

PEER 地震动数据库的选波流程

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第 1 步：进入太平洋地震工程研究中心官网：<https://peer.berkeley.edu/>

第 2 步：进入地震动数据库。（点击图 1 中红框内容）

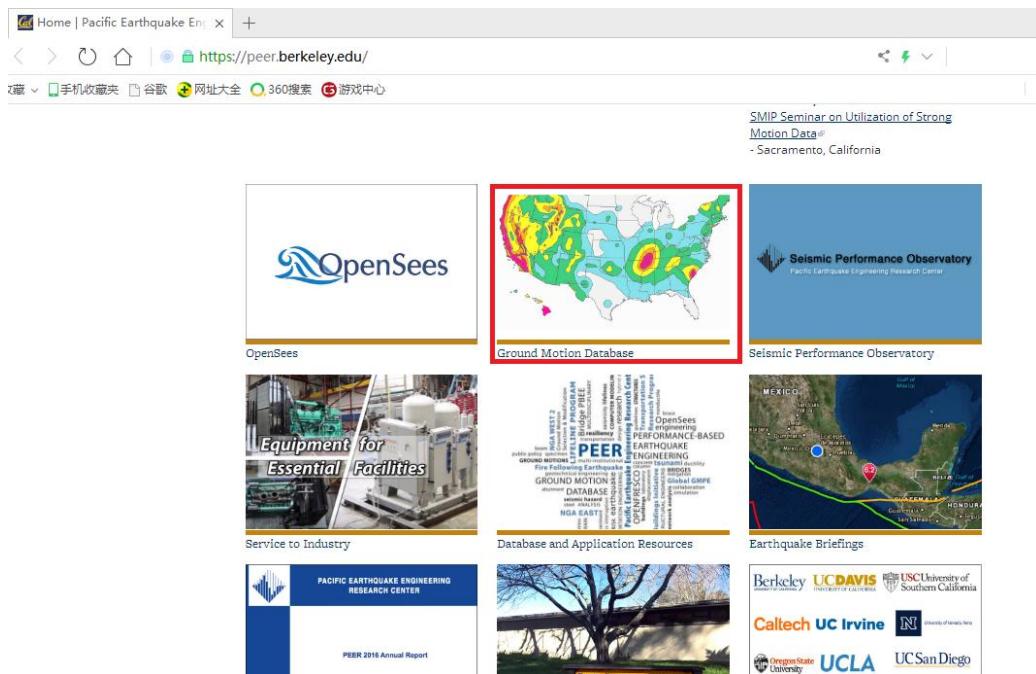


图 1 PEER 官网首页

第 3 步：进入地震动选波截面，选择“New NGA-West 2”地震动数据库。（点击图 2 中红框内容）

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PEER Strong Ground Motion Database



New NGA-West 2 Ground Motion Database

<http://ngawest2.berkeley.edu/>

The new NGA-West 2 database is larger than the old database by a factor of six, and also new features have been added to the new online tool.

The Pacific Earthquake Engineering Research Center (PEER) ground motion database includes a very large set of ground motions recorded worldwide of shallow crustal earthquakes in active tectonic regimes. The database has one of the most comprehensive sets of metadata, including different distance measures, various site characterizations, and earthquake source data.

Since its release, the PEER Ground Motion database has proved to be very popular among engineers in the earthquake-related disciplines, who are increasingly using it for selection and modification of records to analyze computer models of buildings, bridges, and other facilities. The database is now cited as a primary source of ground motion records in the latest revision of the Building Seismic Safety Council's NEHRP Recommended Provisions.

Previous PEER Ground Motion Databases

For many years, PEER has spent considerable effort in collecting and organizing ground motion databases to assure data processing consistency and accurate metadata retrieval. Previous versions were released in 2005, 2000, and 2010. These old database versions are not accessible.

图 2 地震动数据库介绍

第 4 步：进入 PEER 网站自带的地震动选波程序，这里需要提前用邮箱注册一个 PEER 账号。（点击图 3 中红框内容）



Welcome to the PEER Ground Motion Database

The web-based Pacific Earthquake Engineering Research Center (PEER) ground motion database provides tools for searching, selecting and downloading ground motion data.

