Variation in style of overpressure in Scotian Shelf wells, Scotian Basin

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Overpressure is a phenomenon where pressures greatly exceed normal hydrostatic pressure and occurs in many wells within the Scotian Basin. Due to this area being actively explored for oil and gas over the last five decades, it is very important to understand where and what is causing overpressure. The main causes of overpressure are disequilibrium compaction, clay diagenesis, and hydrocarbon generation, although, the relative importance of these processes in the Scotian Basin is uncertain. To assess and interpret the causes of variability in the style of overpressure in different wells in the Scotian Basin, velocity and density data from wireline data logs were used to produce velocity vs. density cross plots. These plots allow the possible secondary mechanisms of overpressure generation to be visualized. XRD of < 2 μm clays from shale in overpressured wells were analyzed based on clay mineralogy to possibly find a link between overpressure and diagenesis occurring in the studied samples. The method of cross plot analysis does indeed work for finding patterns of velocity vs. density changes below overpressure. Down-well variation in velocity vs. density of shale based on wireline logs shows wide range in velocity vs. density patterns in overpressured sections. There was an apparent regular distribution of different types observed based on velocity-density patterns. Fractures and cementation may have an influence on velocity and density downwell. The fractures may be due to the buildup of overpressure and its eventual release. The opening of fractures would cause a decrease in velocity and that would be observable in velocity-density plots.

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