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Simulation for retrieving Green's function with seismic interferometry

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Seismic interferometry is widely used in various kinds of seismology to retrieve the Green's function from long-term ambient noise data. It is sometimes difficult to estimate proper the Green's function from actual data, such as non symmetrical correlation in negative and positive delay times. In this study we conducted numerical simulations for retrieving the Green's function from synthetic microtremor data calculated using a 3DFD code.

A surface vertical loading was set on the surface around two stations (10km apart) to simulate microtremor data. The synthetic velocities were used to generate a correlation. The correlations from 120 sources were stacked with the seismic interferometric way. We confirmed that the correlation agrees with the surface wave portions of the Green's function between the two sites. However, body wave part could not be reconstructed with the correlation. This is due to the lack of sources in vertical direction in the simulation. Since most of possible sources of microtremors are located on the surface, these phenomena can be essential in a correlation from microtremors.

We also conducted similar simulations with S-wave velocity models having irregular interfaces. We have difficulties to retrieve Green's function correctly when the basin has strong lateral heterogeneities. The vertical interface of the basin generates waves as secondary sources that violate the assumption of equal source distribution.

Keywords: seismic interferometry