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Mines

GEOCHEMICAL DATA OF ROCK SAMPLES FROM THE NORTHERN PART OF THE ARCHEAN ASHUANIPI COMPLEX, WESTERN LABRADOR (NTS MAP SHEETS 23J/02, 03, 04, 05, 06, 07, 10, 11, 14 AND 23O/03)

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SUMMARY

This Open File release consists of whole-rock geochemistry of 460 rock samples collected from the northern part of the Archean Ashuanipi Complex of western Labrador. The samples were collected from 1:50 000-scale NTS areas 23J/02, 03, 04, 05, 06, 07, 10, 11, 14 and 23O/03 during a regional bedrock-mapping project of the region carried out in 2013, 2015 and 2016 (Figure 1; van Nostrand and Bradford (2014), van Nostrand *et al.* (2015) and van Nostrand and Broughm (2017)). The analyzed rock types consist of migmatitic tonalite to diorite orthogneiss, metasedimentary gneiss, diatexite migmatite, gabbro and ultramafic rocks, granite, tonalite, quartz diorite, diorite, granitic pegmatite and quartz veins and lenses. Several of the samples are mineralized and contain elevated contents of arsenic, chromium, copper, gold, lead, thorium, zinc, zirconium and rare-earth elements.

NOTES ON THE DATABASE

This database includes the results of major-, trace- and rare-earth element analyses of 460 samples from the Ashuanipi Complex of western Labrador. The location for each sample is referenced in both latitude/longitude, as well as in Universal Transverse Mercator (UTM) eastings and northings (Zone 19, North American Datum (NAD) 27, Spheroid of Clarke (1886)). Abbreviations used in the appendices are defined in Table 1. Appendix A contains details of the rock type and its interpreted relative stratigraphic position (Group, Formation), location data, as well as major- and trace-element, whole-rock geochemical data for the 460 samples. Analytical duplicates were selected at random and inserted at a frequency of one in 20 (Appendix B). Reference materials (Standards) were also analyzed (Appendix C) as part of the Geological Survey of Newfoundland and Labrador's internal quality control measures. Details of the analytical methods used are provided by Finch (1998) and Finch *et al.* (2018); these are summarized in Table 2. The data are available in digital format (*i.e.*, comma separated value files; *.csv).

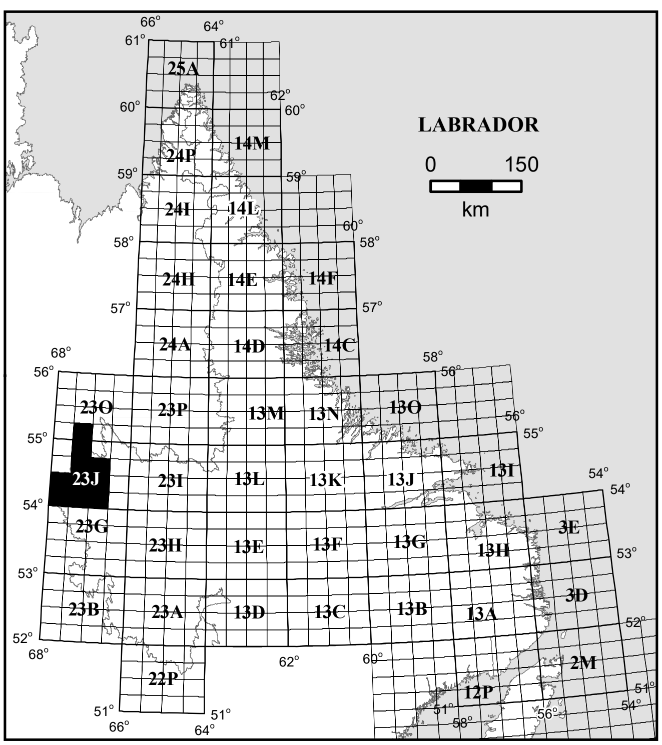

Figure 1. *Location of study area in western Labrador.*

Most analyses were performed at the Geological Survey of Newfoundland and Labrador (GSNL) laboratory in St. John's; these were supplemented by a Neutron Activation Analyses package (BQ-NAA-1) for selected trace elements, carried out externally at the commercial Bureau Veritas Laboratories. The major elements and Cr, Zr and Ba were determined by Inductively Coupled Plasma-Optical Emission Spectrometry following a tetraborate fusion (ICP-MS-FUS). Titanium (Ti)

