RESULTS OF THE FEBRUARY 11, 2009
UTAH GROUND-SHAKING WORKING GROUP MEETING

Members:	Guests:
Ivan Wong	Gary Christenson
Mark Petersen	Steve Harmsen
Bill Stephenson	Steven Bartlett
Jerry Schuster	Mike Olsen
Walter Arabasz	Tyler Knudsen
Greg McDonald	Travis Gerber
Harold Magistrale	Jamie Farrell
Kris Pankow	Chris DuRoss
Jim Pechmann	Mike Hylland
Jim Bay	Christine Puskas
Kim Olsen	Les Youd
Daniel Roton	Eleanor Sonley
	Steve Bowman

MEETING SUMMARY

The meeting was convened at 1:00 by Ivan Wong and Greg McDonald. Introductions of the attending members and guests were performed. Wong gave a brief overview of the purpose of the meeting and reviewed the goals of the working group. The following short technical presentations were made:

Ivan Wong - Update on National Earthquake Hazards Reduction Program (NEHRP) grant "Inversion for source, path, and site parameters from the Wasatch Front Advanced National Seismic System (ANSS) data"

The purpose of the study:

- Evaluate critical factors controlling ground-shaking hazard along the Wasatch Front:
  - Earthquake stress drop
  - Kappa
  - Crustal attenuation Q(f)
  - Site amplication factors
- Analyze ANSS strong motion and broadband data using inversion scheme developed from Walt Silva
- Data have been collected, processed, and is currently being inverted for the above factors

Harold Magistrale – Update on modifications to Community Velocity Model (CVM) and proposal to expand/update CVM and evaluate Vp/Vs ratios and R2 to R3 gradient

The CVM, updated with revised site-conditions units and along eastern basin margin (Wasatch fault), has been tested to see how well simulated ground motions using the CVM compare with actual ground motion recordings.

A NEHRP proposal was submitted to the USGS and recommended, but put on hold pending funding of the USGS external budget.
The purpose of the project is to:

- Expand the CVM to include Tooele and Rush Valleys and Wasatch back valleys,
- Update CVM with intermediate-depth data (USGS Utah and Salt Lake Valley seismic surveys (reflection and SPAC))
- Evaluate Vp/Vs ratios
- Evaluate R2 to R3 velocity gradient using available Utah Division of Oil, Gas and Mining sonic logs (presently using hard rock velocities)

Daniel Roton/Kim Olsen – Presentation and discussion of Wasatch Front CVM validation; preliminary 1Hz 3-dimensional M 7.0 scenario ground motion maps

CVM validation

- Three validation events (Lehi, Magna, and Tremonton)
- Moment tensor inversion increases Mw from 3.3 to 3.6
- Synthetic/observed waveform fit is improved by Mw increase and updated CVM for Lehi and Magna events; however, still some aspects of the waveforms cannot be reproduced

Preliminary scenario M 7.0 earthquake model

- Project planar dynamic-rupture models onto 3-D model of Wasatch fault in CVM; incorporated E-W-striking, S-dipping tear fault (Pechmann) connecting Warm Springs to East bench sections (northern end of Salt Lake City segment)
- Modeled ground motions showing strong rupture propogation/directivity effects
- Ground motions from dynamic models are in general lower than pseudo-dynamic
- Misfit of waveform amplifications at stations near hypocenter (wrong source mechanism?)
- 1s-SAs less than finite-fault model (Solomon, 2004)
- M 7.0 scenario results within 16% and 84% percentiles predicted by empirical attenuation relationships (C&B008 and B&A008)
- Need to refine shear-velocity values (e.g. reconsider truncating velocities at 200 m/s)

Kris Pankow - Update on Feb 21, 2008 Wells, NV M 6.0 earthquake

- Portable instruments recorded aftershocks in the near-field (up to M 4.7)
- Ground motions from normal-faulting earthquakes are poorly represented in the ground-motion prediction equations.
- Records from strong-motion stations in Salt Lake Valley suggest peak ground accelerations may be greater than expected

Mark Petersen - USGS perspective on Wasatch Front urban hazard maps

Petersen led a discussion on the path forward to developing the urban hazard maps. A particular issue was the schedule, given the uncertain status of the CVM. Key issues:

- Evaluate the need for formal review
- Assess whether or not validation exercise is complete
- Define areas where model needs improvement
- Propose releasing CVM to different groups of modelers using specified source parameters to get at epistemic uncertainties
- Provide a simple test case with specific parameters to compare model results
- Proposed test case:
    - Kinematic rupture (defined source, slip function, and rupture timing)
    - National Seismic Hazard Maps fault plane
    - Slip distribution (Zeng)
    - Slip function (Brune, Graves – triangular, Liu – beta function)
    - Rupture velocity – 2.5 km/s
    - Hypocenter – North SLC segment rupture to south
    - M - 7.0
    - Dip - 55 deg
    - Depth - 18 km
    - Rake - Normal
- Continue with plans to test dynamic models: Olsen's group, Archuleta's group, and 2 USGS groups model using specific input parameters for comparison of results:
    - Olsen and Pechmann (dynamic and kinematic)
    - Archuleta and Smith (dynamic and kinematic)
    - USGS – Harmsen, Stephenson, Zeng, Hartzell, Petersen, and Ramirez-Guzman (finite element)
- Test Wasatch fault model using SCEC scenario (i.e., need to vet Wasatch Front model against SCEC model)
- Evaluate how dynamic modeling contributes to waveforms
- Assess where additional Vs data may improve CVM for future updates (Jim Bay and Greg McDonald)
- Evaluate gravity-based basin model outside Salt Lake Valley; data may need to be reprocessed

- Ivan Wong – Perform update of Salt Lake basin ground-shaking maps incorporating PEER NGA attenuation relationships and revised site-conditions units

The meeting adjourned at 5:00 pm.

References

Solomon, B.J., 2004, Earthquake-hazards scenario for M7 earthquake on the Salt Lake City segment of the Wasatch fault zone, Utah: Utah Geological Survey Special Study 111DM, 59 p., 6 pl. scale 1:50,000.