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Mechanism of Elastic Waves Reflection in Geological Media

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ABSTRACT

Reflecting properties of layered geological media are substantiated in the framework of phonon-phonon mechanism of elastic wave propagation in porous media. In this scope the reflection coefficient is calculated using not impedances but impulses of phonons in adjoining porous media. Assuming for the first approximation that rocks do fulfill an average time equation we got an expression for the reflection coefficient via porosity factors of that geological medium. For calculation of reflection coefficient the wavelength is chosen as averaging line scale. These coefficients are calculated at every depth point for a set of frequencies in seismic range. Resulting curves have special depth points. Being cross-plotted in time-frequency space such points do form coherent units. These units we call effective boundaries, because they cause all reflections for the given media in the framework of considered model. Effective boundaries are not wide-band as for two half spaces but have a cutoff at some low frequency. Geological medium at a whole is characterized by the system of such effective boundaries that are capable to form a reflection waves field. To construct this field an algorithm is developed that solves the direct problem of seismic in the framework of effective boundaries theory. This algorithm is illustrated with vibroseis survey modeling for a specific geological section.

KEYWORDS

Elastic Waves; Phonons; Heterogeneous Media; Reflection Coefficient; Direct Seismic Problem; Effective Seismic Boundaries

Cite this paper

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