



May 2016

## LOS ANGELES BASIN GEOLOGICAL SOCIETY MEETING ANNOUNCEMENT

*May 26 (Thursday)*

**Dr. Elizabeth Cochran**  
U.S. Geological Survey

### **MAKING EARTHQUAKES: THE UNPRECEDENTED INCREASE IN EARTHQUAKES IN OKLAHOMA**

#### **Abstract**

It has long been known that humans can cause earthquakes, whether related to dam impoundment, mining activity, geothermal energy development, or hydrocarbon production. Here, Dr. Cochran will discuss the recent increase of earthquakes in Oklahoma that has been linked to energy production, specifically wastewater injection. Wastewater is a byproduct of hydrocarbon extraction that is generated both during traditional oil extraction as well as during enhanced recovery processes, including hydraulic fracturing. Wastewater is often disposed of via injection into deep (1-2 km) wells, which has been shown, for a small percentage of wells, to induce seismicity. Oklahoma, as well as the broader Central and Eastern U.S., has experienced a dramatic increase in earthquakes since 2009; Oklahoma now has more M3+ earthquakes per year than California. She will present results from studies of the largest-ever earthquake linked to wastewater injection, the 2011 M5.6 Prague, Oklahoma earthquake. Using data collected during the Prague sequence, she will demonstrate a link between the earthquakes and nearby wastewater injection.

Additionally, she will suggest that induced earthquakes may have unique rupture properties that may provide clues to how the earthquakes are triggered. Finally, she will present on-going work that will help us to better understand the specific factors that lead to injection-induced seismicity, including a just-completed deployment of over 1,800 sensors in Northern Oklahoma.

#### **Speaker's Biography**

Dr. Cochran is an observational seismologist at the United States Geological Survey in Pasadena, California. She studies earthquake triggering, rupture processes, and seismic wave propagation and has led several large seismic deployments following recent significant earthquakes, including the 2010 M7.2 El Mayor Cucapah earthquake in Baja California and the 2011 M5.6 Prague, Oklahoma earthquake. Cochran and colleagues linked the Prague, Oklahoma earthquake sequence to local wastewater injection activities by examining the details of the earthquake sequence and injection parameters. And, her continuing research on induced earthquakes includes detailed analyses of event triggering, determination of local stress fields, and refinement of ground motion estimates. Cochran is also the chief scientist for ShakeAlert, the earthquake early warning system currently being developed for the west coast of the U.S. And, she specializes in developing new, low-cost seismic stations that involve the community in scientific data collection.

Elizabeth received a B.S. in geophysics from University of California, Santa Barbara and a M.Sc. and Ph.D. in geophysics and space physics from the University of California, Los Angeles. In 2010, she was recognized with a Presidential Early Career Award for Scientists and Engineers (PECASE), which is the highest honor, bestowed by the United States government on outstanding scientists and engineers in the early stages of their independent research careers. And, she was recently highlighted as a 'Federal Player' in the Washington Post, a profile of federal workers who are making a difference.

## Meeting Time, Place, Cost and Reservations

### Time:

**Thursday, May 26, 2016**

### Meeting Agenda

**Lunch Served: 11:30 AM to 12:00PM**

**Announcements: 11:45 AM to 12:00 PM**

**Guest Speaker: 12:00 PM to 12:45 PM**

**Questions/Close: 12:45 PM to 1:00 PM**

### Place:

**The Grand at Willow Street Conference Center** located at 4101 East Willow Street, Long Beach, CA (562-426-0555). Take Lakewood Boulevard south from the San Diego Freeway (405), turn west onto Willow Street, and turn right onto Grand Avenue at the sign for the Center. Park free in the garage structure.

### Cost:

Lunch and Speaker: \$25.00 with reservations  
\$30.00 without reservations

Retired: \$20.00

Student: \$5.00

### Meeting Reservations:

We encourage you to make your reservations using the LABGS web site, at [www.labgs.org](http://www.labgs.org)

Otherwise, call Ryan Weller at (562) 637-6019, or e-mail [ryweller@gmail.com](mailto:ryweller@gmail.com).

**PLEASE Make: ☺ Reservations must be made by 10:00 AM Tuesday morning prior to the Thursday meeting to receive the discount price noted above. As always, walk-ins are welcome.**

## Student Sponsorship

### **Looking for Student Lunch sponsors.**

If you or your business/organization would like to become a Student Lunch Sponsor, please let us know.

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