

A petrochemical study of the Carboniferous volcanic rocks in the Chance and Dipper Harbour area, southern New Brunswick

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In Chance and Dipper Harbour area, the Carboniferous volcanic rocks consist of the Namurian-aged Meadow Cove Volcanics and the Westphalian A-aged Retreat Lake Volcanics. The volcanic rocks are dominantly felsic and consist of basal laharic mudflows and/or lithic tuffs, succeeded by a thick sequence of ash-flow and crystal tuffs with minor interlayered basalt flows and sediments.

The mafic volcanic rocks are basaltic in composition and characterized by low SiO_2 and Al_2O_3 . AFM diagram shows that the basalts are tholeiites. The ash-flow tuffs are generally rhyolitic in composition and characterized by high SiO_2 , molecular $\text{K}_2\text{O} + \text{Na}_2\text{O}/\text{Al}_2\text{O}_3 < 1$, variable $\text{K}_2\text{O}/\text{Na}_2\text{O}$ (due to alteration) and very low CaO, MgO and Fe_2O_3 .

Geochemical studies on the distribution of Zr, Ti, Y, Sr and SiO_2 show that the volcanic rocks are bimodal and the mafic rocks are continental tholeiites occurring in a "within-plate" extensional, possible rifting tectonic regime. The $\text{Fe}_2\text{O}_3^{\text{T}}/\text{MgO}$ ratio and the REE abundances are consistent with this setting and that Meadow Cove Volcanics are more differentiated

than the Retreat Lake Volcanics.

The felsic and mafic volcanic rocks are contemporaneous. The felsic volcanic rocks are probably derived from partial melt of the crust and mafic volcanic rocks are derived from the mantle and the petrogenesis may be explained by the thermo-gravitational convection diffusion model. They were extruded to its present level probably through an extension tectonic regime. Field relationships, thin-sections and geochemical studies on the Chance Harbour granite suggest a genetic relationship to the ash-flow tuffs.

The juxtaposition of orogenic and non-orogenic suites of the Carboniferous volcanic rocks in the study and adjacent Saint John area to the east may be explained by the tectonics provided by the "megashield environment" model. In view of the recent discovery of precious metals in southern New Brunswick in rocks of a similar magma-type and tectonic environment the study will have important implications for the genesis of mineral deposits and is therefore of great interest, for mineral exploration.