

NORTHWEST GEOLOGICAL SOCIETY

A regional association of professionals, students & others interested in geology
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January 2014 Newsletter

Volume 28, Number 1



January 14 Program Speaker

Speaker: Kate Allstadt, Graduate Student, Earth and Space Sciences, University of Washington

Title: Seismically Induced Landsliding in Seattle: a Magnitude 7 Seattle Fault Earthquake Scenario

Abstract: Despite recent catastrophic examples, such as the 2008 Wenchuan earthquake in China where landsliding caused thousands of deaths and impeded rescue operations, seismically induced landslide hazard has not been quantitatively investigated or fully incorporated into seismic-hazard assessments for many areas that are particularly at risk. One such area is Seattle, a city where high seismic hazard, high landslide hazard, and a dense population all converge.

A major limitation to assessing seismically induced landsliding hazard is that most methods require ground-motion information for future earthquakes. Fortunately, seismic methods and computing power have advanced to the point where it is possible to generate realistic broadband synthetic seismograms for scenario earthquakes that can account for basin amplification, coherent pulses, and fault directivity that are poorly approximated by other methods. We used such methods to generate broadband synthetic seismograms for a scenario magnitude 7.0 Seattle fault earthquake and rigorously adjusted these ground motions for amplification in the shallow soils using a combination of methods from geotechnical earthquake engineering and engineering geology. Then, we used these ground motions and pre-existing static slope stability data throughout the city of Seattle to simulate seismically induced landsliding based on the Newmark method.

Our results indicate that landsliding triggered by a large Seattle fault earthquake will be extensive and potentially devastating, causing direct losses and impeding recovery. As expected, the most important control on the extent of landsliding is the saturation level of the shallow soils, but we also found that using full time-series recordings that account for the details of ground-motion variability makes a substantial difference relative to simpler methods. About one third of the landslides triggered in our simulation are outside areas currently designated as landslide-prone, highlighting the need for studies dedicated to seismically induced landsliding.

The framework methods we developed could be expanded to more earthquake scenarios, extended to other regions, be used to develop probabilistic seismically induced landslide hazard maps, and could be adapted to run in near real-time to alert responders to what areas may be affected by landsliding minutes after an earthquake occurs.

PROGRAM DINNER RESERVATIONS: NWGS members: **\$40**; Non-members: **\$45**; Full-time students : **\$20**. Add \$5 for LATE REGISTRATION. Make your reservation and payment on-line at www.nwgs.org (or mail your payment to *Northwest Geological Society, 4616 25th Ave NE #397, Seattle, WA. 98105* (must be received by Thursday prior to meeting)). Contact Secretary [Beth Tanner](mailto:beth.tanner@nwgs.org) with questions about dinner reservations.

If attending the speaker program only, a \$5 voluntary donation to help defray the meeting room cost is requested.

Location: Pacific Dining Hall at the [Talaris Conference Center](http://www.talaris.com), 4000 NE 41st St., Seattle, WA. Ph 206-268-7000. **Directions:** See [on-line directions with map](#), or: from I-5 northbound or southbound in Seattle, take Exit 168B (NE 45th St.). Drive east on NE 45th St. past UW down the hill and past University Village. Turn south (right) onto Mary Gates Memorial Drive at the 5-way intersection. MGM Drive will curve east (left) and become NE 41st St. Continue several blocks to the [Talaris Conference Center](#) entrance on the north (left) side. We meet in the Pacific Dining room on the left.

Upcoming Speakers and Field Trips

February 11: Jim Miller, GeoEngineers, ALASKA GOLD: Geology and Mysteries.

March 11: TBA.

April 8: TBA.

May 13: TBA

Spring, 2014 Field Trip: Ralph Haugerud, USGS UW, the Seattle fault zone on Bainbridge Island, May 17, 2014.

Fall, 2013 Field Trip: TBA.

If you would like to volunteer to give a talk or lead a field trip for NWGS, please contact President [Dan Smith](mailto:dan.smith@nwgs.org).

Please see the [NWGS website](http://www.nwgs.org) for detailed announcements.

Contact webmaster [Julie Masura](mailto:julie.masura@nwgs.org) if you have any announcements to post on the website.

