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SEISMIC NOISE: INVERSION OF VELOCITY PROFILE USING A NON LINEAR ALGORITHM

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For site effect assessment a good knowledge of the shear wave velocity profile is of prime importance. It can be deduced from the dispersive property of the surface waves present in the noise wave-field or artificially generated. This inversion is not straightforward as different ground models have the same phase velocity curve in the observed frequency range. Moreover the uncertainties on the phase velocity obtained by available processing techniques drastically increase the non unicity of the problem. Widely used iterative linear algorithms initiated by a starting model lead to only one optimal solution that could be a local minimum of the misfit function. In order to investigate the parameter space we implement a direct search algorithm (Neighborhood, M. Sambridge,1999) to inverse the velocity profile.

However, in spite of their performance, the direct search algorithms partially reproduce the ensemble of possible good solutions. Different possibilities to help the inversion process are considered. We introduce a priori on the compressional wave velocities in the misfit computations, which could be acquired from refraction tests. Also, adding the inversion of the Rayleigh ellipticity leads to a better constrain of the layer's depth (Scherbaum et al., in press). At low frequency join inversion of both Rayleigh and Love modes could significantly improve the resolution which is usually poor when considering the vertical component alone.

This method has been successfully tested on various synthetics in order to estimate its ability to reproduce the original models. Several sites selected in Belgium for the availability of geological and geotechnical data were deeply investigated with ambient vibration measurements (Lennartz 5 seconds and geophones), refraction tomography and surface wave inversion from hammer and explosive shots, and the coherency of the proposed approach has been validated.

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