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INFLUENCE OF THE SPATIAL CORRELATION STRUCTURE OF AN ELASTIC RANDOM MEDIUM ON ITS SCATTERING PROPERTIES

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Using seismograms recorded at the surface has become an effective tool to explore the structure of the Earth since the pioneering studies of Aki [1]. The decay rate of the envelope of these seismograms at long lapse times is a source-independent characteristic of a medium [2]. Probabilistic models are used to take into account the spatial variability of the medium parameters [3]. The elastic radiative transfer equations describe the spatio-temporal evolution of the angular wave energy density of P and S waves in a weakly heterogeneous random medium [4, 5]. In these equations, the scattering effects resulting from the randomness of the medium are described by scattering cross-sections that are defined as a function of the power spectrum of heterogeneities. This power spectrum (or equivalently the spatial correlation model) is a key factor in wave scattering problems. The main objective of this paper is to introduce different models of spatial correlation and to evaluate their effect on the scattering parameters of a statically isotropic random medium with a single correlation length. The asymptotics (low and high) of the scattering cross-sections are discussed and the effect of the correlation model in the mesoscale range is numerically evaluated. As a by-product, we propose a novel correlation model that mixes P and S waves more efficiently than classical ones.

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