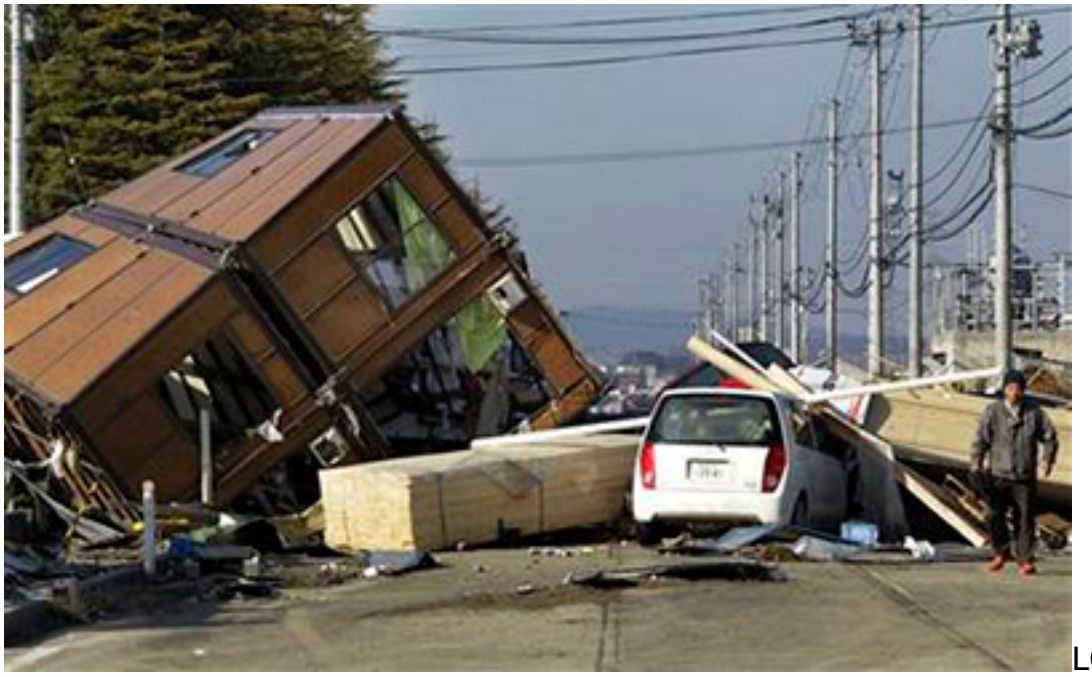
Study: Distant quakes can affect oil, gas fields

ALICIA CHANG, AP Science Writer



LOS ANGELES (AP) -- The powerful earthquake that rocked Japan in 2011 set off tremors around a West Texas oil field, according to new research that suggests oil and gas drilling operations may make fault zones sensitive to shock waves from distant big quakes.

It's long been known that large quakes can trigger minor jolts thousands of miles from the epicenter. Volcanically active spots like Yellowstone National Park often experience shaking after a large distant event.

Less is known about the influence of remote quakes on fault lines that have been weakened by man-made activity like the deep disposal of wastewater at the Texas oil field. A new study led by researchers at Columbia University and published Friday in the journal Science suggests a strong quake that strikes halfway around the globe can set off small to mid-size quakes near injection wells in the U.S. heartland.

"The seismic waves act as the straw that breaks the camel's back, pushing the faults that last little bit toward an earthquake," lead researcher Nicholas van der Elst said in an email.

There has been heightened scrutiny in recent years of quakes near industrial areas as drilling is ramped up to satisfy the country's energy hunger. Research has shown that wastewater disposal - the process of pumping fluids deep into the ground at high pressures - can weaken nearby fault lines and even produce quakes big enough to be felt. The controversial practice of hydraulic fracturing, or fracking, which uses high-pressure mixtures of water, sand and chemicals to extract natural gas or oil, also can trigger quakes, but they're typically microquakes - smaller than

magnitude-2.

By poring through the quake archives, van der Elst and colleagues found evidence that faults near wastewater injection sites were loaded with stress when ripples from a faraway earthquake traveled around the planet.

They contend:

-The magnitude-9 Japan quake set off a swarm in the West Texas town of Snyder, where oil extraction has caused shaking in the past.

-The magnitude-8.8 Chile quake in 2010 triggered a magnitude-4.1 in Prague, Okla., home of active injection wells.

-The Chile quake also set off a series of small quakes in the Colorado town of Trinidad near the New Mexico state line known for extracting natural gas from coal beds.

In those instances, the triggered seismic activity was followed months later by a moderate quake and researchers say that could be a warning sign of stress on the fault. The triggered events are too small to relieve all the stress and some of that stress can be transferred to nearby faults, making a future larger event more likely, said van der Elst.

Not all sites near injection wells showed increased shaking after a strong distant quake. The team found the most affected areas were places where pumping has been going on for decades.

University of Utah mechanical engineer Sidney Green called the results interesting but "rather speculative" and said they need more study.

If the observations bear out, it could help oil and gas operators know "where it's safe to inject and where it's not," said Julie Shemeta, a geophysicist and president of Colorado-based MEQ Geo Inc., a consulting company.

Despite a history of man-made quakes near wastewater injection sites, only a small number of the country's 30,000 disposal wells are a problem, said U.S. Geological Survey seismologist William Ellsworth, who published an article in the journal reviewing the state of research.

Ellsworth said fracking does not pose a high risk for triggering quakes strong enough to feel. The largest man-made quake linked to fracking was a magnitude-3.6 in British Columbia in 2009.

In a third quake-related paper appearing in Science, researchers at the University of California, Santa Cruz, found increased seismic activity over a 30-year period around a Southern California geothermal plant located near the San Andreas Fault. The plant pumps water in and out of an underground reservoir to make steam that drives turbines.

Lead author Emily Brodsky said she has come up with a way to determine the rate of quakes from pumping at the site and plans to test the method at other geothermal plants.