Estimation of scattering coefficient and intrinsic absorption in the Chugoku district (2)

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It is possible to separately estimate the scattering coefficient and intrinsic absorption of the lithosphere by interpreting the observed spatiotemporal distribution of high-frequency seismic wave energy by the Radiative Transfer Theory (RTT). One of such an estimation method is the Multiple Lapse-Time Window (MLTW) method (Fehler et al., 1992; Hoshiba, 1993; Carcole and Sato, 2010), in which the seismic wave energy observed respectively at different positions is integrated using multiple time windows and then its spatial variation is interpreted by the RTT. Recently, Saito et al. (2013, 2014, Seism. Soc. Jp. Fall Meet.) proposed another method to estimate the scattering coefficient and intrinsic absorption. In this method, the seismic wave energy observed respectively at different times is integrated using multiple space windows and then its temporal variation is interpreted by the RTT. Sasaki et al. (2015a, JpGU Meet.; 2015b, SSJ Fall Meet.) improved this method and applied it to the Hi-net records of several shallow earthquakes in the Chugoku district, Japan. He concluded that the scattering coefficient of S waves (1-2 Hz) in this region is on average 0.002-0.0025 km^{-1}. It is roughly half as large as the values previously estimated in this region using the MLTW method.

In this study, we improved the coda normalization process for correcting the source and site effects in the method of Sasaki et al. Though they assumed that the scattering coefficient (g_0) and intrinsic absorption (Q_i^{-1}) are uniform, we introduced a model such that the crust and the uppermost mantle could have g_0 and Q_i^{-1} of different values. We analyzed the Hi-net data of the same events using the improved method. We obtained the g_0 and Q_i^{-1} for frequency bands of 1-2, 2-4, and 4-8 Hz. The g_0 did not show obvious frequency dependence, but the Q_i^{-1} appeared smaller for higher frequencies. The g_0 values we estimated were significantly smaller than those estimated by the previous studies using the MLTW method for all frequency bands. The choice of g_0 and Q_i^{-1} of the uppermost mantle gave little influence on the results. This is because the ray paths from the shallow events (9-13km in depth) that we selected mostly go through the crust only. To evaluate the g_0 and Q_i^{-1} of the uppermost mantle, we would need to analyze data of deeper events.

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