ALL downloaded records are UNSCALED and as-recorded (UNROTATED). The scaling tool available on this site is to be used to determine the scale factors to be used in the simulation platform. These scale factors can be found with the record metadata in the download (Scaling the traces within this tool would only cause confusion with file versioning).

Please note that, due to copyright issues, a strict limit has been imposed on the number of records that can be downloaded within a unique time window. The current limit is set at approximately 200 records every two weeks, 400 every month. Abusive downloads will result in further restrictions.

The database and web site are periodically updated and expanded. Comments on the features of this web site are gratefully welcome; please send emails to: peer_center@berkeley.edu

NGA-West2 -- Shallow Crustal Earthquakes in Active Tectonic Regimes

The NGA-West2 ground motion database includes a very large set of ground motions recorded in worldwide shallow crustal earthquakes in active tectonic regimes. The database has one of the most comprehensive sets of meta-data, including different distance measure, various site characterizations, earthquake source data, etc. The current version of the database is similar to the NGA-West2 database, which was used to develop the 2014 NGA-West2 ground motion models (GMMs). peer.berkeley.edu/ngawest2



图 3 地震动数据库登录界面

第 5 步：PEER 提供了 3 种反应谱选择模型：1) PEER NGA-WEST2 Spectrum；2) User Defined Spectrum；3) ASCE Code Spectrum。第一种是伯克利自主研发的反应谱模型，参数很多，同时可以根据地震等级、震源深度、剪切波速等进行筛选；第二种模型是用户自定义反应谱，进行筛选；第三种是根据 ASCE 规范定义反应谱，如图 4 所示。

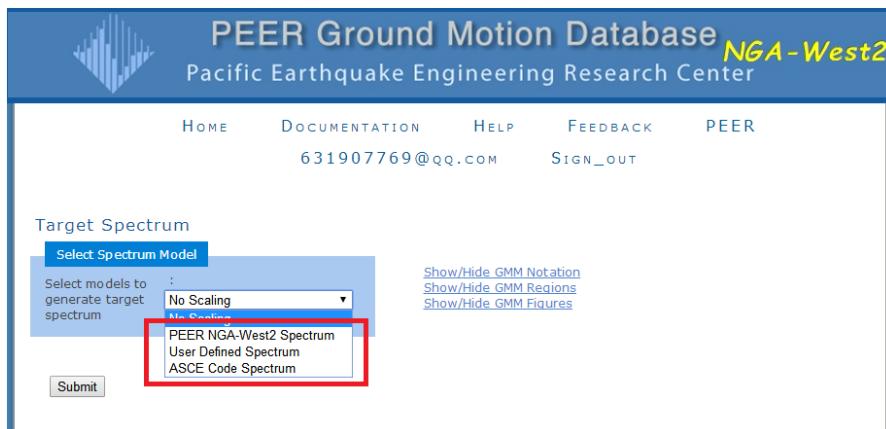


图 4 目标反应谱模型类型

第 6 步：一般选用第二种模型“2) User Defined Spectrum”。然后根据我国《GB50011-2010 建筑抗震设计规范》生成目标反应谱文件，此处使用 Spectrum-2010 EXCEL 表格（详见附件 1）生成，如图 5 所示，根据相应信息生成目标反应谱。

