Geophysical Research Abstracts
Vol. 14, EGU2012-13431, 2012
EGU General Assembly 2012

Validation of the Lower Tagus Valley velocity and structural model using ambient noise broadband measurements

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Along his history the Lower Tagus Valley (LTV) region was shaken by several earthquakes, some of them were produced in large ruptures of offshore structures located southwest of the Portuguese coastline, among these we the Lisbon earthquake of 1 November 1755; other moderates earthquakes were produced by local sources such as the 1344, 1531 and the 1909 Benavente earthquake.
In order to promote an improved assessment of the seismic hazard in this region, we propose the introduction of realistic methods on the prediction of ground motion produced by moderate to large earthquakes in LTV. This process involves the establishment of a structural 3D model based on all the available geophysical and geotechnical data on the area (seismic, gravimetric, deep wells and geological outcrops) and the determination of wave propagation from a finite difference method: by applying the E3D program [1,2].
To confirm this model we use broadband ambient noise measurements collected in two profiles with azimuth perpendicular to the basin axis and we applied the horizontal to vertical (H/V) spectral ratio method [3] to the recordings in order to estimate the amplification of the basin. The H/V curves obtained reveals the existence of two low frequency peaks centered on 0.2 a 1 Hz frequencies[4]. These peaks are strongly related with the thickness of Cenozoic and alluvial sediments. By inversion of the H/V curve, we obtain a more detailed velocity model for the region where the profile were determined, which is in good agreement with borehole data and other results obtained with magnetic and seismic reflection methods.

References:
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