Ground motions for the PEER Transportation Systems Research Program

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Delivered product: standardized ground motion sets

http://peer.berkeley.edu/transportation/gm_peer_transportation.html

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Publications & Data

Ground Motions for PEER Transportation Research Program

by Nirmal Jayaram, Shrey Shahi and Jack Baker, 2010

The following files document selected ground motions for use in the PEER transportation systems research program.
Documentation

Documentation

The following are presentations given in the process of developing these ground motions:

– January 21st draft report documenting selected ground motions and the methods used to select them. (PDF file - 752 KB)

Set #1: Broad-band ground motions (M = 7, R = 10 km, soil site)

See the report above for background regarding the selection of these ground motions.

– Spreadsheet documenting selected ground motions. Worksheets are provided to list a summary of the selected ground motions' metadata, their response spectra, and comparisons of the ground motion set's mean, standard deviation to comparable values predicted by ground motion models. (Excel file - 676 KB)

– Zip file containing acceleration time histories for the 40 selected ground motions. Fault-normal, fault-parallel and vertical components are included. (Zip file - 7 MB)

Set #2: Broad-band ground motions (M = 7, R = 10 km, rock site)

See the report above for background regarding the selection of these ground motions.

– Spreadsheet documenting selected ground motions. Worksheets are provided to list a summary of the selected ground motions' metadata, their response spectra, and comparisons of the ground motion set's mean, standard deviation to comparable values predicted by ground motion models. (Excel file - 664 KB)

– Zip file containing acceleration time histories for the 40 selected ground motions. Fault-normal, fault-parallel and vertical

Broadband ground motions

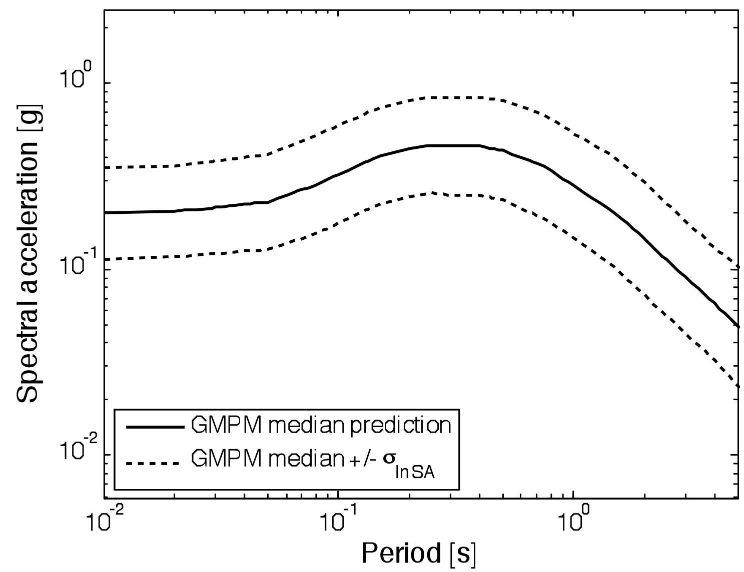
- Selected to match the median and variability in response spectra associated with an M = 7, R = 10 km strike slip earthquake

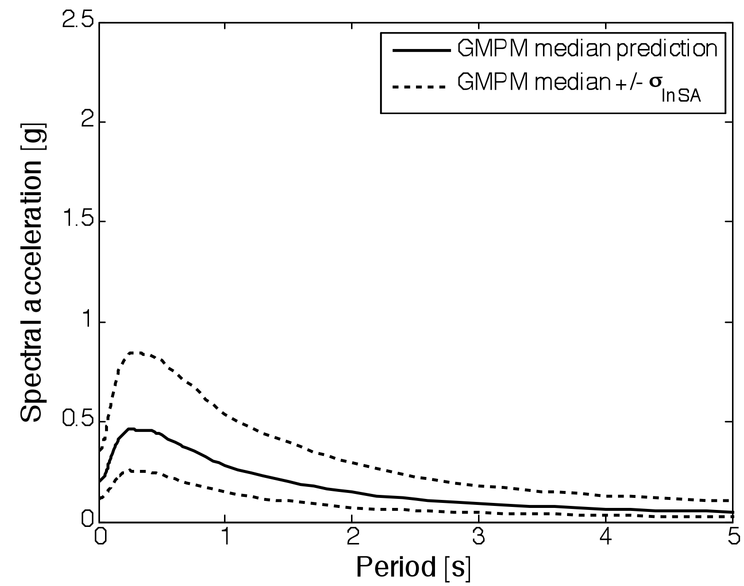
- Separate sets are provided for soil and rock conditions (V_{s30} = 250m/s and 760m/s)
  - Recordings from appropriate sites
  - Target spectra account for site conditions

- This required development of a new ground motion selection algorithm:

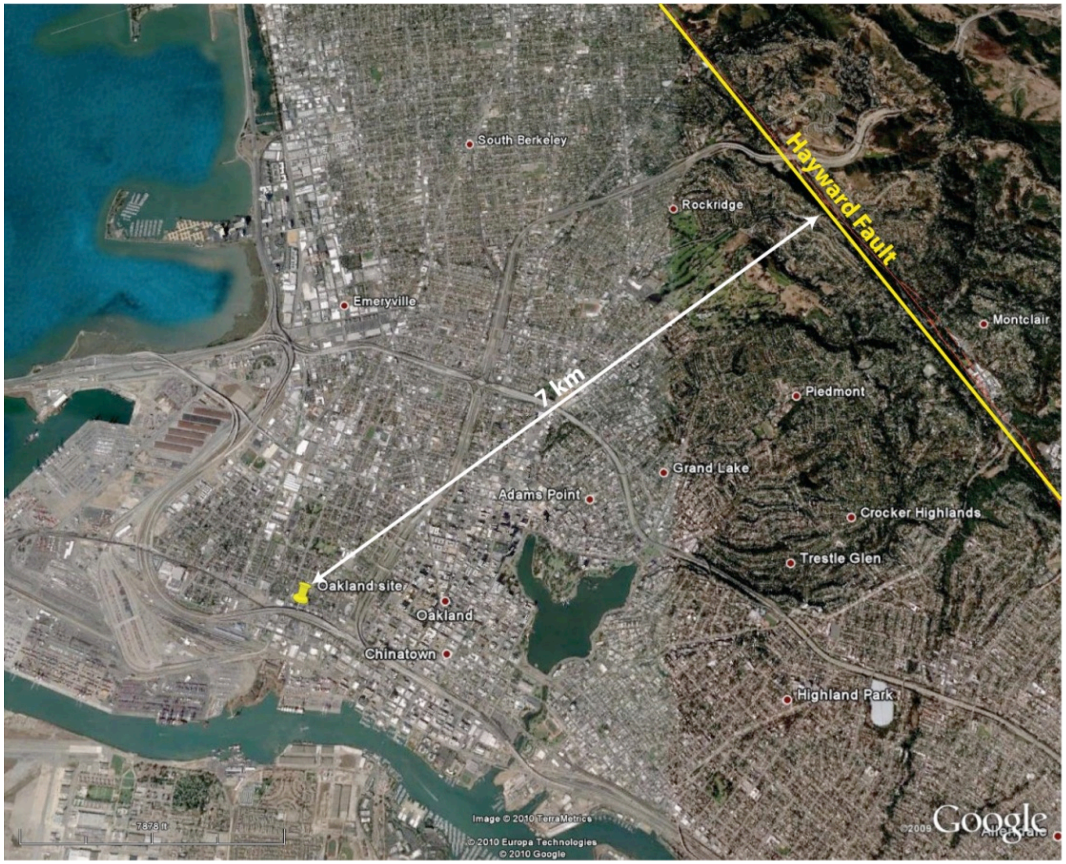
Jayaram, N., Lin, T., and Baker, J. W. (2010). "A computationally efficient ground-motion selection algorithm for matching a target response spectrum mean and variance." *Earthquake Spectra*, (in press).

