



2018 UTAH EARTHQUAKE WORKING GROUP MEETINGS UTAH GROUND SHAKING WORKING GROUP SUMMARY

Tuesday, February 13, 2018

Utah Department of Natural Resources Building Auditorium (1st floor)
1594 West North Temple, Salt Lake City, Utah

WELCOME AND INTRODUCTION

The meeting began at 8:15 am. Greg McDonald gave a brief introduction and overview of the Utah Ground Shaking Working Group (UGSWG).

TECHNICAL PRESENTATIONS

The following presentations were made on current ground shaking research and related activities in Utah, and are available at: (http://geology.utah.gov/ghp/workgroups/pdf/ugswg/UGSWG-2018_Presentations.pdf).

Site Characterization

- Using Nodal Seismic Instrumentation and a Bayesian Application of SPAC to get V_{s30} : Hao Zhang, University of Utah Seismograph Stations
- Wasatch Front Community Velocity Model: Greg McDonald, Utah Geological Survey
- Updated Seismic Imaging of the Salt Lake City Area from 2015 and 2017 Campaigns: Lee Liberty, Boise State University

Ground Motion Modeling

- Rupture Direction, Hanging Wall, Basin, and Distance Effects on Ground Motions from Large Normal-Faulting Earthquakes: Kim Olsen, San Diego State University
- Three-Dimensional Ground Motion Simulations of the Salt Lake City Segment of the Wasatch Fault Zone: Scenarios and Applications to Seismic Hazard: Morgan Moschetti, U.S. Geological Survey
- Three-Dimensional Dynamic Rupture Simulations along the Wasatch Fault: Kyle Withers, U.S. Geological Survey

National Seismic Hazard Maps and Code Design

- 2018 Update of the U.S. National Seismic Hazard Model for Utah—Incorporating Basin Effects: Mark Petersen, U.S. Geological Survey
- Project 17—Improving Ground Motion Maps for Building Codes: Nico Luco, U.S. Geological Survey

Seismic Design Ground Motions

- How Structural Engineers use Ground Motions for Building Design: Eric Hoffman, Ensign Engineering
- Comparing International Building Code 2015 Code Design Acceleration Values to a Deterministic Wasatch Fault Rupture; Brent Maxfield, The Church of Jesus Christ of Latter-day Saints
- Site-Specific Performance-Based Seismic Design Ground Motions; Case Study: Ivan Wong, Lettis Consultants International

- Time-Dependent Seismic Hazard along the Wasatch Front: Patricia Thomas, Lettis Consultants International

TECHNICAL DISCUSSION ITEMS

Wasatch Front USHM Roundtable Discussion

The U.S. Geological Survey (USGS) is planning an update to the National Seismic Hazard Maps (NSHM) and would like to incorporate more detailed, community-specific Urban Seismic Hazards Maps (USHM) for the Salt Lake Valley and potentially the Wasatch Front urban corridor. Significant changes to the maps need to be conveyed to and understood by the engineering community and ultimately the public. Changes must be well-justified, as they are ultimately incorporated in building codes. There is a need to educate the engineering community and public about what the maps and building codes design for (life safety versus building earthquake resistance).

The next generation of USHMs should take into account local effects including basin effects, site conditions, and non-linear behavior. Eventually, incorporating both kinematic and dynamic models may improve the high-frequency components in modeling results. There is a need to evaluate discrepancies between different ground motion modeling results before they can be incorporated into the USHMs. Comparing different models is also useful for producing a probabilistic map and improves understanding of epistemic uncertainties. An evaluation of source effects to ground modeling also needs to be performed. The rupture initiation location and rupture propagation direction have significant effects on ground motions.

The USGS will continue to work on ground-motion models focused on the Salt Lake Valley. Incorporating results of the models into Wasatch Front USHMs will be considered given the lack of large-magnitude earthquake records for the area. There is also a need to evaluate long-period ground motions as they affect taller structure design. The USHMs may not be locally conservative and therefore may not be adequate for engineering to life-safety standards. Future USHMs should also incorporate time dependency into the source models to better reflect the hazard associated with the different Wasatch fault zone segments.

2018 USGS NEHRP External Program UGSWG Priorities

- Collect and compile existing shear-wave velocity (V_s) data for the Wasatch Front region since 2008, when the database was last updated.
- Update the Wasatch Front Community Velocity Model (CVM) with V_s data collected since 2008. The CVM is needed for ground motion modeling.
- Update the Wasatch fault zone, Salt Lake segment source model extent and location to incorporate the results of recent geophysical investigations by Lee Liberty of Boise State University.
- Collect additional geophysical data to characterize V_s and potential intra-valley faults for basins adjacent to the Salt Lake basin.
- Expand and improve the CVM shallow or deep V_s data in basins outside the Salt Lake basin along the central Wasatch Front to help characterize shallow site response and/or basin effects on ground motions. The heavily populated Weber-Davis and Utah basins are the highest priority.

- Perform ground motion modeling of earthquake scenarios along major faults, such as the Wasatch, Great Salt Lake, and Oquirrh fault zones, to characterize ground shaking along the Wasatch Front. Example investigations may include modeling of coseismic rupture of the Salt Lake City segment of the Wasatch fault zone and West Valley fault zone to characterize ground shaking in the urban center of the Salt Lake basin. Modeling should aim to characterize rupture effects such as directionality, basin effects, and shallow site response, including non-linear soil behavior to the extent possible.

MEETING ATTENDANCE
Working Group Members

Ivan Wong*	Lettis Consultants International (UGSWG Chair)
Greg McDonald*	Utah Geological Survey (UGSWG UGS Liaison)
Morgan Moschetti*	U.S. Geological Survey
Kim Olsen*	San Diego State University
Jim Pechmann	University of Utah Seismograph Stations
Kris Pankow	University of Utah Seismograph Stations
Mark Petersen*	U.S. Geological Survey
William Stephensen	U.S. Geological Survey

Guests

Lee Liberty*	Boise State University
Hao Zhang*	University of Utah Seismograph Stations
Brent Maxfield*	The Church of Jesus Christ of Latter-day Saints
Patricia Thomas*	Lettis Consultants International
Kyle Withers*	U.S. Geological Survey
Adam Hiscock	Utah Geological Survey
Emily Kleber	Utah Geological Survey
Eric Hoffman*	Ensign Engineering
Rich Giraud	Utah Geological Survey
Oliver Burt	Reaveley Engineeris
Adam McKean	Utah Geological Survey
Patrick Emery	Gordon Geotechnical
Relu Berlacu	University of Utah Seismograph Stations
Elizabeth Berg	University of Utah
Sam Christensen	TBSE, Inc.
Mike Hylland	Utah Geological Survey
Robert Moyle	ARW Engineers
Jaxon McClay	Wright Engineers
Keith Koper	University of Utah Seismograph Stations
Fan-Chi Lin	University of Utah
Morgan Moschetti	U.S. Geological Survey
Andy Trow	University of Utah Seismograph Stations
Luke Balling	TBSE, Inc.
Cianna Wyshnytzky	Natural Resources Conservation Service
Craig Wilkenson	Reaveley Engineers
Steven Petroff	ARW Engineers
Don Barfuss	TBSE, Inc.
Steve Bowman	Utah Geological Survey

* Speaker