Does Fracking Cause Earthquakes in BC? Jessica O’Sullivan

As a budding geologist living in a province that has active fracking sites, I often get asked about the impact of fracking on earthquakes. The subject is controversial, with little information accessible to the public. There is a general bias against fracking, and I believed the bias to be based in myth, not science. This led me to ask about the connection, with the hypothesis that fracking does not cause earthquakes. Fracking is used in the oil and gas industry as an extraction method. It involves pumping large quantities of fluid into wells, so that the pressure and force of the fluid causes cracks to form in the underlying rock. Tiny particles in the fluid prop the cracks open once the fluid has dissipated, and allows the oil or gas to move towards the extraction site. While it was possible to find references to research on the topic, it was nearly impossible to find primary sources. Part of this is likely due to the influence of the oil and gas industry. For example, of 15 reports commissioned by the Ministry of Economic Affairs in the Netherlands, only 1 was published (Voort and Vanclay, 2014). Research into the Oklahoma earthquakes mentioned below has been published out concern for the researcher’s academic tenure (Behar, 2013)

According to secondary sources, a growing body of science suggests a causal relationship between fracking and earthquakes (Booher, 2015). No such studies appear to have been conducted in BC, and I would argue that the regional structure and tectonics would be directly related to the likelihood of an earthquake occurring. Illustrating my point is the story of an Oklahoma earthquake in 2011. It is possible that a dead fault, one considered to be at no risk of earthquake inducing movement, was reactivated by water injections due to fracking. (Behar, 2013). Unfortunately, there are faults to be found crisscrossing the Earth regardless of location. It is unlikely that the oil and gas industry would be able to avoid contact with a fault, especially considering the unpredictable and uncontrollable behaviour of fluid once it has been injected.

The province of Groningen, The Netherlands, has published the conclusion that around 1000 minor earthquakes in the region have been the result of gas extraction (Voort and Vanclay, 2014). Most of these earthquakes were less than a 3 on the Richter scale, and not strong enough to be felt by humans. The scale and frequency of earthquakes have been increasing over time however, and in 2012, a 3.6 scale earthquake hit the region. It was the largest earthquake ever experienced in the area. A report published in 2013 warned there was a 7% chance of a 4.0 to 5.0 scale earthquake (Voort and Vanclay, 2014). Using publically accessible earthquake data from BC, I hope to see if earthquake rates localized to fracking sites follow a similarly high rate.

To test my hypothesis, I plan on collecting data on fracking rates, location and other variables such as pressure and mine depth. I will cross-reference with public data on earthquake frequency and location. Past this point, I would be interested in determining the magnitude of earthquakes, their location relative to fracking sites, and their location relative to regional structural features such as faults or plate boundaries. I would also like to compare earthquake data prior to when fracking activity started in the region.

Based on my research, and despite my hypothesis, I’m expecting there to be a cause and effect relationship between fracking and earthquakes. Knowing this, I am hoping to expand my data analysis beyond the simple cause/effect umbrella. I expect the variety of fracking, how deep the water is pumped and the location for example, to have an effect on earthquake scale and frequency. I face a couple of challenges in this regard. First is that BC is an already seismically active region, and separating natural and induced earthquakes might prove difficult. The second will be acquiring accurate data regarding the specifics of fracking activity. I will be able to find the location of fracking sites since it is publicly available. Given the private nature of the oil and gas industry, finding detailed data on the fracking activity may be challenging.

References:

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