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Imaging the Western Iberia Seismic Structure from the Crust to the Upper Mantle from Ambient Noise Tomography

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Ambient Noise Tomography (ANT) is now widely used to image the subsurface seismic structure, with a resolution mainly dependent on the seismic network coverage. Most of these studies are limited to Rayleigh waves for periods shorter than 40/45 s and, as a consequence, they can image only the crust or, at most, the uppermost mantle. Recently, some studies successfully showed that this analysis could be extended to longer periods, thus allowing a deeper probing.

In this work we present the combination of two complementary datasets. The first was obtained from the analysis of ambient noise in the period range 5-50 sec, for Western Iberia, using a dense temporary seismic network that operated between 2010 and 2012. The second one was computed for a global study, in the period range 30-250 sec, from analysis of 150 stations of the global networks GEOSCOPE and GSN.

In both datasets, the Empirical Green Functions are computed by phase cross-correlation. The ambient noise phase cross-correlations are stacked using the time-frequency domain phase weighted stack (Schimmel et al. 2011, Geoph. J. Int., 184, 494-506). A bootstrap approach is used to measure the group velocities between pairs of stations and to estimate the corresponding error.
We observed a good agreement between the dispersion measurements on both short period and long period datasets for most of the grid nodes. They are then inverted to obtain the 3D S-wave model from the crust to the upper mantle, using a bayesian approach. A simulated annealing method is applied, in which the number of splines that describes the model is adapted within the inversion.

We compare the S-wave velocity model at some selected profiles with the S-wave velocity models gathered from Ps and Sp receiver functions joint inversion. Both results, issued from ambient noise tomography and body wave's analysis for the crust and upper mantle are consistent.

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