Influence of Fabric and Composition on Geomechanical Properties and Natural Fractures Characteristics in the Duvernay Unconventional Shale Play in the Kaybob Area (Western-Central Alberta, Canada).

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ABSTRACT

During the last few years, significant induced seismicity has been registered near horizontal wells completed using multi-stage hydraulic fracturing, and many studies suggested this stimulation technique as the primary trigger mechanism.

In the Duvernay shale, one of Canada's most promising shale plays, induced seismicity has been registered and directly linked to hydraulic fracturing operations. The aim of this research is to understand the relation between sedimentary facies and geomechanical properties in the Duvernay shale to understand which geological factors are responsible for triggering induced seismicity.

Data from 1400+ wells penetrating the Duvernay have been analyzed in a 60 townships (5700 km2) wide area. 8 sedimentary facies have been identified in core and upscaled to tie to well logs, and for each horizontal well frac data (breakdown pressure, max pressure, DFIT) have been plotted against the sedimentary facies the frac stage was performed within. So far, subsurface thickness maps of the 3 upscaled facies have been built in the entire study area, and frac data are helping to constrain their geomechanical properties.

The next step is to tie geomechanical data in the subsurface to the ones in core and outcrop, where sedimentary facies can be constrained with a much higher level of detail. By taking samples in the field and running specific geomechanical tests on them, we will be able to gain more knowledge about the behavior of the Duvernay when undergoing hydraulic fracture treatment. This innovative workflow is having huge implications in the understanding of the factors that may trigger hydraulic fracturing-induced seismicity, as well as how geology and geomechanics can be tied together to optimize field development in shale reservoirs.

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