Petrology of the Indian Lake and Leadbetter Road plutons, Antigonish Highlands, Nova Scotia

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The Indian Lake and Leadbetter Road plutons are located in the Antigonish Highlands of northern mainland Nova Scotia. They are separated by the West Barneys River plutonic suite, a large composite pluton of Ordovician age (ca. 470 Ma). The purpose of this study is to describe the petrography and geochemistry of the Indian Lake and Leadbetter Road plutons, and based on those data, to investigate whether or not they are likely to have been comagmatic with each other or with other dated suites in the Antigonish Highlands.

The Indian Lake pluton is not reliably dated but is interpreted to have formed at about 615–605 Ma like some other plutons in the Avalonian Antigonish Highlands. It consists of a calc-alkaline suite of medium-grained quartz diorite and diorite and medium-grained granodiorite gradational to monzogranite. Both the granodiorite/monzogranite and quartz diorite/diorite contain abundant dioritic inclusions. Preliminary chemical data from 15 samples from the Indian Lake pluton show that SiO2 content ranges from about 49% to 74% and reveal trends consistent with crystal fractionation of plagioclase and mafic minerals. The petrographic and chemical characteristics are similar to those of I-type granitoid suites formed in subduction zone settings at active continental margins.

In contrast, the Leadbetter Road pluton consists almost entirely of coarse-grained alkali-feldspar granite with quartz phenocrysts. It is petrographically similar to syenogranitic parts of some ca. 615–605 Ma plutons elsewhere in the Antigonish Highlands, but also to some components of the West Barneys River plutonic suite. Chemical data from 6 samples shows compositions characteristic of within-plate A-type granite. SiO_2 ranges from 75% to 78% and high Zr, Y, Nb, and Ga/Al ratios are distinctive. Also distinctive is the elevated rare-earth element content, with light REE up to 900 times chondritic values and heavy REE up to 60 times chondritic values. These petrological characteristics suggest that the Leadbetter Road pluton is more likely related to the Ordovician West Barneys River plutonic suite than to Indian Lake and other Late Neoproterozoic plutons in the Antigonish Highlands.

Atlantic Geology, 2012, Volume 48, Number 1