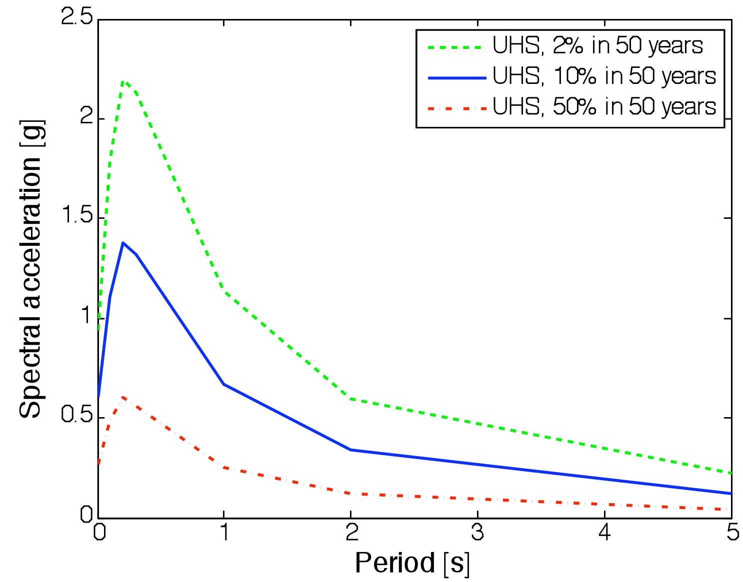
Target spectrum:

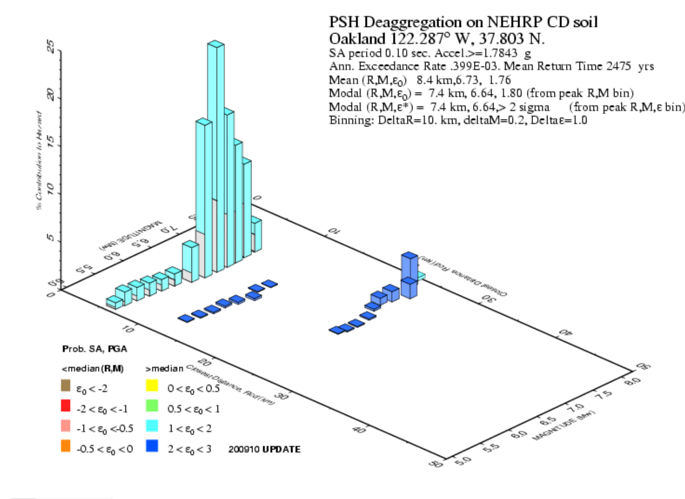




Site-specific ground motions for Oakland I-880 Viaduct



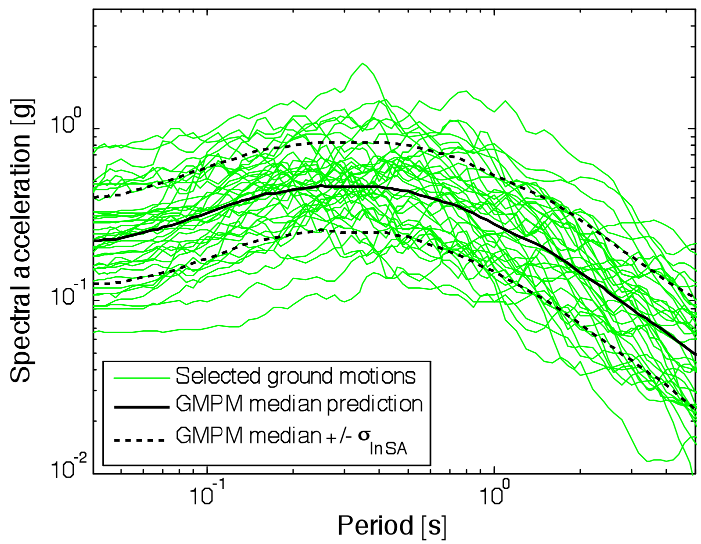


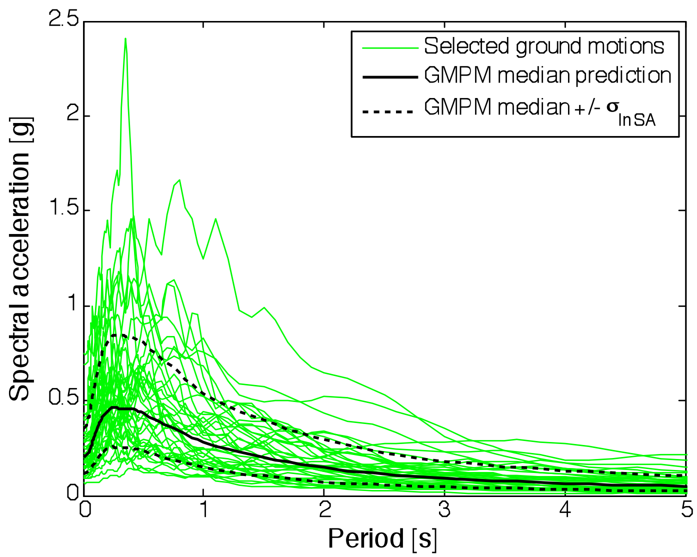


- Same location as the PEER I880 testbed
- Ground motions selected to *closely* match USGS Uniform Hazard Spectra and Deaggregations