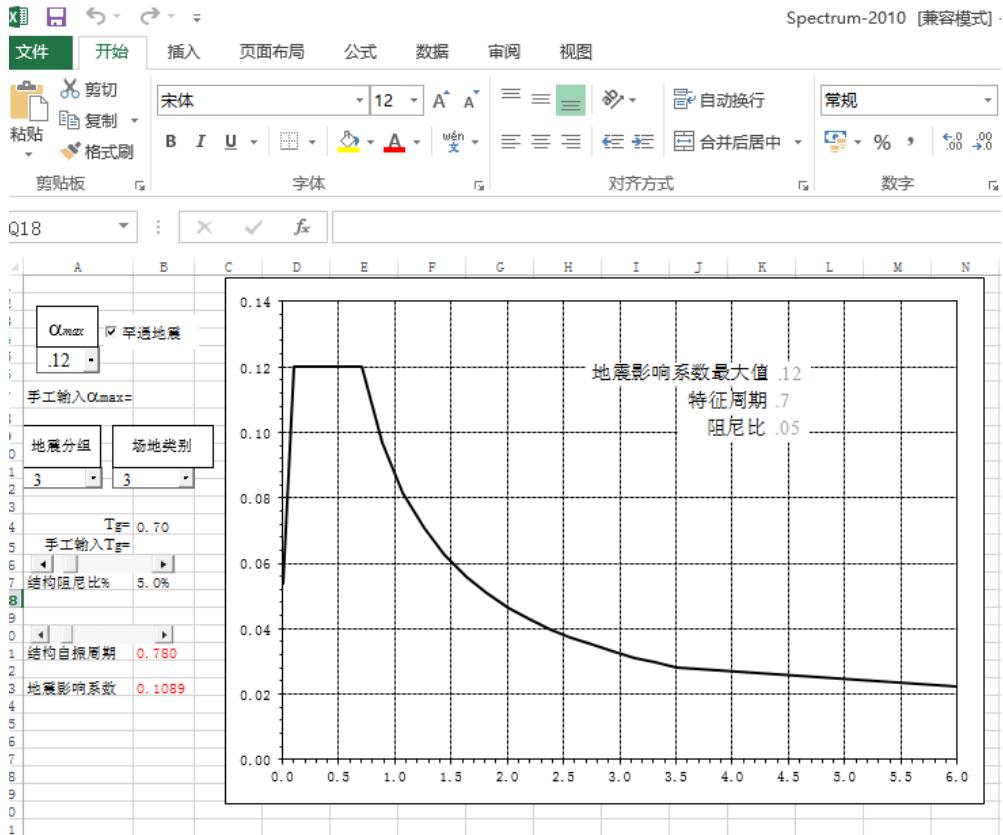


图 5 目标反应谱

第 7 步：设置好目标反应谱参数后，进入目标反应谱的数据表格，点

击图 6 中的“表格”选项。

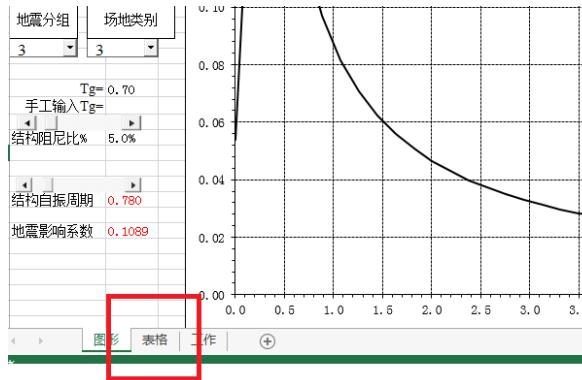


图 6 目标反应谱工具栏

第 8 步：进入反应谱的数据表格后，将图 7 中 A、D 复制到后缀名为“.csv”的 example_spectra 文件中（见附件 2），见图 8，并保存。

A	B	C	D	E	F	G	H
周期	地震影响系数	放大系数	加速度	频率	放大系数	加速度	
0.00	0.054000000	1.0125	0.055688	0.1667	0.4161	0.022884	
0.10	0.120000000	2.25	0.12375	0.2857	0.5286	0.029072	
0.70	0.120000000	2.25	0.12375	0.3018	0.5553	0.030542	
0.89	0.097002994	1.81880613	0.100034	0.3198	0.5851	0.032178	
1.07	0.081678608	1.5314739	0.084231	0.3401	0.6184	0.034011	
1.26	0.070702699	1.3256755	0.072912	0.3632	0.6560	0.036080	
1.45	0.062436400	1.1706825	0.064388	0.3896	0.6988	0.038433	
1.63	0.055976036	1.04955067	0.057725	0.4202	0.7479	0.041135	
1.82	0.050781466	0.95215248	0.052368	0.4559	0.8050	0.044273	
2.01	0.046509511	0.87205332	0.047963	0.4983	0.8721	0.047963	
2.19	0.042931425	0.80496422	0.044273	0.5495	0.9522	0.052368	
2.38	0.039888731	0.74791371	0.041135	0.6122	1.0496	0.057725	
2.57	0.037268075	0.6987764	0.038433	0.6912	1.1707	0.064388	
2.75	0.034986183	0.65599094	0.03608	0.7937	1.3257	0.072912	
2.94	0.032980473	0.61838388	0.034011	0.9317	1.5315	0.084231	
3.13	0.031202979	0.58505585	0.032178	1.1278	1.8188	0.100034	
3.31	0.029616304	0.55530571	0.030542	1.4286	2.2500	0.123750	
3.50	0.028190855	0.52857852	0.029072	10.0000	2.2500	0.123750	
3.69	0.026780855	0.49207852	0.027584	20.0000	1.0125	0.055688	
3.88	0.022190855	0.41607852	0.022884	100.0000			

