A COMPARISON OF NGA GROUND MOTION PREDICTION EQUATIONS TO STRONG MOTION DATA OF TAIWAN

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Ground-motion prediction equations (GMPEs) developed in the Next Generation Attenuation (NGA) project has been used world-wide for application to shallow crustal earthquakes. About half of the data in the NGA dataset are from the 1999 Chi-Chi Taiwan earthquakes and its 5 aftershocks. It will be useful to know if the GMPEs developed by NGA can be used to predict the ground-motion for Taiwan's earthquake especially for median to small magnitude earthquake that happened frequently. Also, by adding NGA's GMPEs for the PSHA in Taiwan will help to reduce epistemic uncertainty in ground-motion model if these model are applicable for Taiwan's ground-motion data.

A large set of strong ground-motion records from Taiwan is compiled and compared to the NGA models. The database used in this study comprises 9676 three-component horizontal acceleration time history recorded form 91 earthquakes with magnitudes ranging from 3.5–7.6. All the records were processed by baseline correction and by band-pass filtering with a causal 4-pole Butterworth filter, channel by channel. The selection of low-cut corner frequency was based on the shape of pseudo spectral velocity (PSV) and Fourier amplitude spectra.

The comparison is made by examining the residuals against several key predictors (moment magnitude, distance, depth to top of rupture, and Vs30) of the NGA models for PGA, 5%-damped pseudo spectral accelerations at 0.1, 0.3, 0.5, 1, 3, and 5 second period. The residuals are calculated as observed value minus predicted value in the natural logarithm domain (i.e. residual = ln(observe) - ln(predict)) and divided into two types of residuals, the inter-event and intra-event residuals.

The results suggest, overall, the magnitude, distance, and soil (Vs30) scaling of the four NGA models examined in this study work for Taiwan.