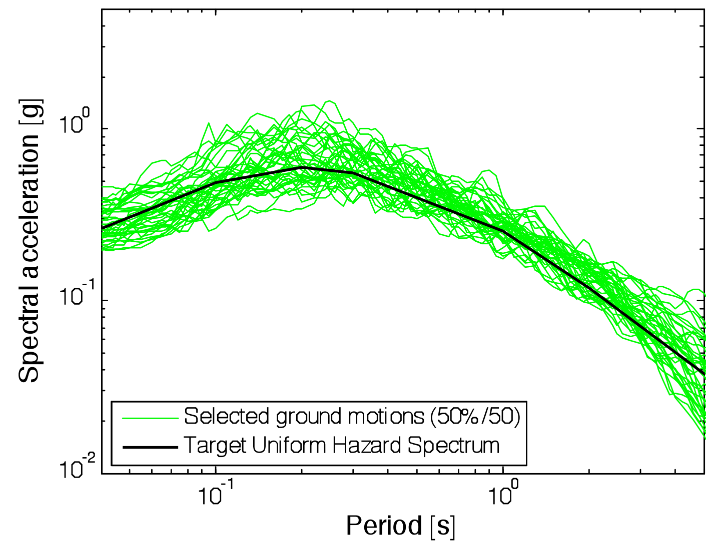
Comparison of ground motions

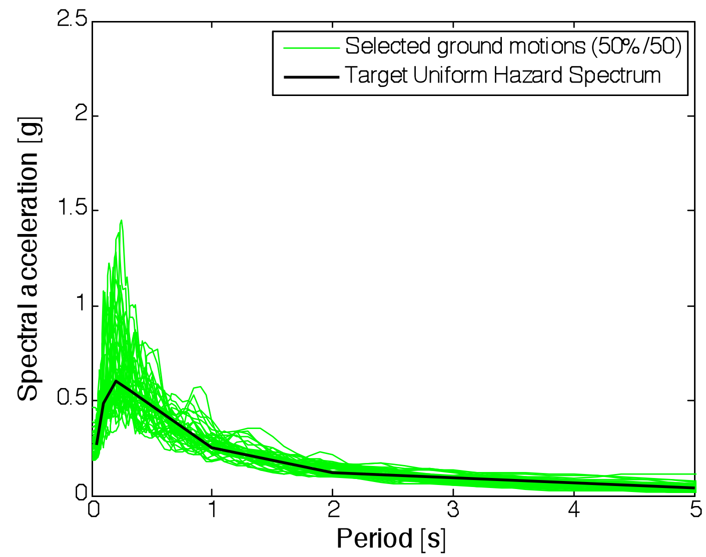
Broadband soil ground motions





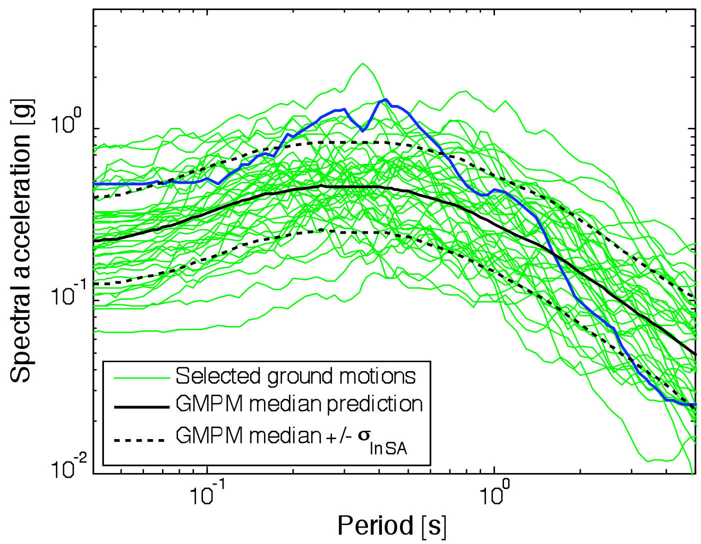
50%/50 yrs site-specific ground motions



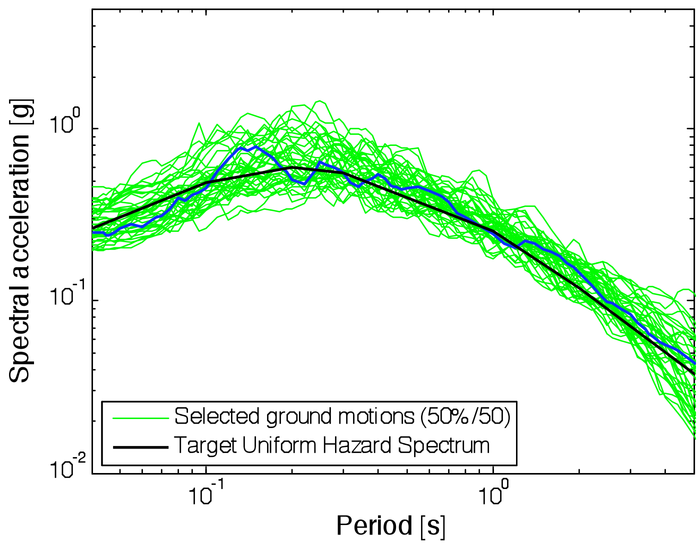


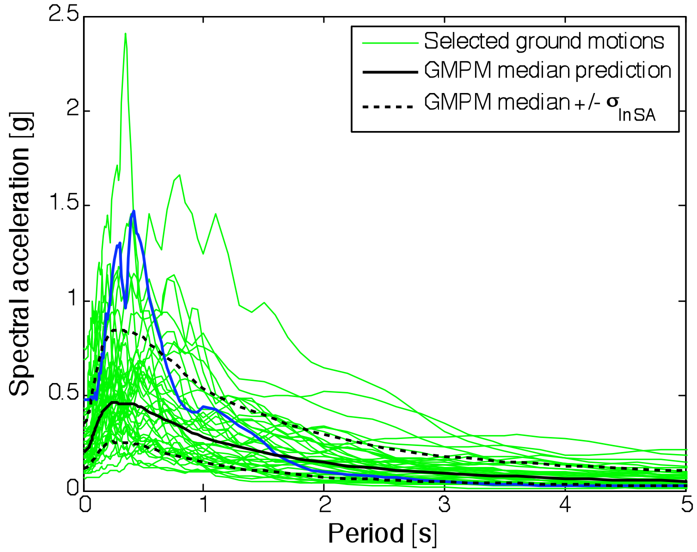
Comparison of ground motions

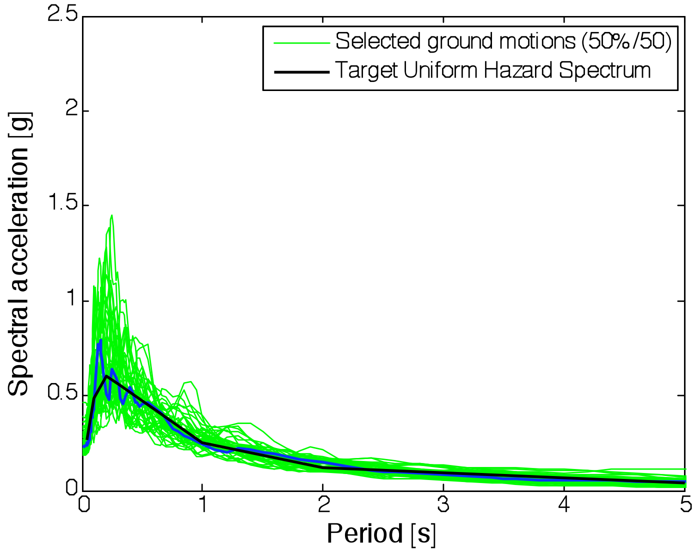
Broadband soil ground motions



50%/50 yrs site-specific ground motions

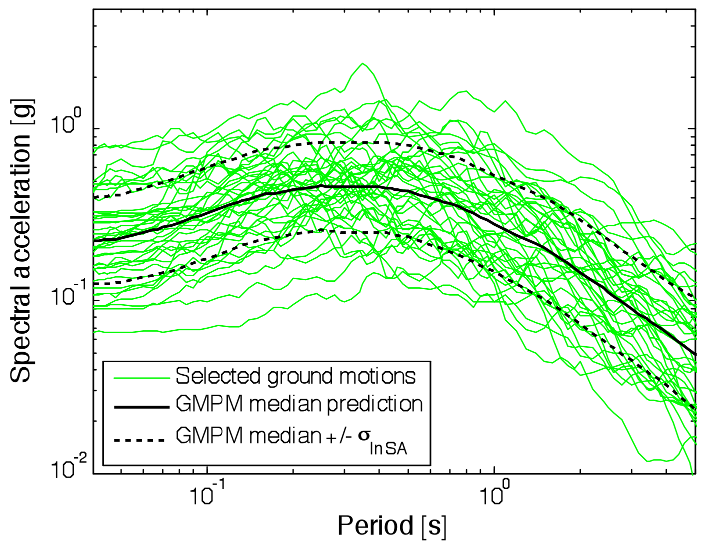


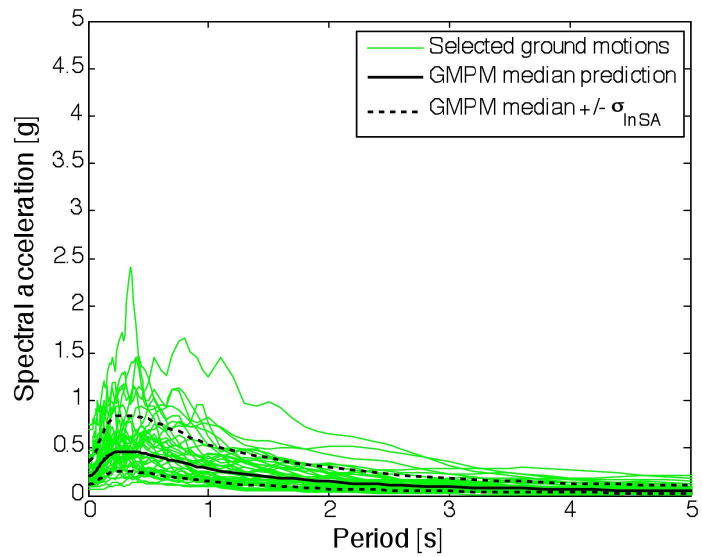




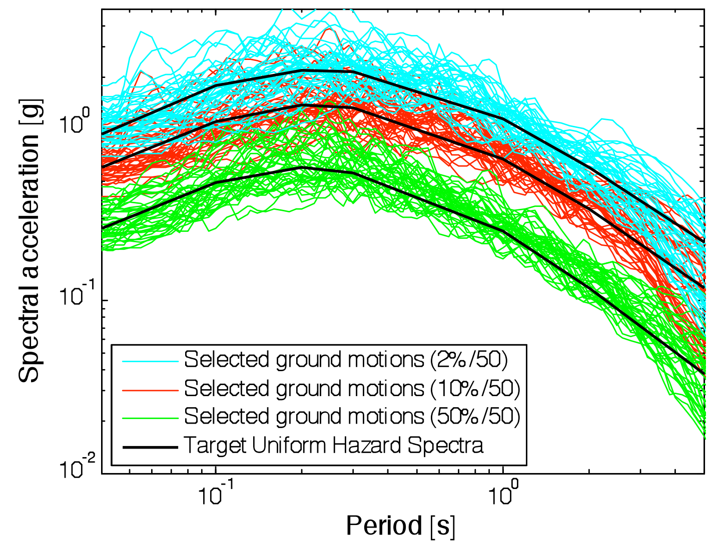
Comparison of ground motion spectra

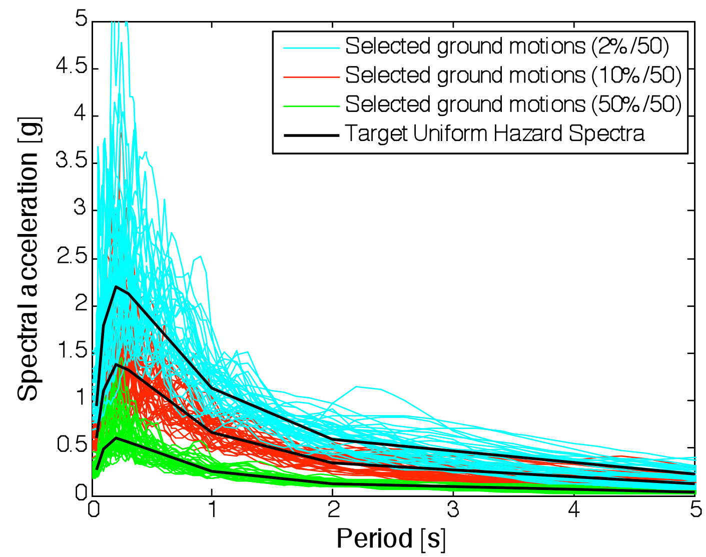
Broadband soil ground motions





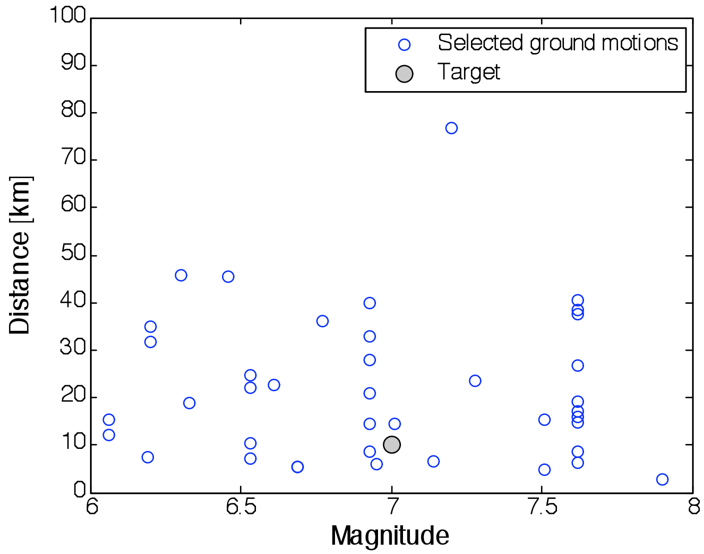
Site-specific ground motions



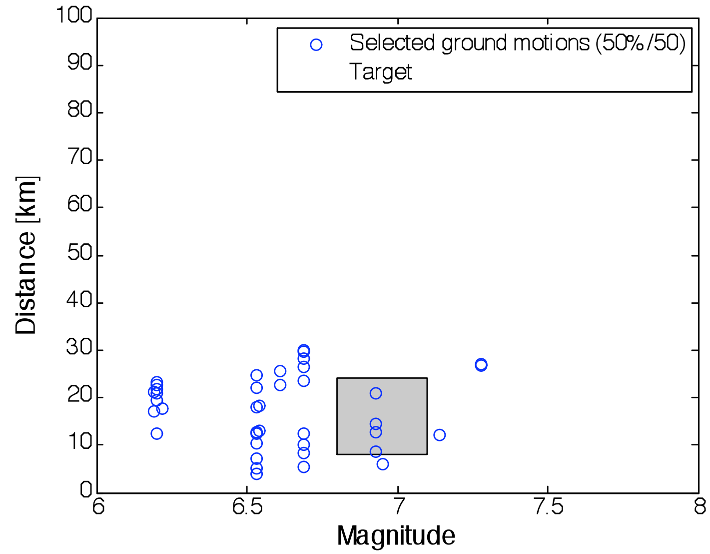


Comparison of other ground motion properties

Broadband soil ground motions



50%/50 yrs site-specific ground motions



Other properties

- Variability included
- No scaling
- Velocity pulses not specifically included or excluded

Other properties

