Estimation Q-1 using the modified coda normalization method

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Frequency dependent 1/Q is an important parameter to know properties of medium with smaller scale heterogeneity than seismic-wave length. A method for estimating 1/Q value has been developed by applied the coda normalization method by Aki (1980). The coda normalization method can be obtained frequency dependent 1/Q values along a ray path from events to station. However, it is not always appropriate for estimating detail structure. Matsumoto et al. (2007) proposed a method resolving 1/Q value between two events. They take ratio between direct wave spectra normalized by those in coda part and success to reveal 1/Q structure in detail. The sequence of the analysis is normalization for direct wave by coda wave first. And next a ratio for an event to other event is taken. 1/Q is obtained many ratios from event pairs. In their estimation, the coda normalization is only for cancellation of source spectra for a pair of events. In this study, we take spectral ratio in coda waves between two events at first. From a lot of spectral ratios in coda part, relative source spectra can be estimated with higher stability through singular value decomposition. After that, the relative source effect between event pair can be eliminated by the solution from ratios between direct wave spectra for many events. By this method, we obtained frequency dependent 1/Q value with smaller estimation error than that by the method of Matsumoto et al. (2007).