Assessing Paleoproterozoic Sill and Dyke Provinces in Formerly Adjacent Fragments of Canada and Finland/Russia towards Reconstructing Supercraton Superia

SC Davey[1], RE Ernst[1], B Cousens[1], and W Bleeker[2]

[1]Department of Earth Science, Carleton University, Ottawa, Ontario [2]Geological Survey of Canada, Ottawa, Ontario

Large igneous provinces (LIPs) and their intrusive sill and dyke components offer a means through which Archean cratonic fragments once belonging to supercratons can be reconstructed using geochronology, geochemistry, geometry and paleomagnetic datasets. The Archean Superior craton of Canada and the Karelia-Kola craton of Finland/Russia are considered nearest-neighbours mainly on the basis of matches in their LIP magmatic records, however, their exact placement and relationship remains disputed. The Superior craton is considered the central and dominant fragment of the Superia supercraton in which Karelia-Kola was positioned at its southeastern margin. Other fragments that were likely part of the Superia supercraton include: Wyoming (USA), Hearne (Canada), Yilgarn (Australia) and Zimbabwe (Africa). The position of Karelia-Kola with respect to the Superior craton remains unresolved as recent paleomagnetic studies contradict a nearest-neighbours position. However, these paleomagnetic data are poorly constrained by Sm-Nd ages and complicated by the pervasive Svecofennian orogeny. The objective of this project is to better understand the relationship between the Superior and Karelia-Kola Archean cratons through expanded study of their Precambrian LIP events. Well established events anchored in the Superior craton, such as Mistassini (2500 Ma), Matachewan (2490 and 2450 Ma), Biscotasing (2170 Ma), and Marathon (2100 Ma), among others, are complimented by approximately similar-aged events in Karelia-Kola. The existing dates for magmatic events in Karelia-Kola lack precision and quality, meaning that presently correlated events may not be a true match. Our solution is to conduct a comprehensive comparison of magmatic events from the Superior craton to a suite of sill and dyke samples of major magmatic events from Karelia-Kola. These include: Koitelainen (2439 ± 3 Ma), Taivalkosky (~2300 Ma), Karjaliitic sills (~2200 Ma), Rantavaara (2148 ± 11 Ma), Tohmajarvi (2118 ± 14 Ma), and granophyric portions of the Kevitsa layered mafic intrusion (2058± 4 Ma). The timing of magmatic events in Karelia-Kola will be constrained using U-Pb geochronology of baddeleyite and zircon. Comparisons to age-matching events in the Superior craton will be further evaluated using major and trace element geochemistry. Mapping, geochemistry and geochronological data will be integrated into a geographic information system platform for individual cratons, and merged in a formal reconstruction. Providing insight into the dynamics of Precambrian plate tectonics and data for mineral exploration through the correlation of magmatic bodies, this study will also explore the possibility of a reconstruction between Karelia-Kola and Kaapval (South Africa) based on their concurrent Kevitsa and Bushveld Ni-Cu-PGE deposits.