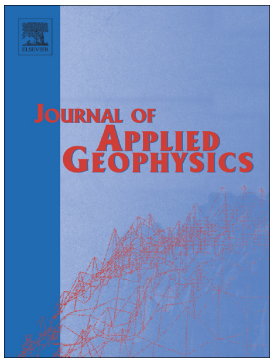

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Energy equipartition in theoretical and recovered seismograms

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Abstract

This study shows a formulation that allows obtaining theoretical results that show the energy contents associated with the propagation of compressional and shear seismic waves (P- and S-waves respectively) for the case of a two-dimensional medium. During the propagation of seismic waves, the energy contents of P- and S-waves show fixed proportions according to the properties of the medium where they propagate (i.e. density, wave propagation velocity and Poisson ratio). Theoretically, a material with a Poisson ratio of 0.35 implies that P-waves will only represent 18.75% of the total energy while the other 81.25% will be contributed by S-waves. For a Poisson ratio of 0.45, S-waves will be enormously powerful and contribute with 91.67% of the total energy during propagation. On the other hand, it is also possible to obtain the energy contents through correlations of seismic motions by means of the interpretation of recovered seismograms. In this study, it is also shown that under certain conditions, the recovered energy converges to exact solutions. Our results are validated using published solutions showing an excellent agreement. In addition, theoretical examples have been developed simulating seismic noise and it has been found that energy contents of the P- and S-waves are also satisfied.

Keywords: Energy equipartition, Seismic noise, Green function, Poisson ratio.

1. Introduction

The equipartition of energy during the propagation of seismic waves implies that the energy associated with the wave types which propagate a medium is in a state of equilibrium. Recent scientific developments have exposed methodologies that allow obtaining the response of systems by means of the correlation of seismic noise and under certain