Lg Attenuation in the Crust of the South Korea Studied by the Source Pair/Receiver Pair Method

Tae-Woong Chung[1]

[1] Sejong University

Lg attenuation has been studied extensively because its regional variations reflect geological structure. Lg attenuation around 1 Hz, in particular, shows close correlation with tectonical seismicity; active regions have higher values than inactive regions. In S. Korea, there were some trials to estimate Lg attenuation by means of the reversed two-station method (RSTM) requiring collinear alignment of event and receiver pairs (Chun et al., 1987). The attempts, however, were inconclusive because of insufficient data to fulfill the collinear restriction. Above all, it is difficult to obtain long path from the domestic events in S. Korea although the Lg attenuation measurements for longer paths are better determined than shorter ones. Recently, Chung and Lee (2003) obtained very low Lg attenuation by using the coda normalization method (CNM). The value was, however, derived from the combined station's data to compensate insufficient data of the single station. Since the CNM is originally applicable to data of a single station, this study also has a problem of insufficient data.

In this study, we analyze Lg attenuation in S. Korea with the source pair/receiver pair (SPRP) method (Shih et al., 1994), which is the generalized version of the RSTM by relaxing the collinear restriction of the sources and receivers. By assuming azimuthal independence of the Lg effect, we can greatly increase the amount of available data for source-receiver pair by the relaxation. In addition, we supplement data of teleseismic events, and obtain nearly 1500 source-receiver pairs with the effective distances (D) ranging from 16 to 657 km. Seismograms are filtered by using an eight-pole band-pass Butterworth filter with a five-center frequency: 0.375, 0.75, 1.5, 3, and 6 Hz. The obtained quality factor of Lg attenuation for all frequencies are less than 0.002, which is a reasonable value for a seismically inactive region while the reversed two-station method provide anomalously high value. In spite of the short effective distances, the results of the SPRP method show reliable values especially at 1.5 and 3 Hz.

Our results, however, appear to be almost frequency-independent because of large errors at lower frequencies than 1 Hz, and the relatively high value of 6 Hz. These problems with appearance of frequency-independence are most likely caused by the short D, because the SPRP method was initially applied for very long D up to 6000 km. Nonetheless, we find the SPRP method done with the short D provides reliable results at 1.5 and 3 Hz, at which we can clearly judge the correlation with tectonical seismicity.