DANMARKS OG GRØNLANDS GEOLOGISKE UNDERSØGELSE **RAPPORT 2021/72**

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Vol. 1 (2): Report

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DANISH MINISTRY OF CLIMATE, ENERGY AND UTILITIES

G E U S

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Content

Introduction

The Caledonian orogen in North-East Greenland is generally understood as a collisional orogen composed by a stack of nappes thrusted westwards over a basement of Archaean and Palaeoproterozoic ortho- and paragneiss units (Higgins et al. 2004; Kalsbeek et al. 2008a). Much of the geochemical and geochronological data obtained to support the present understanding is derived from the western part of the orogen, whereas the central and eastern parts are less well documented. This study focuses on Neoproterozoic and Palaeozoic felsic and intermediate magmatic rocks from the central part of the Caledonian orogen and forms a part of a GEUS-project initiated in 2018 dealing with geological mapping and evaluation of the mineral potential of an area including Clavering Ø, Hudson Land and Gauss Halvø (Figure 1).

The aim of this project is to characterise the Neoproterozoic and Palaeozoic magmatic rocks, based on their geochemistry, to explore ways to effectively discriminate and group the granitoids. In turn, this will help to better understand the genesis of these granite groups, their spatial and temporal distribution, their structural and tectonic setting and predict which granites that may be associated with mineralisation and understand their control on such mineralisation.

The magmatic rocks in focus have been divided into three groups according to formation age: (1) a Tonian group, previously referred to as “Grenville” (c. 950-900 Ma), (2) a Caledonian, Middle Ordovician to Silurian group (c. 465-425 Ma) and (3) a Devonian (c. 380 Ma) group (Kalsbeek et al. 2000, 2001a,b, 2008b). In the field it can be difficult, if not impossible, to tell the different generations of magmatic rocks apart. However, certain characteristics can be of help in determining the relative age, such as extent or lack of deformation and cross-cutting relationships; as where granites intrude younger sedimentary rocks, the ages of the intrusive rocks can be surmised.

Geochemical data for 106 samples of granites *sensu lato* and rhyolites are presented and used to obtain information on diversity, chemical signatures, petrogenesis and mineralisation potential of the rocks.

