Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

SSS33-P31 Room:Convention Hall Time:May 19 18:15-19:30

Attenuation measurements by laboratory tests using rock core samples for earthquake ground-motion estimation

Hiroaki Sato[1*], Shinako Noguchi[1], Tetsuji Okada[1]

[1]Central Research Institute of Electric Power Industry

An applicability of attenuation measurements by laboratory tests using rock core samples (5 cm-diameter and 10 cm-long) is described. The pulse rise-time technique [Gladwin and Stacey,1974] and the spectral ratio technique [Toksoz et al, 1978] were applied to measure an attenuation of four granite core samples by ultrasonic wave measurements using S-wave transducer of 100 kHz. As a result, the damping factors ranged from 0.009 to 0.014 (Qs=37˜54) were obtained from the pulse rise-time technique. Additionally, from the spectral ratio technique, the damping factors ranged from 0.009 to 0.014 (Qs=37˜54) were obtained by using aluminum with Qs=150000 [Zamanek and Rundnik, 1961] as a reference sample. These results indicate that almost equal damping factors are estimated by two different techniques used ultrasonic wave measurements. Further, the cyclic uni-axial compression tests using cyclic loading wave of 0.1 Hz were also performed to get stress-strain curves with ten stress-levels for same samples used in ultrasonic wave measurements. From the stress-strain curves, we found that the curves with the strain levels lower than about $2.x10^{-5}$ were difficult to provide reliable damping factors because of an unstable and distorted shape of hysteresis loops. Meanwhile, the damping factors with the four strain levels ranged from $2.6x10^{-5}$ to $2x10^{-4}$ were obtained from the stress-strain curves and showed strain-dependent characteristics. The damping factors of minimum strain level of $2.6x10^{-5}$ were obtained from 0.008 to 0.01 (Qs=50˜63). From the comparison with the results from ultrasonic wave measurements, we showed that almost the same damping factors of small-strain level were estimated by the two different methods.

Keywords: rock core sample, attenuation measurement, ultrasonic wave measurement, cyclic uni-axial compression test, near surface rock, earthquake ground-motion estimation