- No variability desired in spectra or other properties
- Scaled to match targets
- Velocity pulses included in proportion to expected occurrence at the site of interest

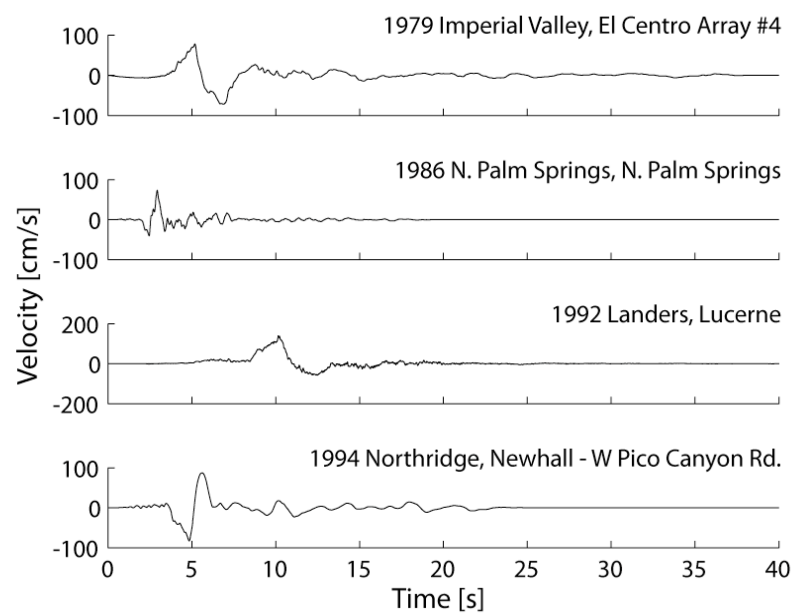
Another set of ground motions: near-fault motions with pulses

Set #3: Pulse-like ground motions

See the report above for background regarding the selection of these ground motions. Further information on the technique used to identify these ground motions is available here.

- Spreadsheet documenting the properties of the selected pulse-like ground motions. (Excel file - 1.75 MB)
- Zip file containing acceleration and velocity time histories for the 40 selected pulse-like ground motions. Strike-normal, strike-parallel and vertical components are included. Separate sets of these time histories are provided for the original ground motions, extracted pulses, and residual ground motions. (Zip file - 16.2 MB)
- Link to web page listing selected pulse-like ground motions, and providing plots of pulse indicators and peak ground velocities for arbitrary horizontal orientations.

