Report of the SCEC Utilization of Ground Motion Simulations (UGMS) Committee Accomplishments during 2018

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Introduction

The goal of the UGMS committee, since its inception in the spring of 2013, has been to develop long-period response spectral acceleration maps for the Los Angeles region for inclusion in NEHRP and ASCE 7 Seismic Provisions and in Los Angeles City Building Code. The maps are to be based on 3-D numerical ground-motion simulations, and ground motions computed using latest empirical ground-motion prediction equations from the PEER NGA project. The work of the UGMS committee is being coordinated with (1) the SCEC Ground Motion Simulation Validation Technical Activity Group (GMSV-TAG), (2) other SCEC projects, such as CyberShake and UCERF, and (3) the USGS national seismic hazard mapping project. Continued progress toward developing the maps was made in 2018, and this summary report highlights the accomplishments and future work.

Background and Motivation for Long Period Ground Motion Maps

This section was covered in the 2015 UGMS report and the reader is referred to that report for details. See https://www.scec.org/proposal/report/15006.

UGMS Activities and Accomplishments during 2018

Based on comments received on the Beta version, SCEC, under the guidance of the UGMS, finished the development of the web-based data access tool for obtaining site-specific MCER response spectra in Southern CA and released the web link to the tool on April 27. SCEC UGMS also prepared and distributed 5" x 7" cards at the 11NCEE; these cards described the tool and its use and provided the web address to gain access. SCEC UGMS also released a beta version of the data access tool to obtain BSE level response spectra for use in the seismic rehabilitation of buildings per ASCE 41-17.

During its November 7, 2018 meeting, the UGMS discussed additions to the data access tool including deaggregation data (magnitude-distance and seismic source) and simulated accelerograms for regions within the City of Los Angeles where tall buildings are being constructed (i.e., downtown Los Angeles and to the west). The simulations would be for M~8 events on the San Andreas fault and M~7 events on local faults with significant contribution to the ground-motion hazard in Los Angeles. A small subset of representative records would be extracted from the CyberShake files, and the short period motions would be added per the stochastic methods of Graves and Pitarka. This effort will be coordinated with UGMS member, Jack Baker, who has made progress on the accelerogram development through his research at Stanford.

The USGS is using CyberShake results to recalibrate the NGA West2 equations to better account for the effect of basins.

UGMS members, Farzad Naeim, Christine Goulet, and C.B. Crouse organized a LATBSDC workshop to be held February 27, 2019, in Los Angeles. The purpose of the workshop will be to discuss the utilization of the SCEC/UGMS data access tool to obtain MCER response spectra for the seismic design of tall buildings in the City of Los Angeles.

Presentations and Publication of UGMS Committee in 2018

C.B. Crouse gave presentations on the UGMS work and accomplishments at the following venues:

- American Association of the Advancement of Science in Austin, TX, on February 18.
- LATBSDC annual seminar in Los Angeles, CA, on May 4.
- 11 NCEE in Los Angeles, CA (3 presentations: pre-conference workshop on numerical ground-motion simulations on June 25; Theme Session 1 on physics-based simulations and their application to engineering design on June 27; and, Session on the science, engineering applications, and policy implications of simulation-based PSHA on June 29.

A UGMS publication by Crouse et al. was published in the 2018 LATBSDC and the 11NCEE Proceedings.

UGMS Work Completed & Planned for 2019

In addition to finalizing and releasing the data access tool for the BSE ground motions, SCEC UGMS plan to add Service Level Earthquake (SLE) response spectra, a requirement in the LATBSDC guidelines along with the site-specific MCER response spectra. The official release of the data access tool with these additions is expected in the first or second quarter of 2019.

As noted above, the UGMS will continue with plans to add deaggregation data (magnitude-distance and seismic source) and simulated accelerograms to the data access tool and will assist the USGS, as needed, in its efforts to recalibrate the NGA West2 equations to better account for the effect of basins.

UGMS members, Naeim, Goulet, Graves, Abrahamson, Somerville, Lew, and Crouse, will participate in the LATBSDC workshop on February 27. The outcome of this workshop may affect the UGMS activities for the remainder of 2019.

Reference (Attached)

Crouse, C.B., T. Jordan, K. Milner, C. Goulet, S. Callaghan, and R. Graves (2018), Site-Specific MCER Response Spectra for Los Angeles Region based on 3-D Numerical Simulations and the NGA West2 Equations: Proceedings of 11th National Conference on Earthquake Engineering and LATBSDC Annual Meeting, Los Angeles, CA.

Acknowledgements

SCEC UGMS MCE$_R$ Look-Up Tool for S. California: https://data2.scec.org/ugms-mcerGM-tool_v18.4

SCIEC UGMS MCE$_R$ Tool

Application   User Guide   Disclaimer   Contact

Site-Specific MCE$_R$ & Design Response Spectra per Sect. 21.2, 21.3, 21.4 of ASCE 7-16

Input Parameters

Report Title

My Report

Latitude and longitude in decimal degrees (or click on map to select site):

Latitude (e.g. 34.45)

Longitude (e.g. -118.35)

Site Geotechnical Classification:

◉ **Site Class**   - Select -   ▼
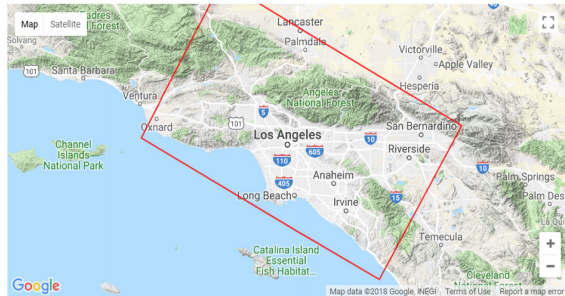
Site Class NOT automatically determined based on site location.

- OR -

○ V$_{S30}$ (m/s)   Value

- OR -

○ Unknown (Vs30 estimated from Wills et al., 2015)

Compute Response Spectra

The UGMS MCE$_R$ tool was developed by the SCEC Committee for Utilization of Ground Motion Simulations (or "UGMS Committee") from research supported by the Southern California Earthquake Center (SCEC). SCEC is funded by NSF Cooperative Agreement EAR-1033462 & USGS Cooperative Agreement G12AC20038. For more information on the UGMS Committee, visit https://www.scec.org/research/ugms.

**SCEC-UGMS Web-App Tool for
Site-Specific MCER Response Spectra**

The web link, https://data2.scec.org/ugms-mcerGM-tool_v18.4, takes the user to the Application page, which is the first tab listed in the maroon-colored bar at the top of the page and is where the user specifies the inputs required to obtain the site-specific MCE_R response spectrum and site-specific design response spectrum (=2/3 x MCE_R spectrum). The second tab is the User Guide, which provides instructions for designating inputs and downloading output data. The Documentation tab contains a publication by Crouse et al. (2018) that provides background information and the method used to obtain the site-specific MCE_R response spectra.
The Application page can also be accessed by scanning the QR code with an iphone.

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