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GEOCHEMICAL DATA FROM MONTAGNAIS GABBRO SILLS AND ASSOCIATED ROCKS IN THE LABRADOR TROUGH
(NTS MAP AREAS 23I/12, 13, 23J/16, 23O/01 AND 02)

J. Conliffe and A. Smith

Open File LAB/1723

St. John's
Newfoundland and Labrador
April, 2018

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CONTENTS

FIGURE

TABLE

SUMMARY

This Open File release consists of whole-rock geochemistry of 81 samples collected in western Labrador in 2017 (Figure 1). The sample locations are located in the eastern portion of the Labrador Trough (NTS map areas 23I/12, 13, 23J/16, 23O/01 and 02), and were sampled in the first year of a multi-year project investigating the metallurgy and mineral potential of the region. The samples represent Montagnais Gabbro sills and associated igneous rocks, as well as sulphide-bearing sedimentary rocks which the gabbro sills were intruded into. These gabbro sills have potential to host Ni–Cu–PGE deposits, and these data forms part of an ongoing B.Sc. (Hons.) thesis by Andrew Smith at Memorial University. For more information on the regional geological setting and geological characteristics of rock units, the reader is referred to Smith *et al.* (2018).

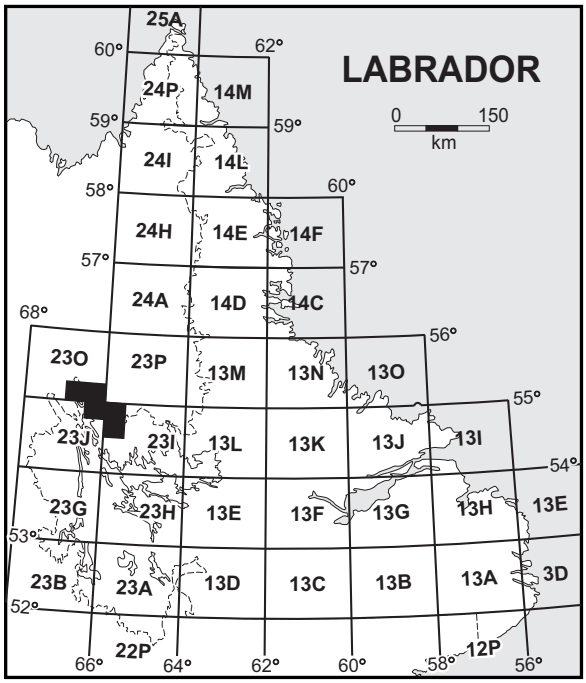

Figure 1. *Location of study area in western Labrador.*

NOTES ON DATABASE

This database includes the results of whole-rock, trace-element, platinum group element (PGE) and rare-earth element (REE) analyses of 81 samples. Also included are the sample location data and brief sample descriptions. The location data for samples are presented in Appendix A, with locations reported as Universal Transverse Mercator (UTM) eastings and northings (zone 19, NAD27). The data are available in digital format (*i.e.*, *.csv comma-separated values files) from the links below.

All samples selected for geochemical analyses were prepared at the Geological Survey of Newfoundland and Labrador's (GSNL) Geochemistry Laboratory in St. John's. Samples were milled using ceramic mills. Most analyses were carried out at the GSNL geochemistry laboratory and analytical methods are described in Finch *et al.* (2018) and summarized in Table 1. These analyses were supplemented by a PGE Fire Assay package for Pd, Pt and Au, carried out at the commercial Actlabs.

Major-element compositions (plus Ba, Be, Cr, Sc and Zr) were analyzed by ICP-OES methods, following lithium tetraborate and metaborate fusion. The REE and selected trace elements were determined by ICP-MS analysis following an identical sample digestion procedure, whereas other trace elements (As, Cd, Co, Cu, Li, Ni, Pb, Rb, V and Zn) were analyzed by ICP-MS after total 4-acid digestion. Volatiles are represented as loss-on-ignition (LOI) at 1000°C, which represents the breakdown of all minerals and release of all volatiles. The ferrous-iron content (FeO) of silicate rocks is determined by the Wilson Method (Wilson, 1960), as outlined by Finch *et al.* (2018). Fluoride content was determined by Ion Selective Electrode (ISE) analysis as described by Ficklin (1970) and Finch *et al.* (2018). For silver analysis, 0.5 g of sample powder was weighed

