**Electronic Supplement to**

**Adjusting Eastern North America Ground-Motion Intensity Measures Between Sites with Different Reference Rock Conditions**

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This Electronic Supplement includes two zip files. One zip file contains files used by the SMSIM stochastic simulation programs *tmrsk\_loop\_rv\_drvr* and *ratios\_of\_loop\_program\_output* in the simulations used to develop the site adjustment factors. That file also contains the output files with the simulated values. The other zip file contains three files with ratios of the ground-motion intensity measures (IMs) between hard-rock sites ( and ) and NEHRP B/C sites (B/C; ). All of the files are in ASCII format and can be easily opened in a spreadsheet for subsequent analysis.

**SMSIM Input and Output Archives**

**Download**: *reference\_rock\_adjustments.smsim\_input\_and\_output\_files\_for\_esupp.zip* [zipped plain text files; 4.4 Mb]. The file names contain information about the models. See Boore (2005) for more information about using the SMSIM programs. For example, the SMSIM parameter file *ena.scf.bt15scr\_fff.bs11\_atten.bt15\_dp.dmb\_avg\_bc\_amps.bt15e\_drms.params* is for eastern North America (ENA). It uses a single corner frequency source model (scf), the Boore and Thompson (2015) stable continental region finite-fault factor (bt15scr\_fff), the Boatwright and Seekins (2011) attenuation model (bs11), the Boore and Thompson (2015) path-duration model (bt15\_dp), the average B/C amplifications from this article (dmb\_avg\_bc\_amps), and the Boore and Thompson (2015) adjustments to the random-vibration-theory (RVT) simulations to account for the finite-duration time series (bt15e\_drms). See Boore (2005) for more information about using the SMSIM programs.

As an example of how to interpret the name of the output files, tmrsk\_loop\_rv\_drvr.avg\_bc\_amps.m\_3\_4\_5\_6\_7\_8.rrup\_2\_to\_1200.k0\_0.006\_0.01\_0.02\_0.03\_0.04.vs\_period.sktmr.col is for the average B/C amplifications for moment magnitudes (**M**) 3, 4, 5, 6, 7, and 8; closest distances to the rupture plane () of 2 km to 1200 km, and site diminution () values of 0.006 s, 0.01 s, 0.02 s, 0.03 s, and 0.04 s. Note that the output files for the hard rock sites with Vs30=2000 m/s and Vs30=3000 m/s have the same value of 0.006 s for the five values. This was necessary because the ratios of the contents of the different SMSIM output files are computed line-by-line for the files. Peak ground velocity (PGV) and peak ground acceleration (PGA) correspond to periods of -1.0 and 0.0, respectively; otherwise, the period is the natural period of the 5%-damped pseudo-absolute acceleration response spectral ordinate (PSA).

The columns have these units and meanings:

damp: fractional damping of the oscillator (ignored for PGA and PGV)

T: s, oscillator period (=0 for PGA and = -1 for PGV)

F: Hz, oscillator frequency

M: moment magnitude

Rjb: km, Joyner-Boore distance (closest horizontal distance to the vertical projection of the fault onto the surface)

h : km, depth, used to convert Rjb to a slant distance as follows:

 (1)

Rrup: km, slant distance, computed as in equation (1)

FF\_F: km, finite-fault factor, used to convert Rrup to the effective point-source distance used in the stochastic-method simulations, using this equation

 (2)

Rps: km, effective point-source distance, computed as in equation (2)

k0: s, distance-independent diminution factor. The Fourier amplitude of the ground motion is decreased using this operator: 

numsource: The source model used for the simulations (see the SMSIM [Boore, 2005] parameter file)

S: bars, stress parameter used in SMSIM simulations

gmim\_dk80(g): ground-motion intensity measure, units of g (except for PGV, which has units of cm/s)

gmim\_dk80(cgs): ground-motion intensity measure, units of cm/s/s for PSA and PGV and cm/s for PGV

**Coefficients of the Ground-Motion Intensity Measure (IM) Ratios Archive**

**Download**: *reference\_rock\_adjustments.im\_adjustments\_between\_hr\_bc\_for\_esupp.zip* [zipped plain text files; 10.7 Mb]. The IM adjustment ratios are summarized in this archive file. The files contain many columns, which should be self-explanatory and are, therefore, not described in detail. The first two lines give the names of the two files for which ratios are computed (file 1 = f1 and file 2 = f2), and the site condition for each file is indicated in the file name (e.g., “2kps” in the file name indicates that the file contains motions for  [2000 m/s]). Ratios are given for both f1/f2 and f2/f1, as well as the square of these ratios (for purposes not relevant to this article). PGV and PGA correspond to periods of -1.0 and 0.0, respectively; otherwise, the period is the natural period corresponding to the specified PSA spectral ordinate. The output of the files is organized as follows: , T, **M**, and R; where, T is period (s) and R is the value of  (km). In other words, for a given value of , there is a block of IMs with constant period, and in that block there is a subset of IMs of constant **M**, and within that subset there is a further subset of IMs that varies with R. This organization makes it easy to plot the site adjustment factors against distance for specified values of , T, and **M**.

The columns have these units and meaning:

Damp: fractional damping of the oscillator (ignored for PGA and PGV)

per: s, oscillator period (=0 for PGA and = -1 for PGV)

freq: Hz, oscillator frequency

m: moment magnitude

Rjb\_f1: km, Joyner-Boore distance (closest horizontal distance to the vertical projection of the fault onto the surface) for file 1

Rjb\_f2: km, as above, for file 2

h\_f1: km, depth for file 1, used to convert Rjb to a slant distance using equation (1)

h\_f2: as above, for file 2

Rrup\_f1: km, slant distance, computed as in equation (1)

Rrup\_f2: as above, for file 2

FFF\_f1: km, finite-fault factor for file 1, used to convert Rrup to the effective point-source distance used in the stochastic-method simulations, using equation (2)

FFF\_f2: as above, for file 2

Rps\_f1: km, effective point-source distance, computed as in equation (2)

Rps\_f2: as above, for file 2

k0\_f1: s, distance-independent diminution factor for file 1. The Fourier amplitude of the ground motion is decreased using this operator: 

k0\_f2: as above, for file 2

numsrc\_f1: The source model used for the simulations (see the SMSIM (Boore, 2005) parameter file) for file 1

numsrc\_f2: as above, for file 2

stress\_f1: bars, stress parameter used in SMSIM simulations for file 1

stress\_f2: as above, for file 2

y\_f1: g for PSA and PGA (per=0.0), cm/s for PGV(per=-1.0), simulated intensity measure for file 1.

y\_f2: as above, for file 2

f1/f2: IM for file 1 divided by IM for file 2

f2/f1: IM for file 2 divided by IM for file 1

(f1/f2)^2: The square of the IM measure ratio

(f2/f1)^2: as above.

References

Boatwright, J., and L. Seekins (2011). Regional spectral analysis of three moderate earthquakes in northeastern North America, *Bull. Seismol. Soc. Am.* **101**, 1769–1782.

Boore, D. M. (2005). SMSIM—Fortran programs for simulating ground motions from earthquakes: Version 2.3, a revision of OFR 96-80-A, Revised 15 August 2005, *U.S. Geol. Surv. Open-File Rept.* 00-509, 55 pp.

Boore, D. M., and E. M. Thompson (2015). Revisions to some parameters used in stochastic-method simulations of ground motion, *Bull. Seismol. Soc. Am.* **105**, 1029–1041*.*