



## Effect of the water layer on seismic noise cross-correlation across the Northeast Atlantic, from Madeira and Canarias to the Atlas-Gibraltar zone

**Graça Silveira**<sup>1,2</sup>, Joana Carvalho<sup>1</sup>, Juan Pinzon<sup>1</sup>, Susana Custódio<sup>1</sup>, Carlos Corela<sup>1</sup>, and Luís Matias<sup>1</sup>

<sup>1</sup>Instituto Dom Luiz (IDL), Faculdade de Ciências, Universidade de Lisboa, Campo Grande, 1749-016, Lisboa, Portugal  
(mdsilveira@fc.ul.pt)

<sup>2</sup>Instituto Superior de Engenharia de Lisboa, Rua Conselheiro Emídio Navarro 1, 1959-007 Lisboa, Portugal

One of the aims of project SIGHT (Seismic and Geochemical constraints on the Madeira HoTspot system) is to obtain a 3D model of SV-wave velocities of the crust and upper mantle of the Northeast Atlantic area encompassing Madeira and Canary Islands to the Atlas-Gibraltar zone, using seismic noise cross-correlations in the period range 2-100 s. Ambient noise cross-correlation has been successfully applied in a variety of tectonic environments to image the structure of the Earth subsurface. This technique overcomes some limitations ascribed to source-receiver geometry and sparse and irregular earthquake distribution, allowing to image Earth structure with a resolution that mainly depends on the network design. However, the effect of the water layer in the short period Empirical Green Functions, which are obtained by seismic noise cross-correlation, for interstation paths crossing the ocean is still poorly understood.

In several studies, it has been observed that the presence of water and sediments is responsible for later wave-train arrivals. Those later arrivals are frequently disregarded when measuring group velocity, either by considering only longer periods or by specifying a given velocity range.

In this work, we present a systematic study of the influence of the water layer on both vertical and radial synthetic Rayleigh waves, as well as on higher-mode conversion and on the group velocities dispersion measurements.

We show that although the fundamental mode dominates, the presence of the first overtones at short periods (typically below 8 seconds) cannot be neglected. We also show that specifying a given velocity range when retrieving group velocity can result in a mixture of modes. Our tests reveal that, at short periods, the water has a dominant effect on ocean-continent laterally varying media.

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