

Study links disposing of wastewater to Oklahoma earthquakes

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The dramatic increase in earthquakes in central Oklahoma since 2009 is likely attributable to subsurface wastewater injection at just a handful of disposal wells, finds a new study to be published in the journal *Science* on July 3, 2014.

The research team was led by Katie Keranen, professor of geophysics at Cornell University, who says Oklahoma earthquakes constitute nearly half of all central and eastern U.S. seismicity from 2008 to 2013, many occurring in areas of high-rate water disposal.

"Induced seismicity is one of the primary challenges for expanded <u>shale</u> gas and unconventional hydrocarbon development. Our results provide insight into the process by which the earthquakes are induced and suggest that adherence to standard best practices may substantially reduce the risk of inducing seismicity," said Keranen. "The best practices include avoiding wastewater disposal near major faults and the use of appropriate monitoring and mitigation strategies."

The study also concluded:

- Four of the highest-volume <u>disposal wells</u> in Oklahoma (~0.05% of wells) are capable of triggering ~20% of recent central U.S. earthquakes in a swarm covering nearly 2,000 square kilometers, as shown by analysis of modeled pore pressure increase at relocated <u>earthquake</u> hypocenters.
- Earthquakes are induced at distances over 30 km from the



disposal wells. These distances are far beyond existing criteria of 5 km from the well for diagnosis of induced earthquakes.

• The area of increased pressure related to these wells continually expands, increasing the probability of encountering a larger fault and thus increasing the risk of triggering a higher-magnitude earthquake.

"Earthquake and subsurface pressure monitoring should be routinely conducted in regions of wastewater disposal and all data from those should be publicly accessible. This should also include detailed monitoring and reporting of pumping volumes and pressures," said Keranen. 'In many states the data are more difficult to obtain than for Oklahoma; databases should be standardized nationally. Independent quality assurance checks would increase confidence. "

More information: Sharp increase in central Oklahoma seismicity since 2008 induced by massive wastewater injection," by K.M. Keranen, *Science*, 2014. <u>www.sciencemag.org/lookup/doi/ ...</u> <u>1126/science.1255802</u>

Provided by Cornell University

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