textural observations, may provide additional insights into crystallization history.

## Tracking the crystallization of a magma chamber: rare earth element geochemistry of amphibole, Greendale Complex, Antigonish Highlands, Nova Scotia

J. Brendan Murphy[1], Stephanie A. Blais[1], Michael Tubrett[2], Daniel MacNeil[1], and Matthew Middleton1

*1. Department of Earth Sciences, St. Francis Xavier University, Antigonish, Nova Scotia B2G 2W5, Canada <bmurphy@stfx.ca>*
*¶ 2. MicroAnalysis Facility - Inco Innovation Centre, c/o Memorial University of Newfoundland, 230 Elizabeth Avenue, P.O. Box 4200, St. John's, Newfoundland and Labrador A1C 5S7, Canada*

The ca. 610 Ma Greendale Complex, Avalon terrane, Nova Scotia, is an appinitic intrusive suite ranging from ultramafic to felsic in composition that was emplaced during ensialic arc magmatism and crystallized at shallow crustal levels under high $pH_2O$. Amphibole is the dominant mafic mineral in all rocks and displays extraordinary variability in texture and modal abundance, a characteristic of appinite suites. The sensitivity of amphibole composition (major, trace, and REE) to the evolution of water-rich magma is investigated.

All amphiboles in mafic and ultramafic rocks of the Greendale Complex are calcic, with $(Ca + Na)_B \geq 1.34$ and $Na_B < 0.67$ apfu, and $Si^{IV}$ between 6.1 and 7.3. They range in composition from tschermakite, to tschermakitic hornblende, to magnesio-hornblende, and display a dominance of edenite ($Na,K_A + Al^{IV} = Si^{IV}$) substitution. Each sample exhibits remarkably uniform $Mg/(Mg + Fe^{2+})$ over a wide range in Si and the mafic rock amphiboles have lower (0.5 to 0.7) $Mg/(Mg + Fe^{2+})$ compared to the ultramafic rock amphiboles (0.7 to 0.9). REE profiles of amphiboles from mafic rocks are all bow-shaped, and are characterized by depletion in LREE ($La/Sm \approx 0.61$), a slight depletion in HREE ($Gd/Yb \approx 1.55$) and a negative Eu anomaly, which is attributed to co-precipitation of plagioclase. REE profiles of ultramafic amphiboles are divided into two groups: Group A amphiboles occur in all specimens analyzed and are very similar to the profiles of the mafic rocks. In contrast, Group B amphiboles display relative enrichment in light REEs ($La/Sm \approx 2.05$), have lower ΣREE, and lack a negative Eu anomaly. They are more enriched in Th and U and show a more pronounced depletion in Ta, Nb, Ti, and Y. Group B amphiboles grew in a reaction relationship with olivine and pyroxene. Groups A and B are virtually indistinguishable with respect to the major elements, suggesting that REE and selected trace elements, when combined with



Atlantic Geology, 2012, Volume 48, Number 1