

Role of volatiles in the petrogenesis of the Carboniferous North River and West Moose River plutons, Cobequid Highlands

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The West Moose River Pluton is a Carboniferous high level granite pluton; the North River Pluton is similar but developed at a deeper structural level. Both plutons have small marginal gabbro bodies that predate the main granite. The plutons were deformed (in a predominantly brittle manner) shortly after intrusion and are cut by mafic sheets, some of which are deformed along with the granite. Deformation patterns are consistent with dextral shear on the Cobequid Fault Zone. Geochemically, the granites are A-type, with high Zr, Y, Nb and Ga/Al, and are similar to Fountain Lake rhyolites, which are interpreted as co-genetic.

The early gabbros and later sheets show similar geochemistry to the Fountain Lake basalts and are different from later Triassic volcanic rocks. TiO₂ content increases from the gabbros to the least-deformed sheets; other high field strength elements increase along with TiO₂. Ga/Al and Zn are high, probably reflecting the role of halide complexes. Rb/K and Cs/K ratios are also unusually high in the mafic sheets, but not the lavas,

reflecting some late stage metasomatic event. The enrichment in TiO₂ and other HFS elements is not the result of partial melting of enriched mantle, since later rocks are more enriched. Neither can fractionation adequately explain the enrichment in rocks with [Mg] of 50-60 and higher Cr and Ni. The relative enrichment of different elements is consistent with partitioning between co-existing mafic and felsic magmas, being greatest for P and Hf.

The mafic rocks are interpreted as the heat source for melting of anhydrous lower crust previously depleted during Hadrynian I-type plutonism. The resulting felsic melts were enriched in halogens, with regional variation in the ratio Cl/F. The plutons developed in an overall transtensional environment associated with the rifting of the Gulf of St. Lawrence Basin, reflected in the intrusion of major gabbro plutons (Folly Lake, Wyvern). Major strike slip faults provided pathways for magma to reach the surface and deformed the plutons, allowing intrusion of mafic sheets.