HIGH FREQUENCY EARTHQUAKE GROUND MOTION SCALING IN UTAH

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Vertical component velocity seismograms from the University of Utah Seismograph Stations are used to measure and quantify high frequency ground motion scaling for the seismically hazardous Wasatch front in Utah. This study analyzed a data set consisting of about 3000 waveforms from 110 stations and 238 regional earthquakes and mining related seismic events in the range of 10 - 500 kilometer hypocentral distance.

The signals were processed to examine the peak ground velocity and Fourier velocity spectra in the frequency range of 1 - 16 Hz. Random vibration theory (RVT) is used to test estimates of the peak ground motion in the time domain and duration defined by the limits of 5% - 75% seismic energy that follows the onset of the S-waves. Comparison of the Fourier velocity and peak filtered time domain regressions indicated that our RVT related duration term for band pass filtered spectra is properly estimated and both regression results display consistent shapes.

Both regression results are characterized by rapid decreases of amplitude at short distance. Low $Q(f)$ (seismic attenuation) and rapid $g(r)$ (geometrical spreading) are required by forward modeling. Using two different geometrical spreading functions at short distances, I found $Q = 145f^{0.65}$ for model A and $Q = 180f^{0.6}$ for model B which are lower than those obtained in previous studies of Q in the Basin and Range province.

Possible explanations for the excitation of mining events are (1) an additional attenuation due to shallow anelastic attenuation near the source, and (2) that low stress drop events are produced by the slow collapse of long tunnels. Low stress drops imply lower corner frequencies for a given M_W. There is a better fit with the low stress drop event ($\Delta\sigma = 0.1$ bar) in spite of unrealistically large seismic moments.