

Provenance of Lower Jurassic to Lower Cretaceous clastic sedimentary systems in the SW Scotian Basin and the Fundy Basin, Canada

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Lower Jurassic to Lower Cretaceous clastic deposits in the SW Scotian Basin and the Fundy Basin, offshore Nova Scotia, are poorly known, but are of current exploration interest. This study determined sediment sources and potential river patterns for these Mesozoic sandstones. Samples from conventional cores and cuttings were analyzed by scanning electron microscope and electron microprobe to identify detrital minerals (heavy and light) and lithic clasts, and determine their geochemical composition. The chemistry of detrital minerals, particularly tourmaline, garnet, spinel, micas and chlorite, and texture and mineralogy of lithic clasts were used to determine provenance.

During Early Jurassic, clastic sediments were deposited only in the Fundy Basin. The abundance of magnetite suggests a local major supply from the North Mountain Basalt, which is the only magnetite parental rock around the Fundy Basin. Lower Jurassic detrital mineral chemistry indicates derivation from metamorphic rocks of the Meguma terrane and a small influence from distal sources to the north. Sediments with local character were transported by small local rivers from the Meguma terrane, flowing along the Cobequid-Chedabucto Fault Zone and directly from the North Mountain Basalt. More distant rivers probably passed through Chignecto Bay before depositing in the Fundy Basin.

In the SW Scotian Basin, detrital minerals and their inclusions, and mineralogy of lithic clasts in Mid Jurassic sandstones indicate a major Meguma terrane source, and transport by local rivers. Small amounts of spinel and garnet characteristic of meta-ultramafic rocks, found only in the Mohawk B-93 well, suggest minor supply from the rising Labrador rift, via a river running along the Cobequid-Chedabucto Fault Zone and across the Fundy Basin. The abundance of metamorphic lithic clasts in the sandstones suggests uplift and intense erosion of the Meguma Supergroup metasedimentary rocks. Upper Jurassic sandstones were sourced entirely from the Meguma terrane. Lower Cretaceous sandstones were also predominantly sourced from the Meguma terrane, but in Mohican I-100 well minor garnet from meta-ultramafic rocks and spinel suggest some supply from Labrador and inboard Appalachian terranes, which were the principal sources of sediment to the central Scotian Basin at that time. The dominant Meguma terrane provenance precludes thick deep-water sandstones in the eastern Shelburne subbasin, but the evidence of Mid Jurassic distant river supply through the Fundy Basin is encouraging for deep water reservoir quality in the western part of the subbasin.