

# High Frequency Earthquake Ground Motion Scaling in Southeastern Canada and Korea

Young-Soo Jeon, B.E., M.S.

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# Abstract

Vertical and horizontal component velocity seismograms from the CNSN seismic network of southeastern Canada and from the KMA and KIGAM networks of Korea are used for this study of high frequency ground motion scaling. I analyzed a data set consisting of 4646 three component seismograms for southeastern Canada, distances  $< 400$  km, and 2701 three component waveforms for Korea, distances  $< 600$  km. I performed the regressions of Fourier velocity spectra and peak filtered ground velocities for southeastern Canada, the Korean peninsula, and inland Korea for different combinations of vertical and horizontal components.

The regression results for southeastern Canada are characterized by rapid decreases of amplitude at distance less than 40 km ( $r^{-1.3}$ ) and three segments of geometrical spreading at mid distance ranges (40 - 400 km). The associated model for the attenuation term can be expressed by  $Q(f) = 650f^{0.33}$ . The geometrical spreading functions for vertical, horizontal, and all component show same values at mid to long distance ranges, while there are some deviations at shorter distance ranges. Even if the spectral parameters of kappa = 0.01 sec, and stress drop of 200 bars are selected to predict the theoretical excitation spectra, the Brune (1970) model does not fit the excitation spectra for events with moment magnitude greater than 4. The earthquakes in this region may have a distribution of stress drops rather than a single universal stress drop.

The regression results for Korea are parameterized by  $Q(f) = 330 f^{0.40}$  and

typical geometrical spreading for both Korean peninsula and inland Korea. The Korean wave propagation study results indicate a more moderate near source amplitude decay at short distance ranges (less than 40 km) than seen in southeastern Canada. The oceanic events do not introduce any bias in determining the wave propagation functional. A  $\kappa = 0.005$  sec, and stress drop of 200 bars for Korean peninsula and  $\kappa = 0.005$  sec, and stress drop of 300 bars for inland Korea are selected for spectral parameterizations. A simple modification of the two-corner model of Atkinson (1993a) yields better fit to Korean excitations in the high frequency ranges compare to those of Brune (1970) model which showed the lack of fit at moderate size magnitude events.