Diagenetic alteration of 'red bed' clastics and potential uranium and petroleum resources, Carboniferous Basin, Atlantic Canada

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The Carboniferous sedimentary rocks of Atlantic Canada continue to be a source of coal, base metals and evaporitic minerals, but to date have yielded only minor amounts of oil and gas, and no economic concentrations of uranium. However, geological evidence suggests the search for these vital energy resources should be continued.

'Red bed' clastic rocks are not inert containers of petroleum, but undergo diagenetic alteration when in contact with pooled or migrating hydrocarbons. The most conspicuous features are changes in colour, from reddish brown to grey or greenish-grey, and in degree of cementation, from a poorly cemented to a well cemented, more resistant sandstone. These altered zones also commonly contain petroleum-derived bitumens, fracture-filling white calcite and pyrite, and local concentrations of uranium. They are found in close proximity to fault zones throughout the Carboniferous basin.

The best exposures of these 'fossil' hydrocarbon reservoirs or seepage zones are found on the Magdalen Islands in the Gulf of St. Lawrence. Large lenses or pods of altered sandstone flank the evaporite piercement structures which created the Islands, indicating that petroleum has at one time been present in structural traps on the flanks of these structures.

Applying this concept to the search for uranium in carboniferous strata, the greatest potential for sandstone-hosted uranium deposits appears to be along the fault-bounded margins of the Moncton sub-basin, New Brunswick, and the Deer Lake basin, Newfoundland. Hydrocarbons expelled from highly bituminous, lacustrine oil 'shales' may have migrated along zones of structural and stratigraphic permeability in nearby alluvial fan deposits. The chemically reducing environment created by the passage of these hydrocarbons would precipitate uranium from uranium-bearing groundwaters and preserve uranium deposits from subsequent leaching.