



Estimating site effects for seismic hazard assessment in Portugal using shear wave and geotechnical data

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The estimation of seismic ground motion requires a simultaneous understanding of the effects of earthquake sources, propagation effects in the earth and local geological site conditions. In this work we address the latter issue in Portugal mainland. The SCENE project has the main goal to improve the seismic hazard assessment in Portugal by taking into account the site effects. To achieve this purpose, the project was divided into two main goals: 1) to estimate the shear-wave profiles at the seismic stations in order to correct the recorded ground motions for site effects and 2) to produce a regional soil classification based on shear-wave velocity averaged on the upper 30m (VS30) that will be used to include first order site effects in seismic hazard maps. This parameter was calculated using seismic refraction and reflection data, interpreted with the aid of nearby wells. The refraction interpretation was carried out using the generalized reciprocal and first break tomographic methods. Using reflection seismic software, the velocities measured from the reflection hyperbolae occasionally observed in the shot gathers were used to obtain an average velocity until the respective reflector and complement the refraction data. The soil classification is based on the eurocode 8, which uses only shear wave velocities, but the classification presented here includes also standard penetration test (SPT) data. The seismic acquisition was carried out next to the accelerometer and broadband stations located in the regions center and south of Portugal. To produce a soil classification, 30 P-wave and 30 S-wave profiles were acquired and data collected under the scope of other projects was also used. The classification takes into consideration not only the geological units on which the seismic profiles were acquired but lithological information and has been generalized to each unit using 1: 200.000 scale geological cartography. This classification for southern Portugal is presented here for the first time. We also investigate the empirical correlations recently proposed in the literature between VS30 and the topographic gradient or grain size and thickness of Quaternary units.