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Wastewater injection reactivated dormant faults near Dallas, says new SMU earthquake study

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Since earthquakes started shaking Dallas and Irving in 2014, folk theories have pinned the blame on everything from construction, to drought, to the implosion of nearby Texas Stadium.

Scientists have [linked the tremors](#) to wastewater disposal from hydraulic fracturing, but the evidence has not been as solid as with other recent tremors.

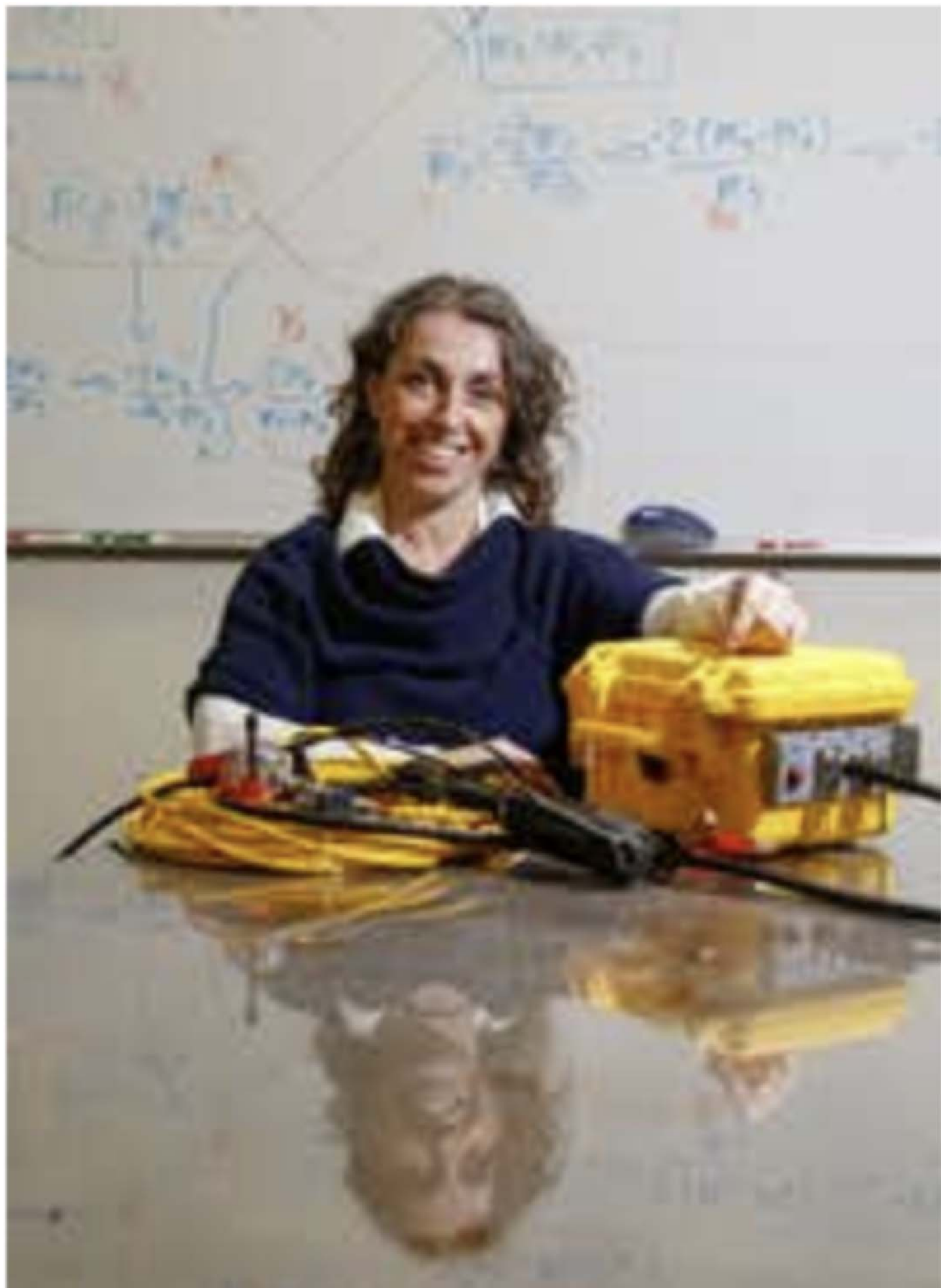
[Scientists offer possible explanation for how oil and gas activity may have triggered Dallas earthquakes](#)

