

ACOUSTICS2008/459

Convergence of correlations in multiply scattering media

Eric Larose^a, Arnaud Derode^b, Philippe Roux^a and Michel Campillo^a

^aLGIT - CNRS - Université Joseph Fourier, Maison des Géosciences, 1381 rue de la Piscine, BP 53, 38041 Grenoble, France

^bLaboratoire Ondes et Acoustique, ESPCI, Université Paris 7, CNRS, 10 rue Vauquelin, 75005 Paris, France

Correlations of ambient seismic or acoustic noise are now widely used to reconstruct the impulse response between two passive receivers as if a source was placed at one of them. Applications include terrestrial and solar seismology, underwater acoustics and structural health monitoring. Nevertheless, for a given set of data, correlations do not only yield automatically the Green function between the sensors, but also contains residual fluctuations that might "blur" the images. [Gizon et al, *Astrophys. J.* 614 (2004); Weaver and Lobkis, *J. Acoust. Soc. Am.* 117 (2005); Sabra et al., *J. Acoust. Soc. Am.* 118 (2005)]. We propose a model to describe the "signal-to-fluctuations" ratio in the correlations in the case of non-stationary wavefields, and more particularly in the case of scattering media. The work includes theoretical derivations and numerical simulations. The role of multiple scattering in the rate of convergence of the correlations toward the Green function is quantitatively evaluated [Larose et al, (submitted 2008)].