

Induced earthquakes come under closer scrutiny at SSA Annual Meeting

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On March 28, the U.S. Geological Survey issued a one-year seismic forecast for the United States that for the first time includes ground-shaking hazards from both natural and human-induced earthquakes. In the wake of the forecast's release, researchers are gathering at the Seismological Society of America's (SSA) 2016 Annual Meeting April 20-22 in Reno, Nevada, to discuss some of the science behind the report.

Presenters at the meeting will speak about factors that may influence the location and strength of induced earthquakes in the central United States and western Canada and what can be done to minimize the occurrence and impacts of this seismic activity.

The USGS report estimates that about 7 million people in the central and eastern United States now live in areas affected by induced earthquakes. In central Oklahoma and southern Kansas, there is a 5 to 12% chance of a damaging (magnitude 4.5 or larger) earthquake occurring within the next year. Other areas at risk for induced earthquake hazards include parts of Texas, Arkansas, Colorado, New Mexico, Ohio and Alabama. At the SSA meeting, Mark Petersen, chief of the USGS National Seismic Hazard Mapping Project, will discuss the data that were used to build the new seismic forecast.

The vast majority of induced seismicity in the United States is related to wastewater from enhanced oil recovery operations being injected back into the ground, says research geophysicist and deputy chief of the USGS Induced Seismicity Project Justin Rubinstein. At the SSA

meeting, Rubinstein will discuss how places such as Harper and Sumner counties in southern Kansas have seen a surge in [seismic activity](#) since a 2012 increase in oil and gas operations in the area, including a magnitude 4.8 earthquake in 2014. When the Kansas Corporation Commission placed limits on the industry's wastewater disposal, Rubinstein reports, earthquake activity in the area under the limits decreased by 40 to 50% in the six months following the commission's order.

A presentation by AECOM seismologist Ivan Wong will address one of the questions on the minds of infrastructure engineers and public policy planners after learning about the new USGS report: what is the potential for damage from these types of earthquakes? There is some disagreement among researchers, Wong notes, about whether the expected ground shaking in induced seismicity might be stronger or weaker in natural earthquakes. It may also be possible that even earthquakes of magnitude 5 or smaller could damage infrastructure in the central U.S. because buildings and roads in those regions have rarely been built with seismic hazards in mind.

Several presentations in the induced seismicity session will examine whether there is a set of seismic features that can be used to distinguish natural from induced earthquakes. This remains a challenging problem, Rubinstein says, "since induced earthquakes involve the same sorts of slip processes as natural earthquakes." For the moment, induced earthquakes are identified by researchers looking at the full catalog of seismicity for a region, "and determining whether changes to industrial operations have coincided with changes in earthquake rates," he says.

While the USGS report has raised new interest and concern about induced earthquakes in the central U.S., induced seismicity may have a relatively long history in the region, according to USGS seismologist Susan Hough, who will discuss 20th century oil and gas practices in

Oklahoma in her SSA talk. She and her colleagues have turned up some interesting documents in the course of tracking down the roots of induced seismicity in the state, including a rare earthquake insurance policy taken out by an prominent Oklahoma City petroleum geologist in 1952, just a couple months before the magnitude 5.7 El Reno earthquake toppled buildings and chimneys and cracked the state capitol building in Oklahoma City.

More information: The session "Induced Seismicity" will take place at 8:30 a.m. US PT April 20, 2016 at the annual meeting of the Seismological Society of America (SSA) in Reno, Nevada.

Provided by Seismological Society of America

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