Unlike North Texas' four other quake sequences going back to 2008, the Irving quakes struck much farther away from wastewater wells. That led some experts, including those at a subsidiary of Irving-based ExxonMobil, to suggest they were in fact natural.

Perhaps the faults had snapped back to life after a long period of inactivity. Or maybe they had been active all along, tossing off tiny quakes that no one felt until humans settled the area in large numbers.

A new study leaves little doubt that these earthquakes, the only ones in Texas that stirred a major metropolitan area, were triggered by industry and not by nature.

"It's the most likely explanation," said Beatrice Magnani, a seismologist at Southern Methodist University and lead author of the paper published recently in the journal *Science Advances*.

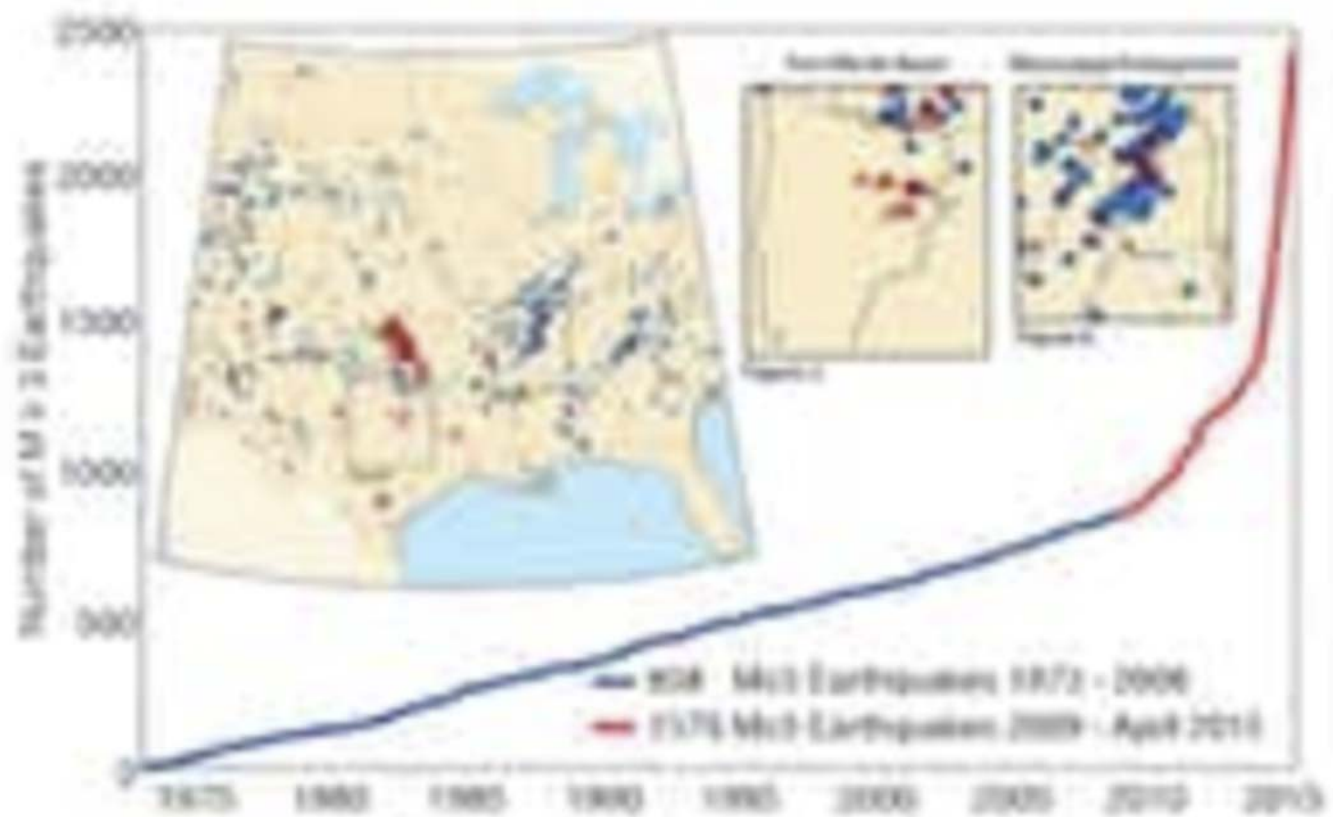


Beatrice Magnani, associate professor of geophysics at Southern Methodist University, at Heroy Science Hall on Southern Methodist University's main campus with a seismometer used in her research. (Ron Baselice/Staff Photographer)

To reach their conclusion, scientists peered deep into the earth and far back in time. Magnani and her colleagues relied on a technique that sets her study apart from previous ones. She examined 2D and 3D images of faults in Irving and near Venus, in Johnson and Ellis counties, and compared them with images of faults that have been known to be active throughout geologic time.

The images, similar to ultrasound scans, showed the faults in North Texas had budged little or not at all since well before the time of the dinosaurs.

That, wrote the scientists, makes it "exceedingly unlikely" that they naturally became active in the previous 10 years. When they examined similar images of faults in the New Madrid Seismic Zone, an area that includes parts of Missouri, Arkansas, Kentucky, and Tennessee, they saw evidence of earthquakes stretching from the present and going back more than 65 million years.



This graphic shows post-2008 seismicity rate change in the central United States. Since 2009, seismicity has occurred both in areas that were seismically active before 2008 (for example, the Mississippi Embayment, which includes the New Madrid Seismic Zone) and in regions with no pre-2008 historical or instrumental seismicity (for example, the Fort Worth Basin in North Texas). (n/a/Science Advances)

