A magnetic fabric study of the sheeted Greendale Igneous Complex of the Antigonish Highlands, Nova Scotia, Canada: preliminary results

S. J. DUBOIS[1], J. B. MURPHY[1], W. MCCARTHY[2], AND M. S. PETRONIS[3]

1. Department of Earth Sciences, St. Francis Xavier University, Antigonish, Nova Scotia B2G 2W5, Canada

<x2016mgz@stfx.ca>

2. Department of Earth & Environmental Sciences, University of St Andrews, St Andrews KY16 9AL, UK

3. Environmental Geology, Natural Resource Management Department, New Mexico Highlands University, Las Vegas, New Mexico 87701, USA

The Greendale Igneous Complex is a ca. 607 Ma old, dominantly mafic pluton located on the northern shore of the Antigonish Highlands within the Avalonia composite terrane. It is dominantly composed of appinites (hornblende and plagioclase rich gabbro) emplaced along sheet-like horizons with minor conjugate syn- to late felsic dykes and local horizons of ultramafic rocks. While compositionally similar, the sheets exhibit variable textures (aplitic to pegmatitic) and fabrics (strongly lineated and foliated to massive, equigranular sheets). The development of the sheets is believed to be controlled by the transpressional regional stress field caused by the dextral movement of the Hollow and Greendale faults located to the NW and SE of the complex, respectively. We present new Anisotropy of Magnetic Susceptibility (AMS) and paleomagnetic data to assess the structural and tectonic controls on the emplacement of the Greendale Igneous Complex.

A total of 34 sites over two different localities were sampled for magnetic fabric analysis. Curie point measurements indicated that pyrrhotite is the dominant ferromagnetic phase with minor magnetite in some samples. The concentration of ferromagnetic minerals is locally variable, however, and is not consistent along strike or across sheet boundaries, with many sampling sites containing no ferromagnetic material at all. Isothermal remanent magnetization acquisition curves on sample sites with the highest mean susceptibilities reached 95% saturation at less than ≤0.2T demonstrating that the magnetic remanence of the rocks is carried by ferromagnetic minerals with low coercivity. The magnetically soft nature of the rocks prevented the successful use of paleomagnetism analysis through typical alternating field demagnetization. Alternative techniques such as thermal demagnetization yield improved results in some cases and warrant further study. Anisotropy of magnetic susceptibility analysis successfully produced AMS tensors that can be interpreted as magnetic foliations or lineations, or both. Comparison of the magnetic fabrics with field maps along strike of the appinite sheets and across sheet boundaries can provide important constraints on the emplacement of the sheets and the evolution of the regional stress field of the system over time. Preliminary observations show that the shape and orientation of AMS tensors are generally consistent along strike within sheets but vary from sheet to sheet, suggesting that the fabrics are magmatic in origin.

Atlantic Geology, 2016, Volume 52
Atlantic Geoscience Society Abstracts 42nd Annual Colloquium & General Meeting 2016
doi: 10.4138/atlgeol.2016.004