS VALLEY BASIN

J.F. Borges[1], R. Torres[1], B. Caldeira[1], H. Silva[1], M. Bezzeghoud[1], J. Carvalho[2], C. Pinto[2]

1 - Geophysical Center of Evora and Physics Department, ECT, University of Evora, Portugal
2 - Laboratório Nacional de Energia e Geologia, Apartado 7586, 221-866 Amadora, Portugal

jborges@uevora.pt

The Lower Tagus Basin (LTB) is a Cenozoic basin located in the western-central part of Portugal mainland. Along its history, this basin was shaken by several strong earthquakes which produced important material damage and loss of lives: the 1st of November 1755 (M=8.5) Lisbon and the 1969 (Mw=7.3) earthquakes, located in the SW Iberia Margin, and the 1344, 1531 (M□6.5–7.0) and 1909 (Mw=6.0) earthquakes located within the basin. It is expected that if an earthquake of similar magnitude occurs in the near future in this so densely populated area will cause great destruction and casualties. To contribute to an improved assessment of the seismic hazard in the LTB we simulate the propagation of seismic waves in a 3D heterogeneous medium produced by moderate to large earthquakes using an elastic finite-difference wave propagation code. The method, successfully applied previously [1,2], involves: the establishment of an accurate 3D seismic velocity model based on seismic reflection/refraction data, potentials methods, inversion of broad-band ambient noise and geological data; the evaluation of the seismogenic potential of the faults in the studied area; three-dimensional seismic ground motion modelling through finite difference methods. Based on this methodology we simulate the ground motion at a grid and, by using appropriate relationships between seismic intensity (MMI) and PGV, we computed the synthetic isoseismic map of the area. Those synthetic results, compared with available macroseismic and instrumental data, allows the validation of source models proposed for the area and can revel the areas more exposed to significant seismic ground motions.

[1] Grandin, R., Borges, J.F., Bezzeghoud, M., Caldeira, B. and Carrilho, F., 2007. Simulations of strong ground motion in SW Iberia for the 1969 February 28 (MS = 8.0) and the 1755 November 1 (M ~ 8.5) earthquakes – II. Strong ground motion simulations, Geophys. J. Int., 171, 2, 807-822.

[2] Bezzeghoud M., Borges J. F., Caldeira B., 2011, Ground Motion Simulations of the SW Iberia Margin: Rupture Directivity and Earth Structure Effects. Natural Hazards, DOI 10.1007/s11069-011-9925-2.