

The Attenuation Relation for Ratio of S- PGA to P-PGA

*Yukio Fujinawa¹, Yoichi Noda²

1. Mierika Bousai, Ltd., 2. Tierra Tecnica Ltd.

The performance of the earthquake early warning (EEW) depends on rapidness and accuracy. Responding to the needs of particular users, a hybrid system using the central EEW and the on-site seismometer has been pursued from 2006. The system estimates the PGA(S) using the P wave PGA(P) of earlier arrival. Here we tried to construct a new attenuation formula for the ratio α between PGA(S) and PGA(P) taking account of the individual radiation pattern.

The strong motion strength is composed a) the radiation effect, b) attenuation and scattering, c) ground site effect. Latter two terms have been extensively investigated using empirical parameters to be corrected under the condition minimum residual. Sample earthquakes are those under the capital. Seismic data of the K-net of NIED are analyzed to estimate PGA, dominant frequencies, and the P/S ratio.

The P/S ratio for the North Tokyo Bay earthquake and the Genroku-type EQ. are 3.7 ± 1.8 , and 3.5 ± 1.8 nearly the same as the default value 3.4. On the other hand, the Tachikawa City Eq. and Tokai earthquake have 6.0 ± 1.7 and 5.1 ± 1.1 , respectively. The Tama City Eq. has 2.2 ± 1.5 , very small value. The factor analysis showed the radiation effect is the dominant among the four factors. Further, the transversal dissipation was found to be introduced to agree the estimated α with the observed one. The Q factor for the transversal direction Q_t is found to be $1/5$ of Q_s , and $Q_{so} = 93$, $Q_{po}/Q_{so} = 2/3$, and the geometrical dissipation index are $n_s = n_p = 0.69$.

It is found that the constructed formula agrees with the observed value of P/S ratio within a limit of several tens percent of intensity scale of JMA I_{jma} . The α value of the first approximation α_1 is obtained at the arbitrary site using the seismic parameters, the second by using correction term for the i -th seismic zone ν_i , and the third another correction ε_{ij} due to the combined effects of the earthquake and site j .

Keywords: Earthquake early Warning, strong motion forecast, Ratio of S- PGA to P-PGA, Attenuation Relation, Radiation Relation, 2D dissipation