图 7 目标反应谱数据表

example_spectra - Excel

A	B	C	D	E	F	G	H	I	J
<u>Example of User Defined Spectrum</u>									
3	T (s)	S (g)							
4	0	0.405							
5	0.1	0.9							
6	0.4	0.5							
7	0.81	0.272522							
8	0.61	0.61259							
9	0.72	0.83237							
10	0.83	0.468273							
11	0.93	0.41982							
12	1.0	0.380861							
13	1.15	0.348821							
14	1.25	0.321986							
15	1.36	0.299165							
16	1.47	0.279911							
17	1.57	0.262396							
18	1.68	0.24654							
19	1.77	0.234022							
20	1.89	0.222122							
21	2.0	0.211431							
22	6	0.139431							

图 8 CSV 文件中的目标反应谱数据表

第 9 步：在选波程序中上传保存好的后缀名为“.csv”的 example _

spectra 文件，再点击“Submit”，如图 9 所示。

The screenshot shows a user interface for selecting a spectrum model. At the top, a blue header bar says "Select Spectrum Model". Below it, a dropdown menu says "Select models to generate target spectrum" with "User Defined Spectrum" selected. The main area is titled "User-Defined Spectrum". It contains instructions: "As shown in the sample file, start spectra data at row 4 of input file. Spectra data consists of rows of T,pSa comma-separated values." Below this is a red-bordered input field labeled "Filename: example_spectra.csv#x#4c556" with a "Upload File" button next to it. There is also a "Download Example file(.csv)" link. At the bottom is a "Submit" button.

图 9 上传 CSV 文件

第 10 步：选择“Linear”可将 Target Spectrum 换成常见形式，点击“Search Records”，进入参数设置界面，如图 10 所示。

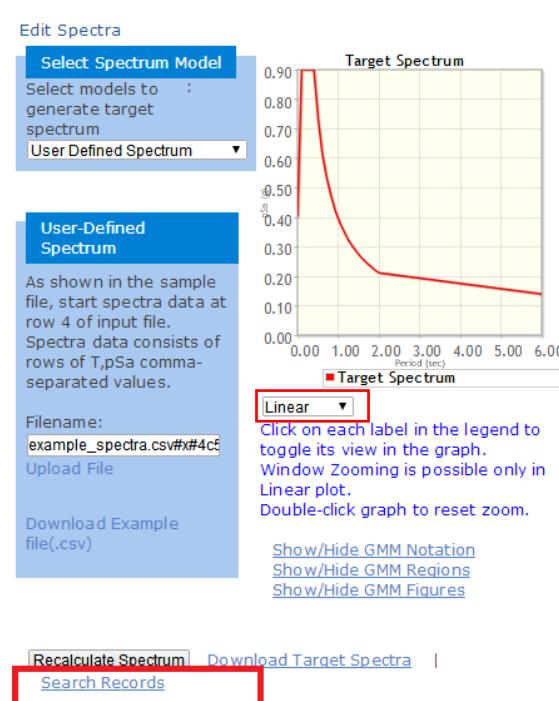


图 10 上传的目标反应谱

第 11 步：设置相应选择范围的参数，如图 11 所示，相关参数解释见

表 1。其中“Spectral Ordinate”光谱纵坐标的选项有：1) SRSS 平方和开平方根；2) RotD100、RotD50 一般用于地震危险性分析，用来推导地震动预测方法(Ground motion prediction equation)；3)GeoMean 是几何平均数；4) H1、H2、V，前两个(H1、H2)是原始记录到的两个水平分量，V 是竖向分量，选波时可以先选择 H1、H2、V。最后点击“Search Records”开始选取地震波。



图 11 参数设置

表 1 参数解释

参数	解释
Magnitude	矩震级范围，以[min , max]的格式输入，或者留空白无限制
Fault Type	断层类型，在下拉菜单里可选择相应类型
R_JB(km)	限制 Joyner-Boore 距离的范围，以[min, max]的格式输入，或者留空白无限制

