

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

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The Scotian Basin lies to the southeast of Nova Scotia and has been actively explored for oil and gas over the last five decades. Many of the reservoir sandstones occur in overpressured rocks, where pressures greatly exceed normal hydrostatic pressure. There are three main causes of overpressure: disequilibrium compaction, clay diagenesis, and hydrocarbon generation. The relative importance of these three processes in the Scotian Basin is uncertain. The purpose of this study is to assess variability in the style of overpressure in different wells in the Scotian Basin, and to interpret the causes of this variability. Down-well variation in velocity vs. density of shales based on wireline logs showed several different styles of variation in overpressured section. For example, wells in the Venture field show a drop in velocity without change in density below the top of overpressure, classified as a type 3 pattern, whereas Louisbourg J-47 shows a curved gradual drop in velocity with some change in density after the top of overpressure, a type 9 pattern, and South Desbarres O-76 shows a drop in velocity followed by a rise, without change in density, a type 10 pattern. The Venture style of variation in other basins is associated with hydrocarbon generation, whereas the origin of the patterns for Louisbourg and South Desbarres is at present uncertain, but may be related to bedding-parallel fractures. Different styles of overpressure are correlated with variation in burial diagenesis in shale samples, based on <2 µm X-ray diffraction analysis.