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Relation between Coda-Q and stress loaded to an elastic body

Kyosuke Okamoto[1*], Hitoshi Mikada[1], Tada-nori Goto[1], Junichi Takekawa[1]

[1]Kyoto University

Seismic coda is formed by superposed signals caused by scatterers such as cracks and medium inhomogeneities in the underground materials. When the spatial scale of scatters becomes comparable with seismic wavelength, it becomes very difficult to analyze the coda-wave quantitatively in terms of the location of scatterers, scattering mechanisms, etc. For inhomogeneous medium, it is natural to deal with stochastic methodologies to interpret seismic data. In this regard, coda-Q, i.e., parameters of attenuation or decay of seismic wave, has been frequently used as a stochastic measure of the medium in which seismic waves propagate. Since objectives of recent structural surveys include spatiotemporal or time-lapse variation of physical properties of underground medium, we would like to exploit the new geophysical monitoring method using the stochastic parameters if these parameters reflect any changes of physical state of the medium. The purpose of this study is to relate this parameter to non-stochastic properties of the underground materials. Analysis of coda-wave revealed proportional relations between the loading stress and attenuation factor of the envelope. Along the direction of the principal stress, we find a tendency in which factor increases with the magnitude of loading stress. The feature implies a possibility of monitoring the loading stress through the observation of temporal variation of coda-wave.

Keywords: Coda-Q, coda wave, scattering