- Forty ground motions with strong velocity pulses in the fault-normal component are provided
- The pulse periods are tabulated
- Extracted pulses are provided separately



Provided data: summary metadata

	A	B	C	D	E	F	G	H	I	J	K	L
1	Record number	NGA Record Sequence Number	Earthquake Name	Year	Station	Magnitude	Hypocentral Distance	Closest Distance	Preferred Vs30 (m/s)	Assumed Fault Normal Orientation	Filename_Vertical	Filename_FN
2	1	231	'Mammoth Lakes-01'	1980	'Long Valley Dam (Upr L Abut)'	6.06	15.52	15.46	345.4	282	'M7_soil_UP_1.acc'	'M7_soil_FN_1.
3	2	1203	'Chi-Chi, Taiwan'	1999	'CHY036'	7.62	44.74	16.06	233.1	292	'M7_soil_UP_2.acc'	'M7_soil_FN_2.
4	3	829	'Cape Mendocino'	1992	'Rio Dell Overpass - FF'	7.01	24.55	14.33	311.8	260	'M7_soil_UP_3.acc'	'M7_soil_FN_3.
5	4	169	'Imperial Valley-06'	1979	'Delta'	6.53	35.17	22.03	274.5	233	'M7_soil_UP_4.acc'	'M7_soil_FN_4.
6	5	1176	'Kocaeli, Turkey'	1999	'Yarimca'	7.51	25.07	4.83	297	180	'M7_soil_UP_5.acc'	'M7_soil_FN_5.
7	6	163	'Imperial Valley-06'	1979	'Calipatria Fire Station'	6.53	58	24.6	205.8	233	'M7_soil_UP_6.acc'	'M7_soil_FN_6.
8	7	1201	'Chi-Chi, Taiwan'	1999	'CHY034'	7.62	46.82	14.82	378.8	292	'M7_soil_UP_7.acc'	'M7_soil_FN_7.
9	8	1402	'Chi-Chi, Taiwan'	1999	'NST'	7.62	89.2	38.43	375.3	306	'M7_soil_UP_8.acc'	'M7_soil_FN_8.
10	9	1158	'Kocaeli, Turkey'	1999	'Duzce'	7.51	99.52	15.37	276	163	'M7_soil_UP_9.acc'	'M7_soil_FN_9.
11	10	281	'Trinidad'	1980	'Rio Dell Overpass, E Ground'	7.2	78.22	-	311.8	319	'M7_soil_UP_10.acc'	'M7_soil_FN_10
12	11	730	'Spitak, Armenia'	1988	'Gukasian'	6.77	36.68	-	274.5	212	'M7_soil_UP_11.acc'	'M7_soil_FN_11
13	12	768	'Loma Prieta'	1989	'Gilroy Array #4'	6.93	36.79	14.34	221.8	38	'M7_soil_UP_12.acc'	'M7_soil_FN_12
14	13	1499	'Chi-Chi, Taiwan'	1999	'TCU060'	7.62	46.07	8.53	272.6	278	'M7_soil_UP_13.acc'	'M7_soil_FN_13
15	14	266	'Victoria, Mexico'	1980	'Chihuahua'	6.33	38.29	18.96	274.5	228	'M7_soil_UP_14.acc'	'M7_soil_FN_14
16	15	761	'Loma Prieta'	1989	'Fremont - Emerson Court'	6.93	57.86	39.85	284.8	38	'M7_soil_UP_15.acc'	'M7_soil_FN_15
17	16	558	'Chalfant Valley-02'	1986	'Zack Brothers Ranch'	6.19	17.47	7.58	271.4	58	'M7_soil_UP_16.acc'	'M7_soil_FN_16
18	17	1543	'Chi-Chi, Taiwan'	1999	'TCU118'	7.62	44.49	26.84	215	271	'M7_soil_UP_17.acc'	'M7_soil_FN_17
19	18	2114	'Denali, Alaska'	2002	'TAPS Pump Station #10'	7.9	84.89	2.74	329.4	199	'M7_soil_UP_18.acc'	'M7_soil_FN_18
20	19	179	'Imperial Valley-06'	1979	'El Centro Array #4'	6.53	28.9	7.05	208.9	233	'M7_soil_UP_19.acc'	'M7_soil_FN_19

Provided data: documentation of metadata

	A	B
1	**PEER broadband ground motions for soil sites**	
2	**Prepared by Nirmal Jayaram and Jack Baker, Stanford University**	
3	**November 15, 2009**	
4		
5	This spreadsheet provides documentation for the PEER "soil broadband" ground motions. A brief description of the include	
6		
7	These ground motions were selected so that their response spectra match the median and log standard deviations predict	
8	Magnitude = 7 earthquake	
9	Source-to-site distance = 10 km	
10	Site Vs30 = 250 m/s	
11	Earthquake mechanism = strike slip	
12	Response spectra predictions from the Boore and Atkinson (2008) ground motion model	
13		
14		
15	**"Records" Worksheet**	
16	This worksheet provides basic summary data regarding the selected ground motions. Columns are defined as follows:	
17		
18	Record number	Numbering for the selected ground motions. This matches the numbering of the ti
19	NGA Record Sequence Number	The corresponding record sequence number from the NGA Flatfile at http://peer.b
20	Earthquake Name	Earthquake name, from NGA Flatfile
21	Year	Year of earthquake
22	Station	Name of station where ground motion was recorded, from NGA Flatfile
23	Magnitude	Moment magnitude of earthquake
24	Hypocentral Distance	Distance from the recording site to hypocenter.
25	Closest Distance	Closest distance from the recording site to the ruptured area (if available)
26	Preferred Vs30 (m/s)	Preferred Vs30 from NGA Flatfile
27	Assumed Fault Normal Orientation	Assumed fault-normal orientation, used for rotating ground motions to fault-norm
28	Filename_Vertical	Filename for the vertical component of the ground motion
29	Filename_FN	Filename for the fault normal component of the ground motion
30	Filename_FP	Filename for the fault parallel component of the ground motion
31		
32	**"Response spectra" worksheet**	
33	Tabulated response spectra (in units of g) are provided here for the 40 selected ground motions	
34	Results are provided for the geometric mean of the fault-normal and fault-parallel components, the GMRotI50 values, a	
35	Plots are also provided at the top of the page comparing these response spectra to the predictions of Boore and Atkinsc	
36	The numerical values associated with the predictions of Boore and Atkinson are also provided at the top of this page	
37		

Provided data: response spectra

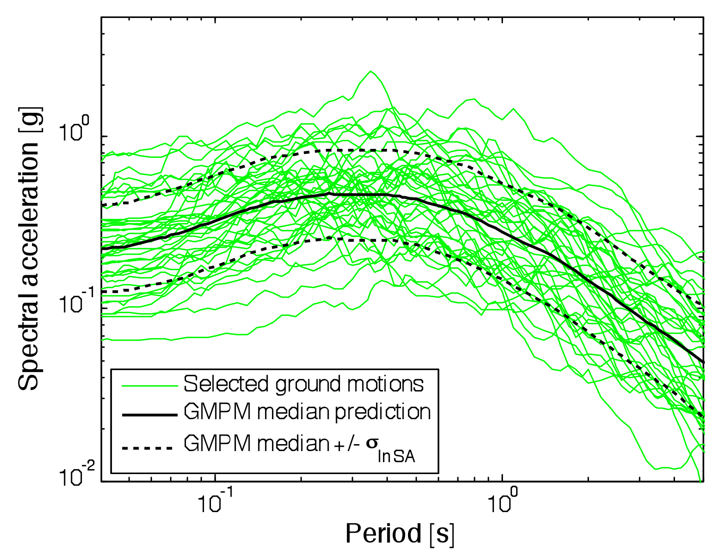
Target spectra, spectra for each horizontal component of each ground motion, geometric mean spectra, GMRotI50 spectra

