

Less shake from artificial quakes, study says

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This Nov. 6, 2011 file photo shows pieces of a chimney that toppled and went through the roof after an earthquake in Sparks, Okla. Man-made earthquakes, a side effect of some high-tech energy drilling, cause less shaking and in general are about 16 times weaker than natural earthquakes with the same magnitude, a new federal study found. People feeling the ground move from induced quakes — those that are not natural, but triggered by injections of wastewater deep underground — report significantly less shaking than those who experience more normal earthquakes of the same magnitude, according to a study by U.S. Geological Survey geophysicist Susan Hough. However within 6 miles of the fault, artificial and natural quakes feel pretty much the same, she said. (AP Photo/Sue Ogrocki, File)

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Distance matters in this shaking gap, however. For people within 6 miles (10 kilometers) of the fault, artificial and natural quakes feel pretty much the same, she said.

Hough studied similar-sized man-made and natural quakes in the central and eastern United States from 2011 to 2013, comparing the reported magnitude to what people said they felt in the USGS electronic "Did You Feel It" survey. She found that while two different types of temblors may have had the same magnitude as measured by seismographs, they had distinct differences in what people said they felt.

The way artificial quakes felt was equivalent on average to a natural quake that had a magnitude 0.8 smaller. So a 4.8 induced quake felt like a 4.0 quake, Hough said. The magnitude scale used by USGS and others is mathematically complex, but a drop in 0.8 magnitude translates to about 16 times less strength or energy released.

Sometimes the difference is even bigger. Hough said a 5.3 August 2011 man-made quake in Trinidad, Colorado, actually felt like a 4.0 quake, which is about 90 times weaker, based on the thousands of responses in the "Did You Feel It" survey system. The study, published Monday in the *Bulletin of the Seismological Society of America*, looked at quakes in Oklahoma, Colorado, Arkansas, Texas and Ohio. It included a 5.7 quake

in Prague, Oklahoma, in November 2011 that injured two people and damaged 14 houses, which Hough said felt like 5.1 magnitude natural quake.



This Nov. 6, 2011 file photo shows earthquake damage in Sparks, Okla. on Sunday, Nov. 6, 2011 after two earthquakes hit the area in less than 24 hours. Man-made earthquakes, a side effect of some high-tech energy drilling, cause less shaking and in general are about 16 times weaker than natural earthquakes with the same magnitude, a new federal study found. People feeling the ground move from induced quakes _ those that are not natural, but triggered by injections of wastewater deep underground_ report significantly less shaking than those who experience more normal earthquakes of the same magnitude, according to a study by U.S. Geological Survey geophysicist Susan Hough. However within 6 miles of the fault, artificial and natural quakes feel pretty much the same, she said. (AP Photo/Sue Ogrocki, File)

"The hazard of these earthquakes is lower than what you'd expect," Hough said. "It's not that there's no hazard, it's just that it's a little better than you might think."

Man-made earthquakes have become a big concern recently as hydraulic fracturing, or fracking, and other drilling injects wastewater deep underground. Scientists say that sometimes triggers shifts along existing and previously unknown faults. Oklahoma has had more than 300 earthquakes of [magnitude](#) 3 or more—strong enough to feel locally but too weak to cause damage—since Jan. 1. Before 2007, Oklahoma averaged only one quake a year of that size.

The artificial quakes may have less energy—only after 6 miles (10 kilometers) away—because the fault is lubricated by the injected wastewater, making it easier to slip and do so more smoothly in less of a herky-jerky motion, Hough theorized. Also these faults can be slipping with less pent-up energy than they would have if they slipped naturally years later.

But induced quakes are shallow, which means the shaking has to travel less distance to buildings nearby, said seismologist Steve Horton of the University of Memphis, who wasn't part of the study. He and others said Hough's study made sense and could change how researchers look at [quake](#) intensity.

More information: The U.S. Geological Survey: www.usgs.gov/

USGS calculator on energy difference between two earthquakes:
on.doi.gov/1qjQYI1

"Shaking from Injection-Induced Earthquakes in the Central and Eastern United States," *Bulletin of the Seismological Society of America*, 2014.

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