Peter Hennings, who oversees a consortium of oil and gas companies that sponsor earthquake research at the University of Texas at Austin's Bureau of Economic Geology, agrees with the paper's conclusions.

"Their work is another piece of evidence that causes us to consider how and where we inject fluids in the subsurface," he said. Hennings served as an independent reviewer of the new paper.

The study builds on SMU-led research published in 2016 that offered an explanation for how wastewater injections could have set off the Dallas and Irving quakes, which started in April 2014, died down in 2016, and reappeared briefly this past August and September.

In the 2016 paper, scientists proposed that pressure from wastewater injections in Johnson and Tarrant Counties migrated into Dallas and Irving along faults, which can serve as fluid conductors. Dallas and Irving sit above the deepest portion of the Fort Worth Basin, the bathtub-like geological structure that underlies the Metroplex, so fluid injected elsewhere in the basin would flow naturally toward the two cities.

[UTA research finds dangerous bacteria in groundwater near Texas gas drilling sites](#)

Unlike Oklahoma, Kansas, Ohio and Arkansas, which have also experienced human-induced quakes, Texas [has yet to officially acknowledge](#) a link between its earthquakes and one of its most prized industries.

In response to the new study, a spokeswoman for the Railroad Commission of Texas said that its seismologist, Aaron Velasco, had not yet had an opportunity to thoroughly review it.

The spokeswoman, Ramona Nye, added that the Railroad Commission "has long recognized the possibility of induced seismicity related to fluid injection" and that the agency had responded by issuing restrictions on wastewater injection wells that went into effect in November 2014.

Nye also noted that the Environmental Protection Agency commended the RRC last year for its actions to address Texas quakes.

Magnani noted that until the RRC publicly accepts that North Texas earthquakes are likely triggered by wastewater injection wells, a level of uncertainty will remain.

"The fact that we have not had an official statement from the RRC that we have induced earthquakes in Texas continues to muddy the waters," she said. "Somewhere this debate exists — maybe not in the scientific community but maybe more in the administrative and governmental communities."

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