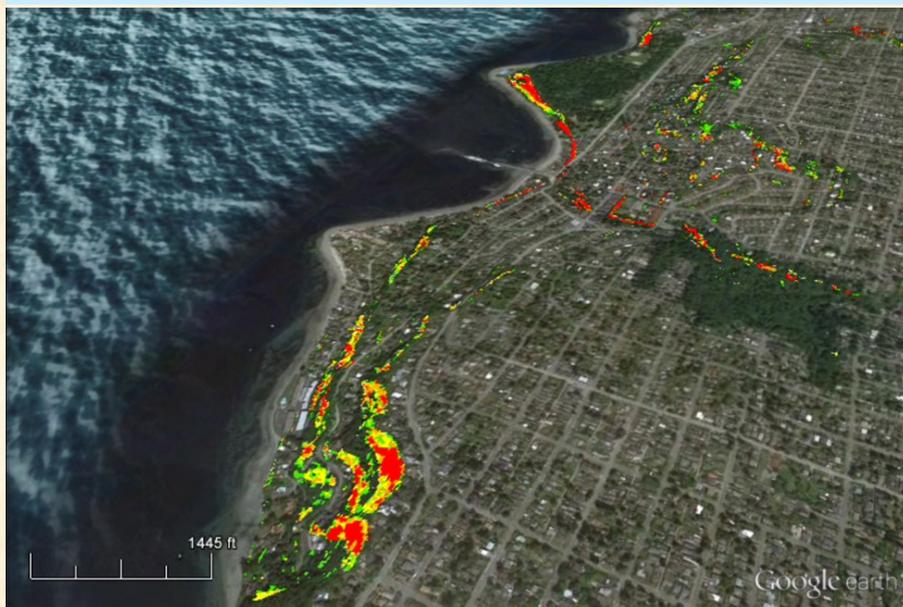
5:30pm: No-host social hour
6:30pm: Buffet dinner
7:30pm: Speaker program
All are welcome to attend –
reservations are required
if coming for dinner.

► [Reservations here](#) 

Announcements

- **Happy New Year** from the Board and other officers at NWGS!
- The NWGS Board and other members are continuing their work on formalizing **NWGS by-laws**. Stay tuned for further developments.
- Heather Vick is working on **T-shirts** and **baseball caps** with the official color Society logo. Watch for these to be on sale soon.
- Congratulations to Dan Smith, Clark Peterson, and Tom Bush, who were each presented with the 2013 **Tool of Geology** award by President Kathy Troost at the December meeting for their contributions to the Society over the years!
- Next **Board meeting**: January 14, 4:30pm, Talaris Conference Center.
YOU would like to be involved!

Photo Spotlight



Google Earth flyover of West Seattle near Fauntleroy ferry terminal showing probability of slope failure predicted for the M7 Seattle fault earthquake scenario when soil conditions are dry. Red corresponds to a >30% chance of failure, Orange 20-30%, Yellow 10-20%, Green 0-10%.

About NWGS

NWGS, a regional association of professionals, students & other persons interested in **geology**, provides a forum for the presentation and discussion of a wide range of geologic topics, emphasizing those of the Pacific Northwest of fundamental scientific interest.
YOU would like to be involved!

Program meetings: 2nd Tuesdays, October through May in the Pacific Dining Hall at the **Talaris Conference Center** in Seattle (see 1st page). Anyone may attend the speaker program, but a reservation is necessary for those wanting dinner (see 1st page). **Field trips (members only)**: one in late spring/early summer and one in late summer/early fall, usually of 1-3 days in length. **Membership** is open to anybody with a professional or amateur interest in geology. **Annual dues**: Professional: \$30; Student: \$5. **To join or pay annual dues**: send a check payable to NWGS to Secretary **Dan Smith**, 10203 40th Ave SW, Seattle, WA. 98146. Please include your name, address, home phone, email, and employer/affiliation (if any). Professional dues may now also be paid at www.nwgs.org.

YOU would like to be involved!

Recommended Readings

- Chleborad, A. F., and Schuster, R. L., 1998, Ground failure associated with the Puget Sound region earthquakes of April 13, 1949, and April 29, 1965, U.S. Geol. Surv. Open-File Rept. 90-687, 136 pp.
- Highland, L. M., 2003, An account of preliminary landslide damage and losses resulting from the February 28, 2001, Nisqually, Washington, earthquake, U.S. Geol. Surv. Open-File Rept. 03-211, 48 pp.
- Jibson, R. W., 2011, Methods for assessing the stability of slopes during earthquakes—A retrospective, Eng. Geol. 122, 43-50.
- Karlin, R. E., Holmes, M., Abella, S. E. B., and Sylvester, R., 2004, Holocene landslides and a 3500-year record of Pacific Northwest earthquakes from sediments in Lake Washington, Bull. Geol. Soc., Am. 116, 94-108.

Please send your reading recommendations to Newsletter Editor **Tom Bush**.

To report a change of email or postal address or request to be removed from mailings, notify Membership Chair **George Bennett**. Questions or comments? Contact President **Dan Smith**.

NWGS Board

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