Predictions from the Boore and Atkinson (2008) ground-motion prediction model

	Period (s) →																
	0.01	**0.02**	**0.022**	**0.025**	**0.029**	**0.03**	**0.032**	**0.035**	**0.036**	**0.04**	**0.042**	**0.044**	**0.045**	**0.046**	**0.048**	**0.05**	**0.055**
Median	0.199915	0.204768	0.207176	0.210451	0.214319	0.215212	0.217075	0.219688	0.220516	0.223641	0.225103	0.226506	0.227186	0.227854	0.229153	0.230406	0.240183
Log Standard deviation	0.566	0.566	0.568351	0.571503	0.575164	0.576	0.577642	0.579923	0.58064	0.583321	0.584563	0.585747	0.586319	0.586878	0.587961	0.589	0.592996

Geometric mean of FN/FP components

		Period (s) →																
		0.01	**0.02**	**0.022**	**0.025**	**0.029**	**0.03**	**0.032**	**0.035**	**0.036**	**0.04**	**0.042**	**0.044**	**0.045**	**0.046**	**0.048**	**0.05**	**0.055**
Record #	**1**	0.332808	0.329604	0.331231	0.334937	0.340809	0.348155	0.369678	0.413019	0.431402	0.495294	0.521013	0.555085	0.564498	0.58352	0.566915	0.573794	0.555106
↓	**2**	0.256526	0.256173	0.256273	0.256437	0.25674	0.256956	0.257665	0.258145	0.259775	0.259704	0.259835	0.263563	0.266454	0.267079	0.266536	0.275127	0.275386
	3	0.481281	0.481281	0.481281	0.481281	0.481281	0.481281	0.481281	0.481281	0.481281	0.481281	0.474968	0.475651	0.476949	0.47649	0.477132	0.480902	0.478264
	4	0.281412	0.281412	0.280105	0.281004	0.281889	0.28137	0.289974	0.283872	0.280184	0.283723	0.28386	0.285557	0.285505	0.285977	0.28879	0.29038	0.28836
	5	0.295792	0.295518	0.295512	0.296031	0.297932	0.299059	0.298639	0.297522	0.296478	0.302845	0.312576	0.312762	0.312444	0.309484	0.313117	0.31425	0.312129
	6	0.10198	0.101568	0.101592	0.101748	0.102378	0.102424	0.103898	0.104895	0.106341	0.109267	0.108251	0.111267	0.110232	0.110025	0.105267	0.113478	0.116406
	7	0.312625	0.312752	0.312953	0.313301	0.314632	0.315376	0.31569	0.317871	0.316723	0.3284							
	8	0.40282	0.40062	0.400505	0.402488	0.404821	0.404732	0.407654	0.406782	0.413368	0.4290							
	9	0.326152	0.325907	0.325925	0.326134	0.326391	0.326497	0.326706	0.326755	0.327022	0.3283							
	10	0.14715	0.146179	0.146584	0.146941	0.147305	0.147133	0.148214	0.148941	0.150435	0.1538							
	11	0.205186	0.205186	0.20483	0.205468	0.205993	0.205888	0.205485	0.20472	0.204091	0.2053							
	12	0.299604	0.299372	0.299289	0.299407	0.299624	0.299554	0.300031	0.300601	0.300656	0.3015							
	13	0.151939	0.151822	0.151776	0.151871	0.152045	0.152109	0.152499	0.153633	0.153479	0.1528							
	14	0.118765	0.118765	0.118423	0.118549	0.118938	0.119183	0.121213	0.119359	0.118646	0.1181							
	15	0.158686	0.158104	0.158171	0.158369	0.158746	0.158986	0.159429	0.160018	0.159231	0.1600							
	16	0.399877	0.398091	0.398842	0.399692	0.399569	0.401318	0.404694	0.405034	0.407835	0.4531							
	17	0.102779	0.102581	0.102605	0.102873	0.103298	0.103264	0.104023	0.106262	0.105074	0.1086							
	18	0.308684	0.308181	0.308157	0.308372	0.3089	0.309091	0.309621	0.310047	0.310337	0.3124							
	19	0.413965	0.412511	0.412305	0.412837	0.414479	0.417201	0.418358	0.417732	0.430748	0.4330							
	20	0.090349	0.090349	0.089683	0.089686	0.090747	0.090496	0.09033	0.089722	0.089974	0.0895							
	21	0.223681	0.223681	0.223681	0.223681	0.223681	0.223681	0.223681	0.223681	0.223681	0.2236							
	22	0.688884	0.688777	0.688107	0.689434	0.692428	0.693569	0.69601	0.700731	0.702941	0.7198							
	23	0.199549	0.199549	0.193579	0.199424	0.193373	0.19307	0.208143	0.205781	0.208109	0.207							
	24	0.222839	0.223079	0.222843	0.222863	0.226173	0.22696	0.227089	0.229339	0.237154	0.2261							
	25	0.285636	0.285621	0.285689	0.286095	0.286166	0.286026	0.286304	0.286196	0.286553	0.2877							



Provided data: prediction residuals (ε ’s)

Residuals for each horizontal component of each ground motion, geometric mean residuals, GMRotI50 residuals

