CO2 fracking linked to mysterious unidentified seismic activity

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In a recent study, scientists have discovered a connection between the controversial practice of fracking and a previously unidentified type of seismic activity.

While fracking is widely known for its potential to induce earthquakes, this new research suggests it can also cause small, slow tremors, that have often gone unnoticed.

Studying impact of CO2 fracking

Fracking, formally referred to as hydraulic fracturing, involves the high-pressure injection of fluids into the Earth's subsurface to extract valuable oil and natural gas reserves.

The standard fluid used for this process has traditionally been wastewater. But the researchers specifically analyzed the impacts of fracking with liquid carbon dioxide (CO2) – a method that serves a dual purpose.

Environmental advantages

Not only does this method extract gas, but it also sequesters carbon dioxide underground, preventing it from contributing to the greenhouse effect in the atmosphere.

The potential environmental advantage of this fracking method is nothing short of remarkable. As some studies suggest, CO2 fracking could offset carbon emissions equivalent to the annual production of one billion solar panels.

“Because this study examines a process that sequesters carbon underground, there may be positive implications for sustainability, and for climate science,” said Abhijit Ghosh, an associate professor of geophysics at UC Riverside.

Professor Ghosh explained that because the carbon dioxide is liquid, the results of this study almost certainly apply to fracking with water. Both are likely to cause tremors.

Silent tremors

The intriguing detail about these tremors is their appearance on seismographs, which starkly contrasts with typical earthquakes. While powerful quakes produce sharp, high-amplitude signals, these tremors are more subdued.

They rise gently above the background noise and then diminish gradually. However, the distinction doesn’t necessarily mean that fracking with wastewater is any safer.

Unraveling the mystery

For years, there was significant contention among seismologists about the true origins of these tremors. Some theories attributed the seismic signals to distant, large-scale earthquakes, while others believed they were the result of local human activity, such as passing trains or industrial operations.

“Seismometers are not smart. You could drive a truck nearby, or kick one with your foot, and it would record that vibration,” said Ghosh, emphasizing the initial challenges in deciphering the data.

To demystify this puzzle, the team set up seismometers around a fracking site located in Wellington, Kansas. This monitoring extended over an extensive period, capturing data before, during, and after the fracking operations.

What the researchers discovered

The conclusive evidence emerged when signals generated underground were found exclusively during the fluid injection phase. “We did not detect the tremors before or after the injections, which suggests the tremors are related to them,” said Professor Ghosh.

Fracking’s capacity to cause more significant seismic events has been an acknowledged concern for years. Yet, completely halting the process appears improbable, making ongoing monitoring of these tremors vital.

Understanding the deformation of rocks due to fracking and tracking the post-injection fluid movement is essential for safety.

Study implications

While modeling experiments offer guidelines on safe fluid injection pressures to minimize potential earthquakes, Professor Ghosh offered a word of caution. The reality is that not all geological faults are mapped, making it challenging to predict all potential outcomes.

“We can only model this type of experiment when we know there is an existing fault. It is possible there are faults we do not know of, and in those cases, we cannot forecast what will happen,” he said.

More about fracking

Fracking is a technique used to extract oil and natural gas from deep underground. Fracking is a topic of significant debate, balancing its economic benefits against environmental and health concerns.

The discussion is further complicated by geopolitical considerations, technological advancements, and the global urgency to transition to cleaner energy sources.

Process

Fracking involves drilling a well deep into the Earth, then injecting a mixture of water, sand, and chemicals under high pressure. This injection fractures the surrounding rock, allowing trapped oil or natural gas to flow freely so it can be pumped to the surface.

Benefits

Fracking has significantly increased the U.S.’s oil and natural gas production, reducing the country’s dependence on foreign oil and leading to lower energy prices.

The fracking boom has also created numerous jobs in drilling, transport, and infrastructure.

Environmental Concerns of Fracking

Water contamination

There are concerns that the chemicals used in fracking fluid might contaminate drinking water supplies.

Air quality

Equipment used in the fracking process can release harmful pollutants.

Seismic activity from fracking

As mentioned in the study, fracking can induce seismic activity, leading to earthquakes in areas that might not typically experience them.

Water usage

Large amounts of water are required for fracking, which can strain local water supplies.

Health concerns

Direct exposure to pollutants from the fracking process can impact health. There are concerns about respiratory problems, endocrine disruption, and other health issues, though research in this area is ongoing.

Alternative methods

As mentioned in the UCR study, there is ongoing research into alternative methods like CO2 fracking. The advantage is the sequestration of CO2, a greenhouse gas, but the method also comes with its own set of challenges and concerns.

The study was published in the journal *Science*.

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