

Wastewater injection could trigger earthquakes along a Texas fault system, UT researchers find

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Earthquakes in Texas are becoming more common
UT scientists lead search for the cause of spike in Texas earthquakes

AUSTIN (KXAN) — Last week, a study led by researchers at the University of Texas at Austin found that the majority of faults under the Fort Worth Basin are sensitive to changes in stress, which could cause them to slip.

Researchers with UT's Bureau of Economic Geology, along with researchers at Stanford University, and Southern Methodist University in Dallas have created a comprehensive map of more than 250 faults which — in total — run more than 1,800 miles. Some of those faults extend under highly populated areas in the Dallas- Fort Worth region.

The study found that the faults are relatively stable if they are left undisturbed, but that wastewater injection significantly increases the potential of faults to slip if they are not managed properly. Wastewater injection is a common practice in the oil and gas industry.

“That means the whole system of faults is sensitive,” said lead author Peter Hennings, a bureau research scientist and the principal investigator at the Center for Integrated Seismicity Research (CISR).

A release from UT Austin noted the Fort Worth Basin saw “a major increase in seismic activity from 2008 to 2015 as oil and gas operations increased, but a significant reduction in earthquakes the last four years as injection has slowed.”

UT researchers said that people should know this fault system is susceptible to possibly hosting earthquakes. They explained that if oil and gas production increases and also comes with an uptick in deep wastewater disposal, that could lead to more earthquakes if it is not managed properly.

For this study, UT Austin developed the new fault map and led the research, SMU pulled together the earthquake history of the region to update the fault map, and Stanford worked on a map of the tectonic stress in the area.

According to the [U.S. Geological Survey](#), there are misconceptions about how oil and gas production are related to earthquakes.

Fracking (a term often used for hydraulic fracturing) is not directly causing most of the induced earthquakes, USGS explained. The agency noted that the disposal of waste fluids that are the byproduct of oil production “is the primary cause of the recent increase in earthquakes in the central United States.”

Wastewater disposal wells are more likely to induce earthquakes than fracturing, USGS explained, because the disposal usually happens for a longer period of time and injects more fluid.

For example, USGS noted that Oklahoma, which has more induced earthquakes than any other state in the country, only one or two percent of the earthquakes are linked to fracking, the rest are induced by wastewater injection.

USGS said that earthquakes can be induced more than ten miles away from the spot where wastewater was injected and at “significantly greater depths than the injection point.

After two recent earthquakes in California, one at a [magnitude 7.1](#) and another at a [magnitude 6.4](#), Texans may wonder, what is the risk that wastewater injection could trigger a quake of that magnitude?

“So far, there is no conclusive example linking injection operations to triggering of major earthquakes,” the USGS says. “However, we cannot eliminate this possibility.”

Earthquakes in Texas have been relatively low in magnitude (take, for example, [the recent 3.1 earthquake in Nixon](#)) and have occurred without sparking major damage.

The study’s findings

The findings relied on data gathered about earthquakes in Texas, including the TexNet Seismological Network which has been tracking seismic activity across the state since January 2017 using funding from the Texas Legislature. UT’s Jackson School of Geosciences maintains TexNet.

“What we’ve learned in this study, is that when disposing of those [injection] waters, it has to be done in a way that understands what we see in the subsurface, knowledge of where the faults are,” said Peter Hennings, a research geologist at UT Austin who worked on the study. “The injections should be spread out as broadly as possible, to manage the hazard of potentially causing earthquakes.”

He acknowledged that saltwater disposal is a vital part of oil and gas activities.

“What we know is there are tens of thousands of injection wells in Texas and very few of those have been associated with earthquakes, but studies like this help us to understand why a few have been implicated,” he said.

The team of researchers on this study received support and data from partners in the oil and gas industry.

Hennings noted that there’s been no damage in Texas experienced because of earthquakes that are thought to be induced by human activity.

This research team was tasked with looking into seismic activity in North Texas first, but they hope to use what they’ve learned to research the different types of causes for earthquakes around Texas.

Hennings explained that the faults his team observed in the Dallas- Fort Worth area don’t come to the surface the same way faults do in in the Austin area. Faults in the Hill Country are exposed and inactive, Hennings said.

“In the Dallas-Fort Worth area, they are buried underground,” Hennings. “We have found that there are a lot of faults and that many of those faults are potentially sensitive to causing earthquakes like we’ve seen in 2014 and 2015 when the earthquake rate was higher in the Dallas-Fort Worth area.”

Hennings said the faults his team observed in North Texas experiencing lots of activity in 2014-2016 were previously inactive. He said the same type of inactive faults can be found in the Hill Country too.

Alexandros Savvaidis, a research scientist specializing in seismology at UT Austin, explained that the state of Texas is considered to be a nonactive tectonic region, meaning that high magnitude earthquakes or high frequencies of earthquakes shouldn’t be happening in the state.

In the past ten years, Savvaidis said this has changed as the rate of earthquakes in Texas has increased. He said that Texas doesn’t see earthquakes with magnitudes higher than 4.5.

“We are trying to identify why this is happening, so we are working to find the cause,” he said.

Savvaidis said that TexNet stations will continue to be used to help understand where the earthquakes are happening.

He noted the seismicity rate has been getting lower in the past few months.

“It seems that currently, we are on the safe side,” he said.