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	**GMRotI50 residuals**																		
2																			
3			Period (s) →																
4			**0.01**	**0.02**	**0.022**	**0.025**	**0.029**	**0.03**	**0.032**	**0.035**	**0.036**	**0.04**	**0.042**	**0.044**	**0.045**	**0.046**	**0.048**	**0.05**	**0.055**
5	Record #	**1**	1.97599	2.070995	2.107328	2.133792	2.268485	2.264258	2.290807	2.375892	2.384202	2.44911	2.433508	2.440995	2.418731	2.363295	2.319344	2.302782	2.0566
6	↓	**2**	0.486193	0.451764	0.431063	0.403145	0.368597	0.363014	0.363094	0.358379	0.356964	0.354741	0.366257	0.368917	0.35803	0.346177	0.329944	0.334088	0.29143
7		**3**	0.735945	0.681398	0.644476	0.612724	0.578367	0.572789	0.550655	0.519224	0.502694	0.479805	0.464017	0.457296	0.453384	0.439635	0.453737	0.492788	0.555183
8		**4**	1.300931	1.237977	1.225957	1.219205	1.23871	1.225673	1.159056	1.098496	1.118901	1.289841	1.273631	1.267167	1.288469	1.316971	1.369583	1.378079	1.367975
9		**5**	-0.78333	-0.84425	-0.85348	-0.87534	-0.92296	-0.92686	-0.95437	-0.95518	-0.95802	-1.00704	-1.05128	-1.05249	-1.06071	-1.07274	-1.09393	-1.11783	-1.18837
10		**6**	-0.14199	-0.12651	-0.15622	-0.13928	-0.1176	-0.10238	-0.09282	-0.1063	-0.11006	-0.23877	-0.21774	-0.19206	-0.19826	-0.21574	-0.26199	-0.23943	-0.13662
11		**7**	0.233761	0.183758	0.165135	0.146196	0.122239	0.114758	0.107052	0.110913	0.108094	0.085341	0.037483	0.029745	0.043959	0.049853	0.056213	0.079002	0.008242
12		**8**	1.510041	1.494026	1.48228	1.443004	1.424093	1.413672	1.397859	1.678843	1.729997	1.797458	1.945948	1.951417	1.971431	2.018063	2.017882	2.067098	1.88636
13		**9**	0.522818	0.47122	0.447837	0.417461	0.38338	0.375982	0.358788	0.338627	0.335666	0.299286	0.286664	0.288526	0.290181	0.289967	0.280358	0.265415	0.195892
14		**10**	-2.27889	-2.33414	-2.34227	-2.35612	-2.40135	-2.38173	-2.34788	-2.37924	-2.41711	-2.40393	-2.40016	-2.40641	-2.40926	-2.42579	-2.49936	-2.49599	-2.42422
15		**11**	-1.32024	-1.38842	-1.41169	-1.43918	-1.45526	-1.46258	-1.50497	-1.47041	-1.45366	-1.50384	-1.47603	-1.40943	-1.38615	-1.35779	-1.33381	-1.38298	-1.51601
16		**12**	1.187741	1.163378	1.142551	1.113136	1.083127	1.077495	1.063882	1.058017	1.053659	1.042713	1.030986	1.018672	1.01514	1.030052	1.031116	1.021673	0.918118
17		**13**	-1.07112	-1.12879	-1.14174	-1.17062	-1.18895	-1.19568	-1.19722	-1.20885	-1.22394	-1.23503	-1.23672	-1.2589	-1.27386	-1.27667	-1.27273	-1.25109	-1.19657
18		**14**	-0.21494	-0.26644	-0.2849	-0.30823	-0.32812	-0.32738	-0.34619	-0.3875	-0.40363	-0.37953	-0.35543	-0.32506	-0.31727	-0.30186	-0.28078	-0.30671	-0.27293
19		**15**	0.514009	0.495334	0.485394	0.475418	0.457539	0.452002	0.438012	0.446635	0.454069	0.440093	0.409785	0.378085	0.367021	0.375302	0.403693	0.45424	0.46368
20		**16**	1.395846	1.340358	1.300194	1.27672	1.237066	1.220102	1.20273	1.230885	1.230001	1.159907	1.170015	1.176666	1.206106	1.232247	1.283432	1.280826	1.244816
21		**17**	-0.91818	-0.92369	-0.93212	-0.9212	-0.95125	-0.92991	-0.92706	-0.88071	-0.87041	-0.87116	-0.86617	-0.86042	-0.8579	-0.85925	-0.83398	-0.82675	-0.70842
22		**18**	-0.92945	-0.99266	-1.02075	-1.0581	-1.09576	-1.10417	-1.12432	-1.15438	-1.16318	-1.18921	-1.19694	-1.21032	-1.22159	-1.23207	-1.25234	-1.25186	-1.31028
23		**19**	1.469576	1.456961	1.443438	1.368229	1.373531	1.360512	1.30844	1.40758	1.434034	1.455144	1.468871	1.488405	1.46694	1.493776	1.51584	1.509781	1.331671
24		**20**	-2.62177	-2.71292	-2.74078	-2.77002	-2.81064	-2.81747	-2.83825	-2.88457	-2.89744	-2.8657	-2.85108	-2.83281	-2.84377	-2.87769	-2.92762	-2.87881	-2.78517
25		**21**	0.288527	0.252802	0.239339	0.191585	0.183458	0.173882	0.140137	0.117694	0.107578	0.078925	0.069284	0.055011	0.051232	0.05182	0.067549	0.066947	-0.01511
26		**22**	1.19644	1.155275	1.122752	1.081215	1.043309	1.040496	1.03752	1.074056	1.116071	1.102362	1.037316	1.049809	1.014076	0.998844	1.033103	1.012551	0.906702
27		**23**	0.634736	0.603527	0.614632	0.664042	0.7132	0.686877	0.734199	0.728692	0.768508	0.559884	0.646773	0.805793	0.850958	0.869931	0.859695	0.850864	0.739682
28		**24**	-0.35518	-0.39143	-0.45813	-0.45688	-0.54053	-0.55049	-0.544	-0.57602	-0.57438	-0.62122	-0.67273	-0.63532	-0.64555	-0.63976	-0.64228	-0.68703	-0.75054
29		**25**	1.090358	1.056733	1.039379	1.016155	0.990562	0.986125	0.969361	0.958165	0.953237	0.921685	0.906657	0.896438	0.891137	0.885443	0.872209	0.867713	0.809944
30		**26**	-0.53864	-0.59284	-0.59212	-0.63533	-0.66949	-0.65704	-0.63095	-0.58815	-0.59114	-0.62891	-0.61847	-0.57786	-0.53794	-0.51519	-0.5638	-0.61349	-0.60594

Provided data: draft summary reports

Documentation of targets, selection methodology and summary data for each selected set (2 reports, 34 pages total)

DRAFT

PEER site-specific ground motions for Oakland: record selection notes

Jack Baker
July 14th, 2010

1. Location

These site-specific ground motions were selected to be representative of the hazard at the site of the I880 viaduct in Oakland, California. The viaduct runs from near the intersection of Center and 3rd Streets to Market and 5th Streets[1]. Those locations are noted in Figure 1 below. For the hazard analysis used here, a location of 37.803N x 122.287W was used, and this location is labeled "Oakland site" in Figure 1.

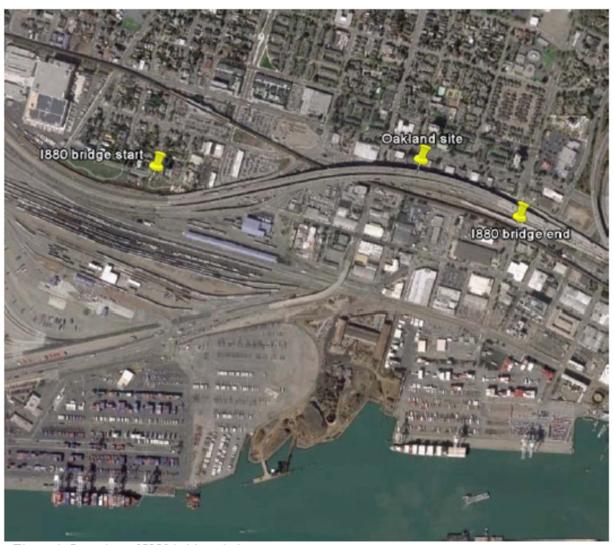


Figure 1: Location of I880 bridge viaduct

[1] Locations, including associated latitudes and longitudes, were taken from

Draft Documentation of Standardized Ground Motions for the PEER Transportation Research Program

Jack Baker, Nirmal Jayaram and Shrey Shahi

January 21st, 2010

1. Introduction

Efforts in recent decades to understand the properties of earthquake ground motions that affect geotechnical and structural systems have led to insights for structure specific ground motion selection in performance-based earthquake engineering. Current practice selects ground motions whose intensity (measured by an Intensity Measure or IM) is exceeded with some specified probability at a given site, and whose other properties are also appropriate (as typically determined by probabilistic seismic hazard and deaggregation calculations). See, e.g., [1-8] among many others for progress and recommendations on structure-specific ground motion selection.

Research on this topic has been focused primarily on cases where the structure and location of interest is known (so that ground motions can be selected and modified with specific structural properties and seismic hazard information in mind). The PEER Transportation Research Program (*peer.berkeley.edu/transportation/*), in contrast, is studying a wide variety of structural and geotechnical systems at a wide range of locations, and would benefit from having a standardized set of ground motions to facilitate comparative evaluations in this research. Even in situations where a specific location might be of interest, the Transportation Research Program is sometimes evaluating alternative structural systems (with differing periods of vibration) for potential use at a given location, so that ground motion selection techniques which depend upon knowledge of structural periods are not applicable. Other techniques are thus needed to choose "appropriate" ground motion sets for this Research Program. This document describes the process that was used to select three standardized ground motion sets for PEER and documents the properties of the selected ground motions. Because the ground motions are not structure-specific or site-specific, it may be useful for the user to pre-process these ground motions prior to using them for structural analysis (e.g., by scaling the motions) or to post-process the structural analysis results (e.g., to identify trends in structural response as a function of ground motion intensity parameters). A companion document is in preparation that will describe pre-processing and post-processing techniques that may be of use for users. The selected ground motions described in this report, and some additional descriptive data for these motions, are available electronically at *www.stanford.edu/~bakerjw/PEER_gms.html*.

