Fracking requires a minimum distance of at least 0.6 kilometers from sensitive rock strata

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This is Professor Richard Davies. Credit: Durham University

The chances of rogue fractures due to shale gas fracking operations extending beyond 0.6 kilometres from the injection source is a fraction of one percent, according to new research led by Durham University.

The analysis is based on data from thousands of fracking operations in the USA and natural rock fractures in Europe and Africa.

It is believed to be the first analysis of its type and could be used across the world as a starting point for setting a minimum distance between the depth of fracking and shallower aquifers used for drinking water.

The new study, published in the journal *Marine and Petroleum Geology*, shows the probabilities of 'rogue' fractures, induced in fracking

operations for shale gas extraction, extending beyond 0.6 kilometres from the injection source is exceptionally low. The probability of fractures extending beyond 350 metres was found to be one per cent.

During fracking operations, fractures are created by drilling and injecting fluid into the rock strata underground to increase oil and gas production from fine-grained, low permeability rocks such as shale. These stimulated fractures can significantly increase the rate of production of oil and gas from such rocks.

Fracking operations in the USA are growing in number and many countries across the world are looking at shale gas as a potential energy resource. The process of fracking has come under increasing scrutiny. A recent test well in the UK near Blackpool, Lancashire, was stopped after some minor earthquakes were felt at the surface. The UK government is allowing the test fracking to resume but critics have also warned of other possible side-effects including the contamination of groundwater.

Researchers from Durham University, Cardiff University and the University of Tromsø looked at thousands of natural and induced fractures from the US, Europe and Africa. Of the thousands artificially induced, none were found to exceed 600 metres, with the vast majority being much less than 250 metres in vertical extent.

Fracture heights are important as fractures have been cited as possible underground pathways for deep sources of methane to contaminate drinking water. But the likelihood of contamination of drinking water in aquifers due to fractures when there is a separation of more than a kilometre is negligible, the scientists say.

Professor Richard Davies, Director of Durham Energy Institute, Durham University, said: "Based on our observations, we believe that it may be prudent to adopt a minimum vertical separation distance for stimulated

fracturing in shale reservoirs. Such a distance should be set by regulators; our study shows that for new exploration areas where there is no existing data, it should be significantly in excess of 0.6 km.

"Shale gas exploration is increasing across the world and sediments of different ages are now potential drilling targets. Constraining the maximum vertical extent of hydraulic fractures is important for the safe exploitation of unconventional hydrocarbons such as shale gas and oil, and the data from the USA helps us to understand how fracturing works in practice.

"Minimum vertical separation distances for fracturing operations would help prevent unintentional penetration of shallow rock strata."

Professor Davies' team looked at published and unpublished datasets for both natural and stimulated fracture systems in sediment of various ages, from eight different locations in the USA, Europe and Africa.

Professor Richard Davies said: "Sediments of different types and ages are potential future drilling targets and minimum separation depths are an important step towards safer fracturing operations worldwide and tapping into what could be a valuable energy resource.

"We need to keep collecting new data to monitor how far fractures grow in different geological settings."

The team accepts that predicting the height and behaviour of fractures is difficult. They now hope that the oil and gas industry will continue to provide data from new sites across the globe as it becomes available to further refine the probability analysis.

Analysis of new sites should allow a safe separation distance between fracking operations and sensitive rock layers to be further refined, the

scientists say. In the meantime, the researchers hope that governments and shale gas drilling companies will use the analysis when planning new operations.

Provided by Durham University

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