



Seismic tomography in the Basque-Cantabrian basin: Rayleigh wave phase velocities, V_p , V_s and V_p/V_s determined from ambient noise and local events across the SISCAN seismic network

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The Basque-Cantabrian basin, located in the north of Spain, represents the main Mesozoic extensional basin developed during the opening of the Bay of Biscay. This basin shows a very high subsidence with sediment thickness exceeding 20 km. In Cenozoic times, it was inverted as part of the Pyrenean-Cantabrian Mountains. The SISCAN seismic network was designed to high-resolution long-term monitoring of the seismic activity within the basin and to gain insight into basement depth of sedimentary basin and its crustal structure by the use of different tomographic techniques. The network consists of 31 broad-band seismic stations with a mean inter-station distance of 30 km. Its deployment concluded in July 2014 and it is operative since then.

The geometry and close spacing of the SISCAN network coupled with the relatively weak but persistent regional seismicity favor the application of both ambient noise and body wave local tomography techniques. Since time domain methods suffer from limitations at short inter-station distances, Rayleigh wave phase velocities have been measured from the cross-correlation spectrum of the continuous records provided by the network. These measurements have been used in a tomographic inversion to produce a set of preliminary phase velocity maps for periods ranging from 5 to 20 s. In addition, more than 12000 P-wave travel times and near 8000 S-wave travel times from about 1500 events recorded in 3 years were inverted to obtain the three-dimensional velocity structure of the area for P-waves, S-waves and the V_p/V_s ratio.

Preliminary results reflect a significant agreement between the outcomes of both methods (considering their different approaches and resolutions) and with the existing geological knowledge of the basin. Low phase velocities are recovered for the zones with a thicker sedimentary cover (like the Villarcayo and Miranda-Treviño synclines, and the western end of the Jaca-Pamplona basin) and along the Pamplona transfer fault. Relatively high velocities are found in areas where the Paleozoic basement crops out or lies at shallow depths within the basin. More quantitative results will arise from future lines of work including a rigorous assessment of the uncertainties and the refinement of the inversion procedures.