

Origin and nature of hydrothermal dolomitization and controls on porosity development: implications for the St. George Group carbonates in western Newfoundland, Canada.

The proposed project investigates the origin and distribution of hydrothermal dolomites in eastern North America carbonate reservoirs, particularly St. George Group in western Newfoundland. Hydrothermal dolomites have progressively become a major target in the carbonate sequences of eastern North America where significant reservoirs are being produced from the Appalachians and the surrounding area such as Gaspé Peninsula and New Brunswick.

Dolomitization of carbonate sediments is a crucial diagenetic process which influences the secondary porosity development and fluid flow characterization in rock strata. The St. George Group carbonates of western Newfoundland have been affected by significant meteoric diagenetic alterations, due to a major subaerial exposure (St. George Unconformity), which likely increased the rock porosity and enhanced dolomitization. The preliminary petrographic investigations show the high porosity zones are associated with hydrothermal dolomites. Petrography, geochemistry and microthermometry of the late dolomites suggest precipitation at higher temperatures (~100°C) in deeper burial environments from hydrothermal solutions. The occurrence of organic-rich shales (possible potential source rocks) and impermeable layers at the top of the sequence (seal rock) as well as the structural framework developed by the Acadian orogeny make the sequence a potential candidate for oil accumulations, an analogue to that of the Ellenberger play of West Texas. The field observations of live kerogen seeps and earlier preliminary drillings results encourage the investigation of the St. George carbonate sequence.

The origin and distribution of dolomites in eastern North America Paleozoic reservoirs, particularly in the Ordovician (Arenig) carbonates of St. George Group of western Newfoundland and coeval strata nearby, have been the focus of many recent studies. Recently, hydrothermal dolomites have become a major target in the Appalachians and adjacent areas. The approach of the current investigation can be applied to other carbonate sequences on a global basis regardless the age or location of basin of deposition.

The main objectives of this project are to:

- 1- Investigate the diagenetic evolution and reservoir characterization of these carbonates.
- 2- Identify (petrographically and geochemically) the cementation and dolomitization phases that influenced the rocks and investigate the origin and nature of the dolomitizing fluids of each phase to understand the diagenetic controls on porosity development and distribution.
- 3- The investigated sequences will cover areas that were not previously investigated (e.g., Northern Peninsula). The results will contribute to other studies of predicting the porosity distribution in the equivalent offshore layers, which may have important implications for hydrocarbon exploration.