R_rup (km)	限制到破裂平面的最近距离范围，输入格式为[min, max]，或留空，无限制。
Vs30 (m/s)	该站点顶部 30 米内的平均剪切波速度，以[min , max]的格式输入，或者留空白无限制
D5-95 (sec)	限制记录的重要持续时间范围，以格式输入[min, max]，或留空无限制。持续时间定义为地震动强度从 5% 到 95% 所需的时间。
Pulse	限制搜索记录的脉冲特征。下拉选项包括：(1) 任何记录；(2) 仅脉冲记录；(3) 没有脉冲记录。
Max No. Records	限制输出地震动的数量，最多 100 条

第 12 步：下载、整理选出来的地震动，如图 12 所示。

The screenshot shows the 'Results -- Metadata' section of a software interface. At the top, there is a message: 'Click heading of the column to be sorted in ascending order' and a checkbox labeled 'Rescale Using Checked Records'. Below this is a table with the following columns:

Result ID	Spectral Ordinate	Record Seq. #	MSE	Scale Factor	Tp(s)	D5-75(s)	D5-95(s)	Arias Intensity (m/s)	Event
1	SRSS	1	0.6261	3.2916	-	1.2	2.5	0.1	Helena, Montana-01
2	SRSS	2	1.7386	111.7586	-	0.3	0.8	0.0	Helena, Montana-02
3	SRSS	3	0.8994	10.4311	-	9.5	23.2	0.0	Humbolt Bay
4	SRSS	4	2.1586	49.2121	-	7.6	15.8	0.0	Imperial Valley-01
5	SRSS	5	1.4376	5.4429	-	4.1	11.6	0.1	Northwes Calif-01
6	SRSS	6	0.1455	0.9284	-	17.7	24.2	1.6	Imperial Valley-02
7	SRSS	7	0.3362	6.7565	-	9.0	22.2	0.0	Northwes Calif-02
8	SRSS	8	0.9613	4.4468	-	4.8	15.5	0.1	Northern Calif-01

Below the table, there is a 'Download Options' section with two buttons:

- Download Search Results (metadata+spectra)
- Download Time Series Records (metadata+spectra+traces) (This button is highlighted with a red box)

At the bottom left, there is a link: 'Show/Hide Map'.

图 12 下载地震动

第 13 步：下载下来的地震动时程曲线需要对结构进行小震时程分析，需要根据《GB50011-2010 建筑抗震设计规范》的相关要求，每条时程曲线计算所得结构底部剪力不应小于振型分解反应谱计算结果的 65%，多条时程曲线计算所得结构底部剪力的平均值不应小于振型分解反应谱法计算结果的 80%。否则应重新选取地震动。

第 14 步：在论文中形成如下地震动信息的表格，见图 13。地震动的信息按照如下表格列出：地震动的信息包括：你论文中的序号、PEER 中的序号、地震名称、震级、台站、地震分量、峰值加速度，缺一不可。可以用英文写，不必翻译，也可以中英文对照。

Table 2
Selected ground motions.

GM.	NGA #	Earthquake event	Mw	Station	Component	PGA (g)
GM1	1290	Chi-Chi-Taiwan, 1999	7.62	HWA043	CHICHI/HWA043-FN	0.06
GM2	1188	Chi-Chi-Taiwan, 1999	7.62	CHY016	CHICHI/CHY016-FN	0.09
GM3	1481	Chi-Chi-Taiwan, 1999	7.62	TCU038	CHICHI/TCU038-FP	0.17
GM4	1762	Hector Mine, 1999	7.13	Amboy	HECTOR/21081-FN	0.19
GM5	163	Imperial Valley-06, 1979	6.53	Calipatria Fire Station	IMPVAL/H-CAL-FP	0.08
GM6	186	Imperial Valley-06, 1979	6.53	Niland Fire Station	IMPVAL/H-NIL-FP	0.08
GM7	172	Imperial Valley-06, 1979	6.53	El Centro Array #1	IMPVAL/H-E01-FN	0.14
GM8	176	Imperial Valley-06, 1979	6.53	El Centro Array #13	IMPVAL/H-E13-FN	0.14
GM9	1149	Kocaeli-Turkey, 1999	7.51	Atakoy	KOCAELI/ATK-FP	0.17
GM10	826	—	7.00	—	—	—

图 13 论文中地震动信息