
**Lower Silurian subduction-related volcanic rocks in the
Chaleurs Group, northern New Brunswick, Canada**

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Volcanic rocks are hosted by Lower Silurian rocks of the Chaleurs Group at two locations in northern New Brunswick. At Quinn Point, minor mafic to intermediate volcanic rocks occur in the Weir Formation, and at Pointe Rochette, a thin bed of felsic tuff has been identified at the top of the Clemville Formation. These rocks are interpreted as the first evidence in New Brunswick of magmatism associated with Late Ordovician-Silurian northwest-directed subduction of the Tetagouche-Exploits back-arc basin. At Quinn Point, volcanic rocks include a thick flow of massive basalt, and mainly andesitic cobbles and boulders in overlying conglomerate beds. The basalts have low (evolved) Mg#s, despite high Cr and Ni values and abundant pseudomorphed olivine phenocrysts, implying replacement of Mg by Ca during olivine alteration. The *in situ* flow and the conglomerate clasts are chemically alike, and display volcanic-arc affinities on diagrams used to infer tectonic setting. The volcanic rocks were emplaced in the fore-arc region, probably reflecting local step-back of the

magmatic axis due to accretion of continental back-arc ribbons. Chemical characteristics such as depleted HREE, high La/Yb, high Al₂O₃ and slight positive Eu anomalies suggest that the parent magma may have been generated from partial melting of the subducting slab, namely young, warm Tetagouche-Exploits back-arc oceanic crust. Subduction of young back-arc crust in general was probably largely responsible for the relatively low volume of Early Silurian arc magmatic rocks in the northern Appalachians. At Pointe Rochette, fine-grained vitroclastic felsic tuff has a rhyodacitic composition and displays extensive alkali and large-ion-lithophile mobility, with depletion in K, Rb, Ba and Cs. Elevated Th and U, and depleted high-field-strength elements (Nb, Hf, Zr), are consistent with a subduction-influenced setting, although REE abundances are low and the REE profile is relatively flat and unfractionated. A U-Pb (zircon) age of 429.2 ± 0.5 Ma was obtained from the tuff, consistent with the late Llandovery to early Wenlock fossil-indicated age of the overlying La Vieille Formation. Although not altered to bentonite, the age of the tuff suggests an affiliation with one of many Early Silurian subduction-related K-bentonites documented in northwestern Europe and eastern North America, e.g., at Arisaig in Nova Scotia.