



Site-condition map for Portugal based on Vs30 values and evaluation of the applicability of Vs30 proxies

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Maps providing information on site conditions are essential tools to accurately represent the spatial distribution of ground motions, both in seismic hazard maps and in instrumental intensity maps (ShakeMaps). Project SCENE, funded by the Portuguese Foundation for Science and Technology, aims at characterizing the site conditions for Portugal and to outline a first-order site effects map to be used in seismic hazard assessment at a national level.

In the context of project SCENE we developed a database of available shear-wave velocity profiles together with surface-geology data and geotechnical data. Currently the database includes around 60 profiles dispersed in a variety of lithological and geological units. The vast majority of data consist of seismic refraction sections that were acquired both within the scope of ongoing research projects SCENE and NEFITAG, and previously performed CAPSA and ERSTA campaigns. Few sites analyzed with multichannel analysis of surface waves by Lopes et al. (2005) were also included. The Vs30 values calculated from the profiles range from 100 m/s to 1000 m/s, but the higher values are poorly represented.

We performed a careful evaluation of the geological conditions at database sites, using the smallest scale available maps (usually 1:50000), and grouped it into six generalized geological units. The variability of the distribution of Vs30 values varies significantly with the generalized geological unit. Holocene deposits and Pliocene units display the lowest variance. On the other hand the Pleistocene and Miocene units, which are characterized in Portugal by a large lithological variety, display a large dispersion. Geological outcrop studies and the analysis of geotechnical data in close association the seismic refraction data acquisition are currently under way to better understand this velocity-lithology relation.

The use of proxies based either on exogenous geological-geographical defined units (Wills et al., 2006) or topographic slope shows relatively unbiased residual distributions of the logarithm of Vs30. Although the variance is large for both methods the geological/geographical-defined units method shows a better performance with respect to the topographic slope method.

Lemoine et al. (2012) evaluated the applicability of the topographic slope method for stable and active regions of Europe using the Vs30 dataset compiled in the context of project SHARE. The variability of the entire residuals distribution is larger for the Portuguese dataset than for the European dataset, suggesting that the European database is far from being representative of the near-surface conditions in Europe.