# Study of average envelope shapes of small earthquakes at rock and sedimentary sites

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Average envelope shapes (mean square amplitude time histories) of small earthquakes represent a convenient basis for the construction of semi-empirical stochastic 'Green's functions', needed for prediction of future strong ground motion. To determine such shapes in the Kinki region we use the records of near (R smaller than 100 km) shallow earthquakes located around the CEORKA network. At first step, on the rock-site records, we select the S-wave group and determine its root-mean-square duration Trms, separately for each of the 4 octave frequency bands: 1-2, 2-4, 4-8 and 8-16 Hz. Then we determine the empirical Trms vs. R dependence and find it proportional to R^0.6-R^0.7. At the reference distance R=100 km, average Trms decreases from 6.0 sec for the 1.5 Hz band to 4.5 sec for the 6 Hz band. At second step, to analyze average envelopes, we assume that the functional form of the envelope shape function is independent of distance, and stretch each of the observed envelopes along the time axis so as to reduce it to a fixed distance. Through averaging of these envelopes we obtain characteristic envelope shape functions for rock ground condition. At third step we estimate envelope station correction for sedimentary CEORKA sites using deconvolution of the average rock-site envelopes from observed envelopes at a soft-soil site.

Effect of broadening of envelopes with distance due to random scattering is especially important for simulating high-frequency seismic records of large, relatively distant, interplate, subduction zone earthquakes. To demonstrate applicability of our average band-pass envelopes and envelope site corrections to the stochastic simulation of strong ground motion records we simulated ground motion for a few moderate earthquakes recorded by CEORKA and compare them with observed records.