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STRONG GROUND MOTION SOURCE SCALING AND ATTENUATION MODELS FOR EARTHQUAKES LOCATED IN DIFFERENT SOURCE ZONES IN TAIWAN

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ABSTRACT

The ground-motion database collected recently in Taiwan was used for evaluation of strong ground motion models. The database contains more then 2800 acceleration records from M > 3.0 – 3.5 earthquakes occurred in 1993-2004. The records were obtained at rock (class B) sites located in the northern and eastern parts of Taiwan. Parameters of attenuation models (geometrical spreading and anelastic attenuation) were evaluated using acceleration spectra corrected for the site effect. The horizontal-to-vertical Fourier spectral ratio of the S-wave phase was used for the correction. The analysis was performed for three characteristic zones, namely: shallow (hypocentral depth < 30-35 km) earthquakes occurred beneath central Taiwan, shallow offshore earthquakes occurred to the east of island, and deep earthquakes (depth > 35 km). Analysis of spectra corrected for site effect, attenuation, and the influence of upper crust (*kappa*-factor) showed that the source spectra in Taiwan region may be described by the ω-square spectral model (Brune, 1970). The value of seismic moment is estimated from regional relationships between seismic moment and local magnitude. The stress parameter should be considered as a magnitude-dependent quantity (120-150 bars for M 5.0 and 250-300 bars for M 6.8) for shallow earthquakes beneath central Taiwan. The offshore and deep earthquakes are characterized by relatively constant values of the stress parameter.

Keywords: Strong Ground Motion, Attenuation Relation, TSMIP, Taiwan

INTRODUCTION

The Fourier amplitude spectrum (FAS) is widely used for strong ground motion prediction and estimating seismic hazard. One of the used approaches to describe the dependence of Fourier amplitude spectra on magnitude, distance and local soil condition, does consider the source, propagation, and site effects separately (e.g. Lam et al., 2000; Boore, 2003). First, the source spectral model (e.g. Brune, 1970) is introduced as a function of magnitude (seismic moment) and stress parameter or maximum slip velocity. Second, the source spectrum is modified as it propagates through the crust and the modification includes attenuation of ground motion with distance and amplification of motion by near surface velocity gradient. Third, the site effect is considered by means of frequency-dependent amplification functions.

The seismicity in the Taiwan area is very high, and many strong earthquakes (M > 6) occurred in the region during last hundred years. The ground motion database collected in Taiwan provides an

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