Attenuation of High-frequency P and S Waves in the Crust of the Southeastern Korea

Tae-Woong Chung [1] and Haruo Sato [2]

1. Departmennt of Earth Sciences, Sejong University, Seoul 143-747 Korea
2. Department of Geophysics, Tohoku University, Sendai 980-8578 Japan

The Yangsan fault in southeastern Korea has been receiving increasing attention in its seismic activity, because the fault lies in the industrial region where nuclear power plants are located. In Korean history, the fault is believed to be responsible for the most damaging earthquake that caused more than hundred deaths in A.D. 779. On June 26, 1997, an earthquake with M 4.3 took place near the fault, although the Korea is far from seismo-active plate boundary and the earthquakes more than M 4 class have not frequently occurred in the last century. In the fault, the first regional seismic network in Korea has been in operation by Korea Institute of Geology, Mining and Materials (KIGAM) from December 1994. Based on the network data, Kim et al. (1999) obtained very low Q_P^{-1}; however, the value was derived from only ten earthquake data. There have been no reports on Q_S^{-1} in Korea. Using more than 120 earthquakes recorded on the network from 1994 to 2000, we first make the simultaneous measurement of Q_P^{-1} and Q_S^{-1} by means of extended coda-normalization method developed by Yoshimoto et al (1993).

We found strong frequency dependence from the plots of Q_P^{-1} and Q_S^{-1} for each station. Q_P^{-1} and Q_S^{-1} of each station decreased from $(7\pm2)\times10^{-3}$ and $(5\pm4)\times10^{-3}$ and at 1.5 Hz to $(5\pm4)\times10^{-4}$ and $(5\pm2)\times10^{-4}$ at 24 Hz, respectively (see Figures). The standard deviations represented by error bars are smaller in high frequency than those in low frequency. If we fit a power law depending on frequency, the best fit lines for all these Q_P^{-1} and Q_S^{-1} are $0.009\ f^{-1.05}$ and $0.004\ f^{-0.70}$, respectively. The best fit line for Q_P^{-1} shows a good agreement with the Kim et al. (1999)'s measurement, which was carried out in the same area based on the reversed two-station method. These results indicate that $Q^{-1}{}_S$ and $Q^{-1}{}_P$ in the Yangsan fault area correspond to those in the shield region, where the attenuation values are the lowermost in the world. On the other hand, the power indexes of the frequency agree well with those in the other areas.

Acknowledgements

This paper was accomplished with Research Fund provided by Korea Science & Engineering Foundation (No. 1999-2-311-005-3).

References

Kim, S.K., M.S. Jun and J.K. Kim (1999). *J. Geol. Soc. Korea* **35,** 223-228 (in Korean).
Sato, H. and M. C. Fehler (1998). Springer-Verlag New York, Inc., 308 pp.
Yoshimoto, K., H. Sato, and M. Ohtake (1993). *Geophys. J. Int.* **114,** 165-174.

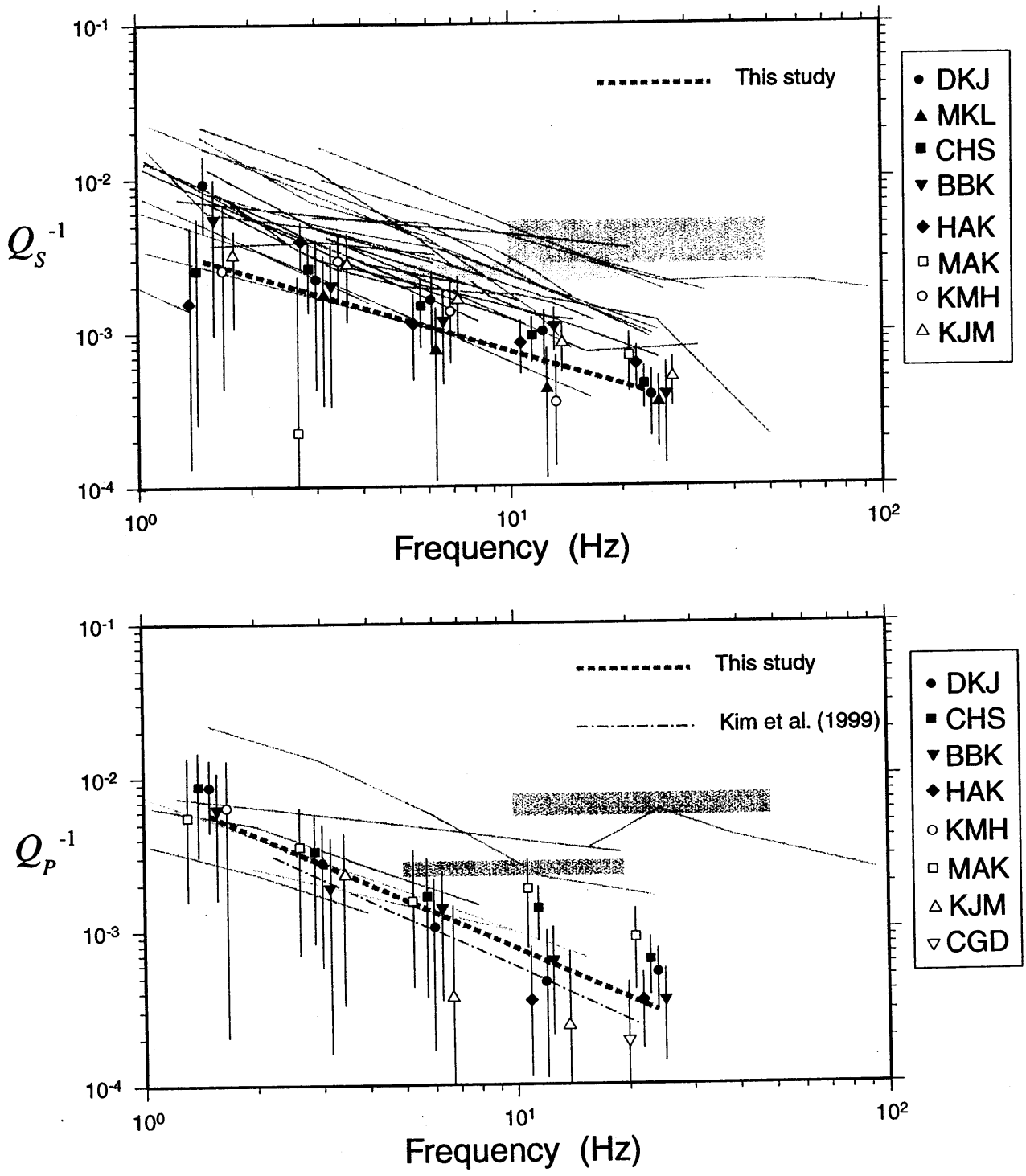

Figure. The comparison of $Q^{-1}{}_S$ (upper) and $Q^{-1}{}_P$ (lower) for our result and past studies (shaded, after Sato and Fehler, 1998). The broken lines refer to the fitting of the values of the each station.