Table 1. Analytical methods for geochemical analyses

Analysis	Analytical Method	Preparation/Digestion
SiO_2, Al_2O_3, Fe_2O_3, MgO, CaO, Na_2O, K_2O, TiO_2, MnO, P_2O_5, Ba, Be, Cr, Sc, Zr	Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES)	50-50 Lithium Tetraborate Lithium Metaborate Fusion
As, Cd, Co, Cu, Li, Ni, Pb, Rb, V, Zn	Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES)	HF-HCl-HNO_3-$HClO_4$ (total digestion)
Bi, Ce, Cs, Dy, Er , Eu, Ga, Gd, Ge, Hf, Ho, La, Lu, Mo, Nb, Nd, Pr, Sm, Sn, Sr, Ta, Tb, Th, Tl, Tm, U, W, Y, Yb	Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	50-50 Lithium Tetraborate Lithium Metaborate Fusion
F	Ion Selective Electrode (ISE)	Na_2CO_3 and KNO_3 fusion
Ag	Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES)	HNO_3 digestion
Au, Pd, Pt	Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	Fire Assay fusion, HNO_3-HCl digestion
LOI	Gravimetric (Grav) at 1000°C	None

into a 15 ml digestion tube with 2 ml of concentrated nitric acid, and digested for two hours. The digested sample was analyzed by ICP-OES (Finch *et al.*, 2018).

The Pd, Pt and Au contents were analyzed at Actlabs using the following protocol. The sample was mixed with fire assay fluxes (borax, soda ash, silica, litharge). Ag was added as a collector and the mixture was placed in a fire clay crucible. The mixture was preheated at 850°C, intermediate 950°C and finished at 1060°C with the entire fusion process lasting 60 minutes. The crucibles were then removed from the assay furnace and the molten slag (lighter material) was carefully poured from the crucible into a mould, leaving a lead button at the base of the mould. The lead button was then placed in a preheated cupel which absorbs the lead when cupelled at 950°C to recover the Ag (doré bead) + Au, Pt and Pd. The Ag doré bead was digested in hot (95°C) HNO_3 + HCl. After cooling for 2 hours the sample solution was analyzed for Au, Pt, Pd by a Perkin Elmer Sciex ELAN 6000, 6100 or 9000 ICP/MS. On each tray of 42 samples there were two method blanks, three sample duplicates, and 2 certified reference materials.

Major elements are reported in weight percent (wt. %), and minor and trace elements are reported in parts per million (ppm), except palladium (Pd), platinum (Pt) and gold (Au), reported in parts per billion (ppb) A negative number indicates the concentration of the specific element in the sample was below the detection limit (*e.g.*, -0.01 indicates the measured value was below the detection limit of 0.01). Detection limits are listed for each element in the .csv files. The code -99 indicates the sample was not analyzed for that element.

Analytical duplicates were inserted at a frequency of one in 20, with the duplicate selected at random. In addition, a selection of reference standards was analyzed, also at a frequency of one in 20. For ICP-OES FUS (major element) and ICP-MS FUS (trace element) standards were supplied by the United States Geological Survey (AGV-1, BHVO-1, BIR-1, G-2, SDC-1, STM-1, RGM-1, W-2). Two standards were used for ICP-OES FUS (trace elements) analysis, supplied by the Canadian Certified Reference Materials Project (SY-4, WGB-1). Standards for fluoride analysis are in-house standards (AND-1, BS-1, GA-1, GD-1), with certified values in Finch *et al.* (2018). For silver analysis, standards were supplied by the Canadian Certified References Materials Project (CH-2, SU-1A). The Pd, Pt and Au analyses (at Actlabs) used standards TDb-1 and WPR-1 provided by the Canadian Certified Reference Materials Project.

The raw, unprocessed data from duplicates and standards is included in the appendices, and can be used by the reader to assess accuracy and precision.

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APPENDICES

Appendices A–G are available as digital comma-separated files (.csv) through this link.

APPENDIX A: Sample Locations and Descriptions

APPENDIX B: Major-element ICP-OES FUS Data (including Standards and Duplicate Samples)

APPENDIX C: Trace-element ICP-OES 4-Acid Data (including Standards and Duplicate Samples)

APPENDIX D: Trace-element ICP-MS FUS Data (including Standards and Duplicate Samples)

APPENDIX E: Fluoride (F-) Ion Selective Electrode (ISE) Data (including Standards and Duplicate Samples)

APPENDIX F: Silver (Ag) ICP-OES HNO_3 Data (including Standards and Duplicate Samples)

APPENDIX G: Palladium (Pd), Platinum (Pt) and Gold (Au) ICP-MS Data (including Standards and Duplicate Samples)