1SCEC Utilization of Ground Motion Simulation (UGMS) Committee

Minutes of 3rd Meeting (11-3-14) at SCEC Conference Room from 10:00 a.m. – 3:30 p.m.

Member Attendees (in person)	**Member Attendees (Remotely)**	**Members Absent**
C. Crouse – chair	A. Frankel	P. Somerville
T. Jordan		R. Hambuger
N. Luco		N. Abrahamson
J. Anderson		M. Lew
R. Bachman		J. Baker
J. Hooper		F. Naeim
J. Bielak		C. Haselton
M. Hudson		C. Kircher
S. Razaeian		R. Graves

Observers in Attendance: A. Skarlatoudis (URS); T. Huynh (USC/SCEC); K. Milner (USC/SCEC); P. Maechling (USC/SCEC)
Remote Observers: S. Callahan (USC/SCEC)

After introductions of attendees and introductory remarks by UGMS chairman Crouse on the UGMS mission and progress to date, PI Tom Jordan gave an overview presentation on CyberShake. Crouse followed with a brief presentation on the calculation of the risk-targeted Maximum Considered Earthquake (MCER) response spectra at 14 Southern California sites using CyberShake and the 2013 NGA West2 ground-motion prediction equations (GMPEs). See attachment with a Google map of site locations and relevant parameter values for the calculation of the MCER response spectra. The Google map without the parameters can be accessed from the following link: http://scec.usc.edu/scecpedia/CyberShake_MCER#Disaggregation_Plots. Once opened, go to MCER 2014 Study Sites (Google Earth KML Format).

Presentations of MCER Response Spectra at 14 Sites: Much of the meeting was devoted to a review and discussion of the CyberShake MCER response spectra and the MCER response spectra computed using the NGA West2 GMPEs. The results had been posted prior to the meeting on a Wiki page prepared by Callhan. The MCER response spectra were plotted on log-log graphs with the vertical axis being 5% damped, horizontal component, pseudovelocity [PSV = $(T/2\pi)\ S_a$, where S_a is the response spectral acceleration], and the horizontal axis being period, which ranged from 1 to 10 sec. The GMPE-based MCER covered this entire period range, whereas the CyberShake MCER covered the period band from 2 to 10 sec. The MCER response spectrum obtained from the General Procedure of Section 11.4 of ASCE 7-10 was also shown on each plot.

Several observations were apparent from the MCER response spectra plots:

1. The CyberShake spectral ordinate at 2-sec period appeared to be underestimated by a factor of ~2. T. Jordan confirmed that this was the case and said future CyberShake results would be valid to at least 2-sec period, which the committee endorsed.

2. The CyberShake MCER and GMPE-based response spectra were within a factor of 2 of each other in the 3 to 10-sec period band, in for some sites the two spectra were virtually identical, which was an encouraging result.

3. An average of the CyberShake and GMPE-based MCER response spectra from 3 to 10 sec provided a curve that was a fairly smooth transition to the GMPE-based MCER response spectrum between 1 and 3 sec.

Discussion and Future Work: During the 2nd UGMS meeting Nico Luco said (and Jordan confirmed) that unlike the USGS seismic source model, the CyberShake so far had only computed ground motions from ruptures on known active faults, whereas, the USGS also includes random earthquakes (background seismicity) in its seismic hazard analysis. This issue was addressed and prior to the 3rd UGMS meeting, CyberShake was run with the background seismicity included, and it resulted in negligible effect on the MCER at 3 sec period. Nevertheless, this seismicity will be included in future CyberShake analyses. [Note: Shortly after the meeting, K. Milner computed the GMPE-based MCER response spectra at the 14 sites with and without the background seismicity and showed the effect was insignificant at all periods from 1 to 10 sec.]

During the 2nd UGMS meeting Art Frankel questioned whether the absolute values from CyberShake could be trusted because of the way the fault rupture was modeled. Subsequently, Art discussed this issue with Rob Graves, and Art reported the results of the conversation. One item was the placement of the hypocenter at the bottom of the thrust/reverse faults, which would tend to introduce more directivity from upward propagating ruptures than was considered realistic. It was agreed that a more random distribution of hypocenters with depth for these faults should be made for future CyberShake runs.

Another issue discussed was the effect of the near surface velocity model on the ground motions CyberShake generates at shorter periods ~1 to 2 sec. SCEC will check the ground-motion sensitivity at a few basin sites resulting from (1) a finer mesh of the near surface geology over a depth ~200m, and (2) a more realistic velocity structure over this depth. Depending on the results, some refinements the near surface velocity structure may be made.

Action Items. Bachman suggested that he and Crouse should begin contacting building officials in major Southern California cities (Los Angeles, Long Beach, San Bernardino) and inform them of our project to develop long-period ground motion maps for possible inclusion as amendments to the ASCE 7-16 standard. These maps would be a SCEC product. Regional maps for the possible inclusion in the ASCE 7-22 standard could be a joint SCEC/USGS effort, but those logistics still need to be worked out. The plan remains to develop the maps in coordination 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 project.

Crouse reported the Building Seismic Safety Council (BSSC) requested proposal topics for consideration during the next code cycle likely to begin in 2015. He submitted the topic of developing long period MCER ground-motion maps for Southern California, and will keep the UGMS committee informed on its status.

Focus of Next Meeting: T. Jordan indicated that prior to the next UGMS committee meeting, tentatively scheduled for May 2015, Cybershake will be enhanced to generate reliable results to 2-sec period and eliminate the bias in the hypocentral placement on the thrust/reverse faults. Results of sensitivity studies on the near surface velocity structure will also be presented. Jordan also indicated that preliminary contour maps MCER spectral accelerations might also be computed for Southern California and presented at the meeting.

A Doodle poll will be sent to members sometime this winter to arrange a date in May 2015 for the next UGMS committee meeting.

MCER Sites

Site	Latitude	Longitude	Vs30 (Wills 2006)	Zl.0 (CVM-S4.26)	Z2.5 (CVM-S4.26)
CCP	34.05489	-118.41302	387	0.39	2.96
COO	33.89604	-118.21639	280	0.73	4.28
LADT	34.(([5204	-118.25713	390	0.31	2.08
LAPD	34.55700	-118.12500	515	0*	0*
P22	34.18277	-118.56609	280	0.22	2.27
PAS	34.14843	-118.17119	748	0.01	0.31
s429	33.80858	-118.23333	280	0.71	2.83
s603	34.10275	-117.53735	354	0.19	0.43
s684	33.93515	-117.40266	387	0.15	0.31
s758	33.37562	-117.53532	390	0*	1.19
SBSM	34.06499	-117.29201	280	0.33	1.77
SMCA	34.00909	-118.48939	387	0.59	2.47
STNI	33.93088	-118.17881	280	0.88	5.57
WNGC	34.04182	-118.06530	280	0.51	2.44

*CVM-54.26 has a Vs30 larger than the Z-value, so the depth is essentially 0.