Table 1. List of abbreviations

Abbreviation	Explanation
-99	Samples not analyzed for that element
Avg	Average value
Dup	Duplicate analysis
Fe_2O_3T	Total measured iron
FeOT	Total iron (II), calculated from total measured iron (III)
GOI	Gain on ignition
ICP-OES-4-ACID	Inductively Coupled Plasma-Optical Emission Spectrometry following HF-HCl-HNO_3-$HClO_4$ acid digestion
ICP-OES-FUS	Inductively Coupled Plasma-Optical Emission Spectrometry following lithium metaborate/tetraborate fusion
ICP-OES-HNO_3	Inductively Coupled Plasma-Optical Emission Spectrometry following nitric acid digestion
ICP-MS-FUS	Inductively Coupled Plasma-Mass Spectrometry following lithium metaborate/tetraborate fusion
INAA	Instrumental Neutron Activation Analysis
ISE	Ion-selective electrode
LCL	Lower control limit
LOI	Loss-on-ignition
negative detection limit	Below detection limit
pct	Percent
ppm	Parts per million
Rec_Val	Recommended value
UCL	Upper control limit
wt_pct	Weight percent

was analyzed by ICP-OES-4 ACID method for some 13VN samples. Where the oxidation state was determined by titration, iron is presented as FeO and Fe_2O_3, otherwise as Fe_2O_3 (total). Select trace elements were determined by Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES 4 ACID) following a four-acid (HF-HCL-HNO_3-$HClO_4$) total digestion. Other trace elements were determined by Inductively Coupled Plasma Mass Spectrometry following a lithium tetraborate fusion (ICP-MS-FUS). At the GSNL laboratory beryllium (Be), scandium (Sc), cadmium (Cd), vanadium (V) and cobalt (Co) were analyzed by ICP-MS-FUS or ICP-OES-4 ACID methods depending on the year the analyses were performed. *See* Appendix A for analytical methods used for these elements. Silver was analyzed by ICP-OES following a nitric acid digestion. Fluorine was analyzed by ion selective electrode (ISE) method following a sodium carbonate and potassium nitrate fusion. Volatiles are reported as loss on ignition (LOI) determined through gravimetric methods. A GOI value indicates gain on ignition (*i.e.*, a net increase in weight). The analytical methods are listed in Table 2; and further details are outlined in Finch (1998) and Finch *et al.* (2018).

Major elements are reported in weight percent (wt. %), and minor and trace elements are reported in parts per million (ppm), except gold (Au), reported in parts per billion (ppb). Detection

Table 2. Analytical methods for the geochemical analyses

Element	Analytical Method	Preparation/Digestion
SiO_2, Al_2O_3, Fe_2O_3T, MgO, CaO Na_2O, K_2O, TiO_2, MnO, P_2O_5, Ba, (Be*, Sc*)	ICP-OES-FUS	50-50 Lithium Tetraborate Lithium Metaborate Fusion
Fe_2O_3, FeOT	Calculation	
FeO	Titration	NH_4VO_3, HF, H_2SO_4, H_3PO_4
As, Be, Cu, Li, Mn, Ni, Pb, Rb, Ti, Zn (Cd*, Co*, V*, Sc*, Be*)	ICP-OES-4 ACID	HF-HCl-HNO_3-$HClO_4$ (total digestion)
As, Bi, Ce, Cs, Dy, Er, Eu, Ga, Gd, Ge, Hf, Ho, In, La, Lu, Mo, Nb, Nd, Pr, Rb, Sm, Sn, Sr, Ta, Tb, Th, Tl, Tm U, W, Y, Yb (V*, Co*, Cd*)	ICP-MS-FUS	50-50 Lithium Tetraborate Lithium Metaborate Fusion
Ag	ICP-OES	HNO_3 digestion
F	ISE	Na_2CO_3 and KNO_3 fusion
LOI	Gravimetric (Grav) at 1000°C	None
As, Au, Ba, Br, Ce, Co, Cr, Cs, Eu, Fe, Hf, La, Lu, Mo, Na, Rb, Sb, Sc, Se, Sm, Ta, Tb, Th, U, W, Yb, Zr	INAA	Irradiation

* Elements are analyzed with this method depending on year of analyses at the GSNL laboratory. *See* Appendix A for type of analyses method used for these elements.

limits are listed for each element in Appendices A and B. Note that '-99'reported for a given element indicates that it was not analyzed for the sample. All other negative numbers indicate the concentration of the specific element in the sample was below the detection limit (*e.g.*, -0.2 indicates the measured value was below the detection limit of 0.2). Note that for BQ-NAA-1 analyses, some samples have elevated detection limits due to high concentrations of Sb, Br or As and some Se detection limits are elevated due to interference from Ta.

The release also includes raw, unprocessed data for several standards completed at the GSNL and Bureau Veritas laboratories (Appendix C). These may be used to assess accuracy and were analyzed at a frequency of one to 20. For ICP-OES (major elements, Ag) and ICP-MS (trace-element) standards were supplied by the Canadian Certified References Materials Project (CH-2, SU-1A) and the United States Geological Survey (AGV-1, BHVO-1, MAG-1, RGM-1, and W-2). Two standards were used for ICP-OES (trace-element) analyses, supplied by the Canadian Certified References Materials Project (SY-4, WGB-1). The latter standard WGB-1 was also used for BQ-NAA-1 analyses at Bureau Veritas laboratories. Analytical duplicates were inserted at a frequency of one in 20, with the duplicate selected at random.

Within the Duplicates Table (Appendix B):

%_difference = [(Original Value - Lab Split Value)/Original Value] * 100

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APPENDICES

Appendices A–C are included in the OF_LAB_1795 zip folder as comma separated value (.csv) files.

APPENDIX A: Major-element and Trace-element Data

APPENDIX B: Major-element and Trace-element Data for Duplicates

APPENDIX C: Major-element and Trace-element Data for Standards, with Certified Reference Materials