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Fractal properties of the seismic noise-field and their implications on the soil motion

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We present experimental observations and data analysis concerning the fractal features of seismic noise in the frequency range from 1 Hz to 40 Hz. In detail, we investigate the 3D average squared soil displacement and the distribution function of its fluctuations for different near-surface geological structures. We have found that the seismic noise is consistent with a persistent fractal brownian motion characterized by a Hurst exponent grather than 1/2. We deal with a correlated random motion with memory longer than the Brownian motion. How long is the memory depends on the near-surface local geology: the more the soil is consolidated the farther behavior of the soil motion is far from Brownian. On physical ground this means that the soil motion is realized through two different dynamical behaviors that are present at the same time in the seismic noise-field: one more close to the ballistic regime and the other more close to the diffusive one.