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On the interpretation of the amplitude decay of noise correlations computed along a line of receivers

Laurent Stehly and Pierre Boué
ISTerre, Université Grenoble Alpes

Measuring seismic wave attenuation is critical to the prediction of accurate ground motion and for earthquake hazard analysis. In the present article, we carefully investigate to what extent noise correlations can be used to unambigously measure the attenuation of the Earth crust.
More precisely, we explore the different ways to interpret the amplitude decay of noise correlations computed along two lines of broadband receivers located nearby the french Pyrenees.

To this end, we first study how the distribution of seismic noise sources affects the amplitude of noise correlations by computing of the noise-source kernels in PREM. Numerical experiments in a two-dimensional homogeneous medium are then used to intepret the amplitude decay of the noise correlations measured along two lines of broadband receivers located in southwest France. We find that in the 5-10s period band, where Rayleigh waves are sensitive to the upper-crust, the noise correlations have stronger amplitude decay along the northern Pyrenees than along the Aquitain basin. However this difference cannot be interpreted unambigously as a contrast of attenuation as it is also possible to find a distribution of noise sources that explains our observations.

This shows that even when considering a line of receivers, it is not possible to use noise correlations to measure the attenuation of the medium without making strong assumptions about or taking into account the distribution of the noise sources.