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OIL AND GAS

Earthquakes and the Permian: What's the link?

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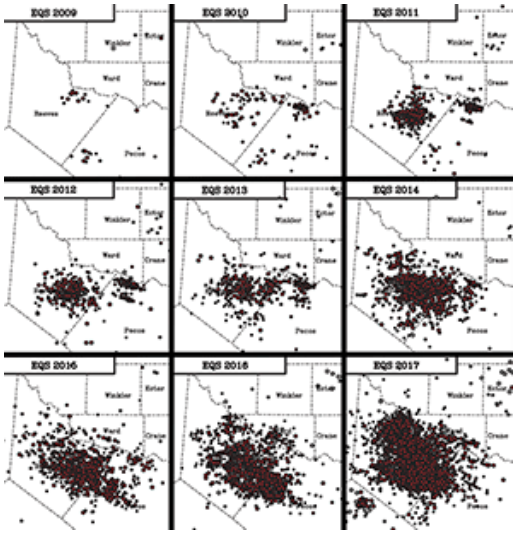
An increased rate of earthquake activity in West Texas is linked with oil and gas production, according to a new study that concentrated on the state's fuel-rich Delaware Basin.

The study, published this month in the *Journal of Geophysical Research: Solid Earth*, cataloged close to 20 years of seismic activity around Pecos, Texas, a town roughly 200 miles east of El Paso that began to see elevated earthquake activity in the late 2000s. The **paper** said there were 19 earthquakes in 2009 near Pecos of at least magnitude 1, compared with over 1,600 earthquakes of that degree or higher in 2017.

Overall, researchers said, there were more than 7,000 earthquakes near Pecos — a town of about 10,000 — between 2009 and 2017.



[+] A new study uses historical data to confirm an increase in seismic activity near the city of Pecos in West Texas. The graphic depicts the locations of earthquakes each year from 2009 to 2017. University of Texas, Austin, Jackson School of Geosciences

While the research correlates higher earthquake activity in the area with greater production and related activities, it doesn't specifically pinpoint which part of the production cycle the seismic activity stems from. Still, the study significantly extends the region's seismic record, which only began to be monitored by TexNet — the state's seismic monitoring program — in 2017.

"West Texas has the highest seismicity rates in the state right now," said Heather DeShon, an associate professor at Southern Methodist University and paper co-author. "This paper is the first peer-reviewed publication in the scientific literature that actually tracks when earthquakes started in the oil and gas fields out in West Texas and explores various aspects of oil and gas operations that the earthquakes could be directly linked to."

Researchers used a system of seismographs called TXAR to derive earthquake data and build out their earthquake catalog.

DeShon said while in states like Ohio and Oklahoma, earthquakes have been linked with hydraulic fracturing and the disposal of wastewater, respectively, the exact mechanism that's inducing seismicity in the Delaware remains uncertain.

The study found that the earthquakes first occurred in the Delaware, a subregion of the Permian Basin, in 2009, and said "many of them are probably induced by petroleum production." Although many of the earthquakes around Pecos were too small to be felt, researchers said low-magnitude earthquakes can be harbingers of larger ones.

Todd Staples, president of the Texas Oil & Gas Association, said most of the events cited in the study had a magnitude too low to be felt at the surface.

"We believe that more data is always better, and the oil and natural gas industry continues to work collaboratively and extensively with industry peers, TexNet and CISR [the Center for Integrated Seismicity Research] to monitor and share data, and gather information that guides industry practices," Staples said in a statement.

The Texas Oil & Gas Association pointed to a section of the study's abstract describing a "causal link." Nicole Jacobs, team lead for Energy in Depth — a project of the Independent Petroleum Association of America — also welcomed the research and the opportunity to work with both scientists and regulators.

Cliff Frohlich, a senior research scientists emeritus with the University of Texas Institute for Geophysics, said that the region's geology is well-characterized because of the oil and gas industry, but that having more information

about when earthquakes occurred will help to better understand man-made earthquakes.

Frohlich said past studies have shown that fracking, wastewater disposal and production have all caused earthquakes, but that doesn't mean those activities will induce seismic activity in a given, specific oil field. A study last month found that man-made earthquakes in the Permian Basian were more likely caused by hydraulic fracturing than by injection of oil field wastewater (***Energywire***, Oct. 17).

"It is certainly true that it's in the interest of petroleum companies and society to be able to manage earthquakes," Frohlich said. "Nobody wants to cause damaging earthquakes."

Although the exact relationship and mechanism between hydraulic fracturing, wastewater injection and seismic activity is unclear, the study "strongly suggests" the area will see more earthquakes, said Cyrus Reed, conservation director of the Lone Star Chapter of the Sierra Club.

"What this means is private property, water and air quality, and natural resources could not only be threatened by the direct extraction of fossil fuels but also face direct impacts from seismic activity induced by that same industry," Reed said. "The people and property of West Texas should not be sacrificed to unmitigated oil and gas production."

Reed, the group's interim director, said the Texas Railroad Commission — the state agency that regulates the oil and gas industry — should institute a moratorium on injection wells and drilling permits before authorizing more permits and injection wells.

The commission did not return a request for comment.

DeShon, the SMU associate professor, said it's important to begin earthquake monitoring early and to continue to pay attention before and through petroleum production. Although TexNet now monitors the area around Pecos constantly, she said, the region had no seismometers back in 2008 and 2009 when production in the Delaware "shot up."

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