Attenuation Characteristics of High-frequency Seismic Waves in the Andaman Sea Basin

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Abstract

We estimated frequency dependent attenuation of coda waves (Q_C^{-1}) and body waves (Q_P^{-1} and Q_S^{-1}) in 1.5-24 Hz by applying the single isotropic scattering theory and the extended coda normalization method, respectively, in the crust beneath the Andaman Sea. We used 43 aftershocks of the 13 September 2002 earthquake (M_w 6.5) in the Andaman sea recorded by three stations installed in the Andaman Islands. The coda Q factors calculated from the amplitude decay rate of the S-wave coda show a dependence on frequency and lapse time. The average frequency dependent relations of Q_C^{-1} vary from $0.02f^{-1.1}$ to $0.01f^{-0.94}$ with an increase in lapse time window from 10 s to 40 s, respectively. The values of Q_P^{-1} and Q_S^{-1} corresponding to spectral amplitude decays show strong frequency dependence, and are expressed as $0.02f^{-1.01}$ and $0.01f^{-1.0}$, respectively. Our results are consistent with those of other seismically active regions. The ratio Q_P^{-1}/Q_S^{-1} is found to be larger than unity for the whole frequency range. We separated intrinsic absorption (Q_i^{-1}) and scattering attenuation (Q_{sc}^{-1}) using the independent estimates of Q_C^{-1} and Q_S^{-1} following the Wennerberg's (1993) method for small source-receiver distances by reinterpreting the measured Q_C in terms of multiple scattering (Zeng, 1991). In the assumptions of small source-station distances and uniform half space, the results are biased furnishing a first order estimates of the scattering and intrinsic absorption parameters. Results obtained in this study thus give useful constraints on the possible biases present in the methods for separation of intrinsic from scattering attenuation using Wennerberg approach. Within the first order approximation, we infer that Q_C^{-1} is close to Q_i^{-1} and both of them are larger than Q_{sc}^{-1} suggesting that coda decay can be well explained by intrinsic attenuation in Andaman Sea.