One Year Post-Doctoral Position at LMSS-Mat CNRS-UMR 8579
École Centrale de Paris (France)

Anisotropic transport and diffusion of elastic waves in random media

Abstract: The purpose of this project is to consider the influence of material anisotropy on the possible depolarization and diffusion of elastic waves in randomly heterogeneous media. Anisotropy should be considered at two levels. The first one is related to the constitutive law of random materials, which may be treated by a random matrix theory for the elasticity tensor. The second level is related to the correlation structure of these random materials, which is referred to as anisomery in the dedicated literature. As the propagation of waves in such complex media cannot be described by deterministic models, a probabilistic framework shall be adopted based on a radiative transfer model in the so-called mesoscopic regime, when the wavelength and the correlation length are comparable.

The post-doctoral applicant for this project will work on developing models for the consideration of anisotropy in the collision kernels of the radiative transfer equations, and establishing the corresponding multiple scattering, diffusive limit if any. He/she shall also develop numerical simulations of these regimes using existing codes based on the Monte-Carlo method and/or the spectral finite element method. This research is aimed at better understanding the role of anisotropy in the multiple scattering processes and comparisons with experimental data shall be ideally considered.

Profile: Candidates should be motivated by theoretical investigations and numerical modeling in elastic wave propagation phenomena. People having experience in theoretical continuum mechanics, wave physics, surface geophysics, condensed matter physics, applied mathematics (kinetic models) among others are invited to apply. The position is funded for 1 year and the salary is approximately 2000 Euros (2800 US Dollars) net + expenses per month. The candidates should have a PhD degree or equivalent and can be nationals of any country. **Starting date**: fall 2011.

Collaborations: The project is in collaboration with Didier Clouteau and Régis Cottereau at École Centrale Paris, France (http://www.mssmat.ecp.fr/) and Johann Guilleminot at Paris-Est University, France (http://msme.univ-mlv.fr/).

Contact: Éric Savin
Eric.Savin@onera.fr
Tel: +33(0) 146 734 645
Fax: +33(0) 146 734 143

Some references:

E. Akkermans & G. Montambaux: *Mesoscopic Physics of Electrons and Photons*. Cambridge University Press, Cambridge (2007).

S. Chandrasekhar: *Radiative Transfer*. Dover Publications, New York (1960).

O.I. Lobkis & R.L. Weaver : Anderson localization of ultrasound in plates: Further experimental results. *Journal of the Acoustical Society of America* **124**, 3528-3533 (2008).

L. Margerin : Attenuation, transport and diffusion of scalar waves in textured random media. *Tectonophysics* **416**, 229-244 (2006).

L.V. Ryzhik, G.C. Papanicolaou, & J. Keller: Transport equations for elastic and other waves in random media. *Wave Motion* **24**, 327-370 (1996).

É. Savin : Diffusion regime for high-frequency vibrations of randomly heterogeneous structures. *Journal of the Acoustical Society of America* **124**, 3507-3520 (2008).

C. Soize: Non-Gaussian positive-definite matrix-valued random fields stochastic partial differential operators. *Computer Methods in Applied Mechanics and Engineering* **195**, 26-64 (2006).

C. Soize: Tensor-valued random fields for meso-scale stochastic model of anisotropic elastic microstructure and probabilistic analysis of representative volume element size. *Probabilistic Engineering Mechanics* **23**, 307-323 (2008).