2. Objectives

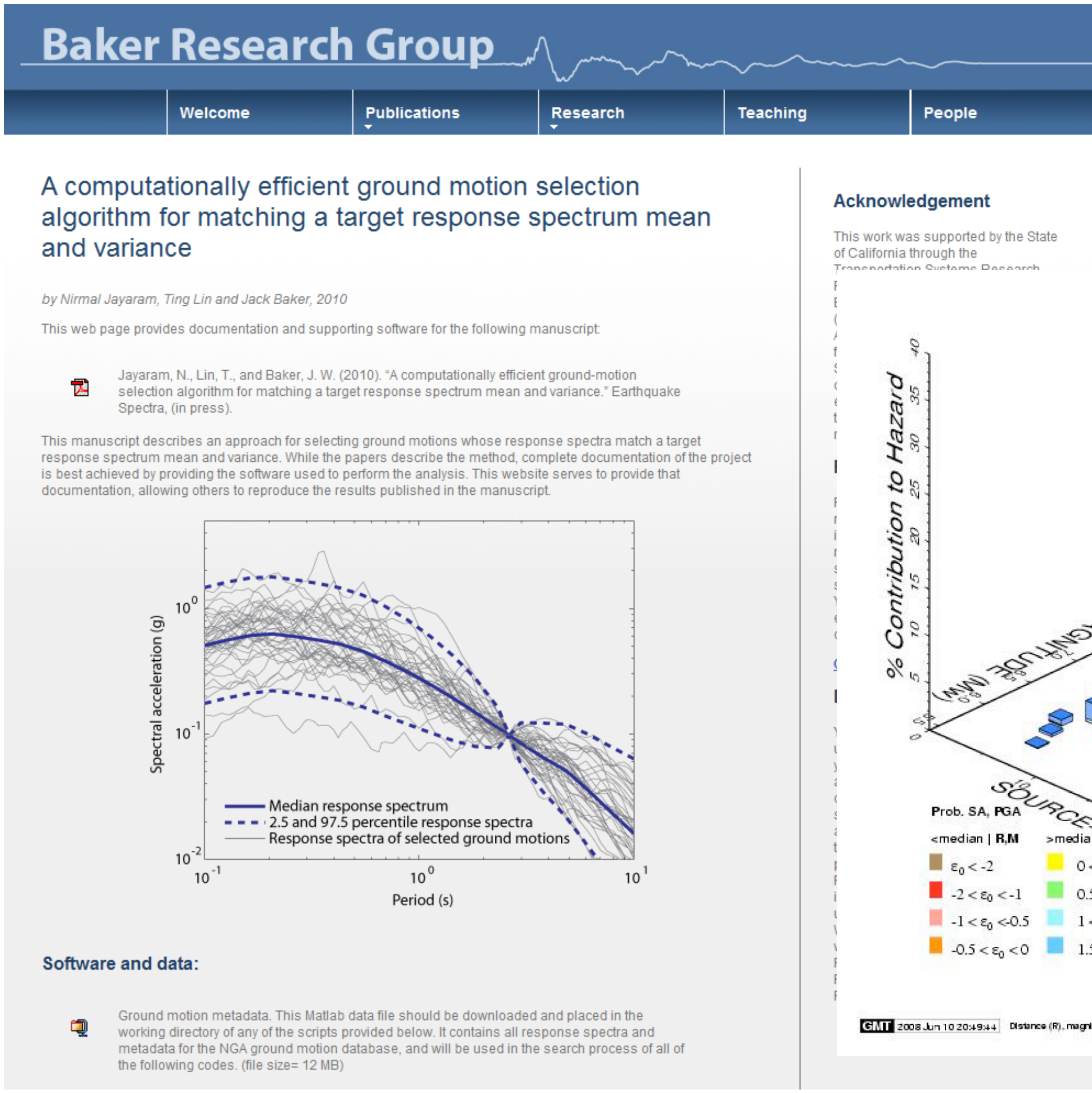
The goal of this project is to select several standardized sets of ground motions that can be used in the PEER Transportation Research Program, for use in analyzing a variety of structural and geotechnical systems that would potentially be located in active seismic regions such as California. Because of the wide variety of uses for these ground motions, it is not feasible to use the site-specific/structure-specific ground motion selection methods most frequently proposed in

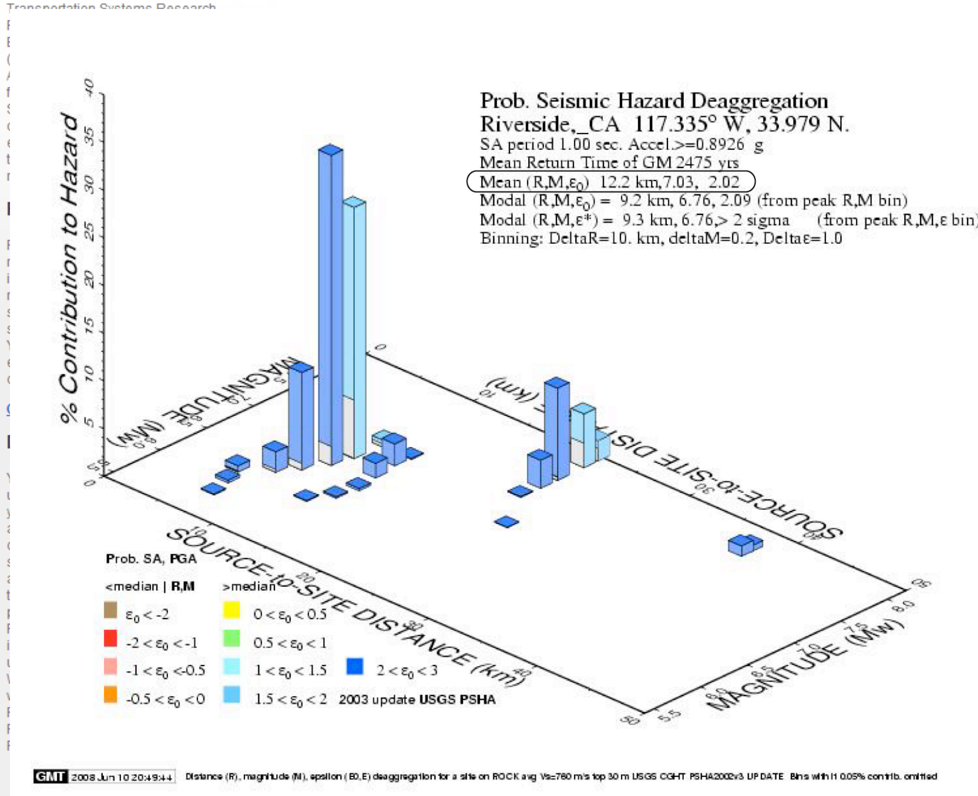
1

A related resource: source code for CMS ground motion selection

http://www.stanford.edu/~bakerjw/gm_selection.html

Jayaram, N., Lin, T., and Baker, J. W. (2010). "A computationally efficient ground-motion selection algorithm for matching a target response spectrum mean and variance." Earthquake Spectra, (in press).





Project status

- Completed work:
  - A new ground motion selection algorithm that captures response spectrum variability has been developed and published
  - Broadband soil and rock ground motions are selected and posted (80 records)
  - Near-fault pulse-like motions are selected and posted (40 records)
  - Site-specific ground motions for Oakland are selected and posted (120 records)
  - Draft documentation for all ground motions is complete and posted
  - Adaptive Incremental Dynamic Analysis using M/R selection has been schematically developed (presented as 2009 PEER AM poster)
- Next steps:
  - A lower-intensity broadband set will be selected (40 records)
  - A second site-specific set may be selected (120 records)
  - Adaptive Incremental Dynamic Analysis using CMS concepts will be implemented
- By December
  - A PEER report documenting the ground motions and discussing the use of generic ground motion sets for PBEE will be completed
- We are on schedule and on budget for December 2010 completion