

## Lower Carboniferous volcanic rocks of the Magdalen Islands: Volcanism in the Fundy Epieugeosyncline

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Volcanic rocks on the Magdalen Islands occur within and overlying Lower Carboniferous clastic, carbonate, and evaporitic sequences which have been correlated with the Windsor Group of Nova Scotia and New Brunswick. The volcanic units consist mostly of volcaniclastic rocks and basaltic flows, intruded by gabbroic dykes and plugs. The stratigraphy has been widely disrupted by evaporite diapirism which has produced basaltic breccia and melange, the latter particularly spectacular where gypsum and volcanic rocks are involved. Petrological studies of the basaltic flows and intrusions show that their primary mineralogy included plagioclase (labradorite ?), titaniferous augite, and olivine, but intense alteration has produced abundant chlorite, sericite, carbonate, epidote, hematite, and other secondary minerals. The alteration is reflected in wide chemical variations, especially in Ca, Na, and K, which have

led to previous interpretations that the rocks are alkalic based on major element chemistry. However, the relatively immobile elements (Ti, Nb, Y, Zr) show clearly that the basalts are continental tholeiites, probably generated under moderately thick continental crust.

Other volcanic rocks formed in association with the Fundy Epieugeosyncline range in age from Middle Devonian to late Carboniferous. They are exposed at the surface in Nova Scotia and New Brunswick and have been encountered in the subsurface in Prince Edward Island and the Gulf of St. Lawrence. This wide distribution of volcanic rocks both geographically and in time implies a relatively high geothermal gradient in the Fundy Epieugeosyncline throughout its development. This may have important implications for the formation both of hydrocarbon accumulations and of mineral deposits of submarine-exhalative type.