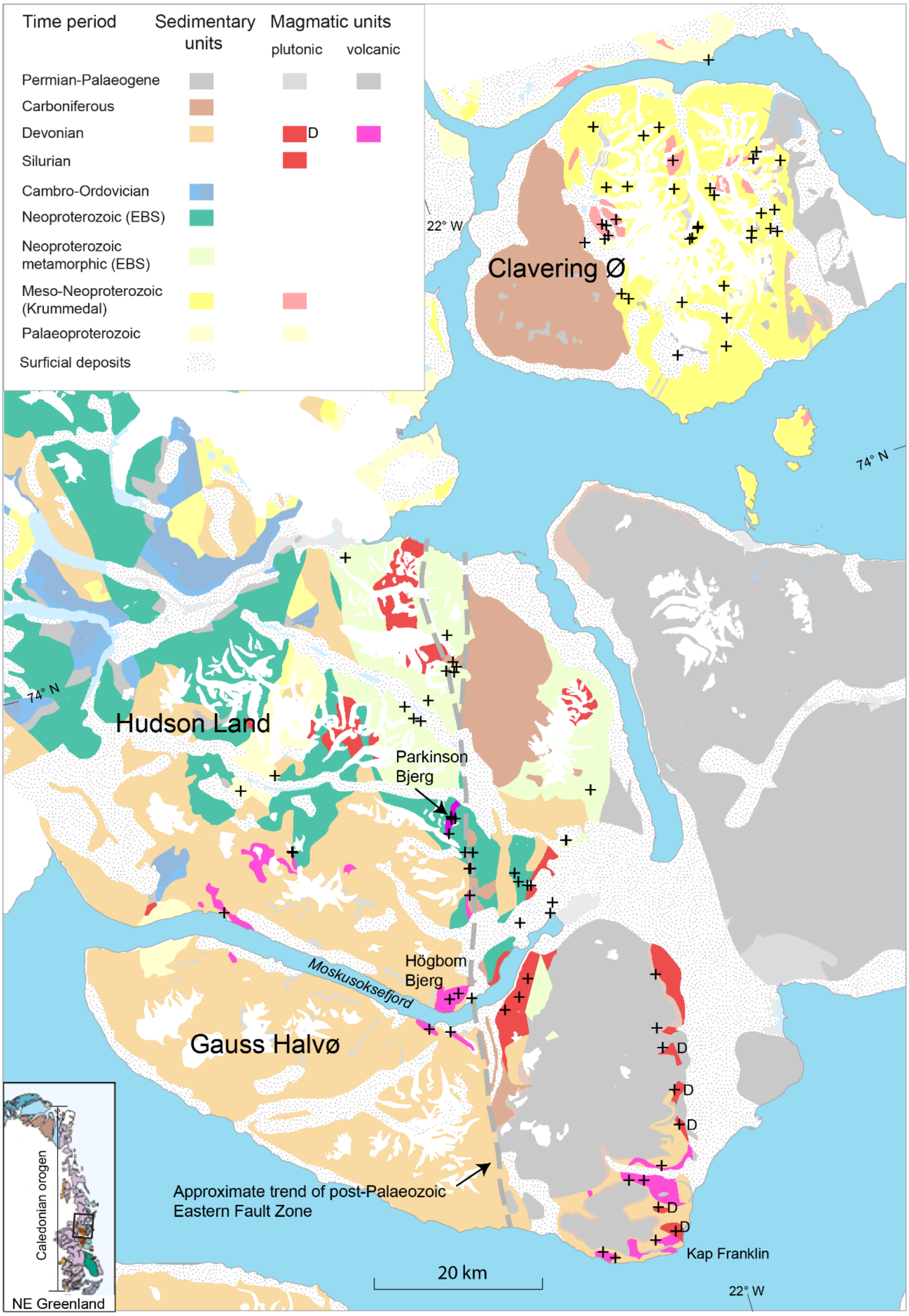

Figure 1 *Geological map of study region with sample sites, indicated (+). Simplified and modified from Escher (2001). D marks granites regarded as Devonian by Koch & Haller (1971).*

Geological Setting

Most of the study area is composed of rocks affected by the Caledonian collisional orogeny (Higgins et al. 2004; Kalsbeek et al. 2008a). Palaeoproterozoic basement and Neoproterozoic to Ordovician sedimentary rocks were highly deformed by folding and thrusting and were variably metamorphosed during the orogeny. The area has also previously been affected by an Early Neoproterozoic high-grade metamorphic and magmatic event at c. 950-920 Ma, related to an orogenic event (Kalsbeek et al. 2000; Watt & Thrane 2001).

The region of Clavering Ø, Hudson Land and Gauss Halvø exhibits a complex pattern of Proterozoic to Palaeogene rocks (Figure 1). The underlying Palaeoproterozoic orthogneiss basement (Kalsbeek et al. 1993) is only recognised in few places. More dominant is the overlying Meso- to Neoproterozoic migmatised metasedimentary rocks of the Krummedal supracrustal sequence. Neoproterozoic basinal sediments of the Eleonore Bay Supergroup (EBS) as well as platformal Cambro-Ordovician limestone are thrusted on top of the Krummedal sequence. The Krummedal sequence and EBS are intruded by granites of presumed Tonian, Caledonian and Devonian ages.

Unmetamorphosed Devonian and Carboniferous continental sediments have been deposited in down-faulted basins during the waning and extensional stages of the orogen. Permian, Triassic, Jurassic, and Cretaceous sedimentary successions are preserved in downfaulted blocks in the eastern part of the region. These rocks are, in turn, overlain by Paleogene basalts.

The region is transected by numerous faults of various ages. The most prominent tectonic feature is the several hundred metres wide Post-Devonian Eastern Fault Zone (EFZ) that transects Hudson Land and Gauss Halvø as a regional N-S trending brittle structure (Figure 1). Within the fault zone, rocks (including some granites and rhyolites) are fractured and hydrothermally altered with extensive hematisation, epidotization and argillization (Harpøth et al. 1986). In addition, the EFZ hosts numerous quartz veins with Ag-Au-Pb-Zn-Cu sulphides and fluorite.

Clavering Ø

The crystalline complex of Clavering Ø forms a 22 km wide N-S trending belt in the centre of Clavering Ø. This area has previously been studied by Mittelholzer (1941), Haller (1971) and Jones & Escher (1999).

In the west, the crystalline complex is unconformably overlain by Carboniferous sediments and Palaeogene volcanic rocks, whereas in the east, they are overlain by Triassic to Cretaceous sediments and Palaeogene volcanic rocks. Outliers of Carboniferous to Cretaceous sediments and Palaeogene volcanic rocks also overlie the crystalline complexes in the central region. The crystalline complexes mainly comprise migmatitic supracrustal rocks, presumed to belong to the geographically widespread Krummedal sequence (Escher 2001). The underlying Palaeoproterozoic orthogneiss is only recognised in the very northern part of the island. The ortho- and paragneiss complex is intruded by three generations of granites described in this report.

Hudson Land and Gauss Halvø

Hudson Land and Gauss Halvø comprise highly metamorphosed ortho- and paragneisses, Neoproterozoic EBS, and Devonian sediments that are intercalated with felsic and mafic extrusive rocks. Carboniferous sediments occur east of the EFZ. Likewise, Permian, Triassic, Cretaceous sediments and Palaeogene volcanic rocks only occur east of the EFZ.

Western Hudson Land are dominated by successions of the upper part of the EBS, Cambro-Ordovician and Devonian sediments. N-S and NW-SE trending faults transect all these sequences (Koch & Haller 1971; Stendal 1999). The crystalline complex and the Devonian sediments were intruded by several generations of granites.

Geological maps of Hudson Land show granite bodies up 10-20 km in size and more or less conspicuous bodies are seen in unpublished field maps from Hudson Land. Ages of the granites are unknown, but most are termed ‘Caledonian’ i.e. Silurian (c. 430 Ma), except the few intruding into Devonian sediments, that must be Devonian or younger. The large granite body in northern Hudson Land is foliated and could be of Tonian age. The rhyolitic lavas shown on the map are Devonian.

Previous investigations of granites and rhyolites

Granite bodies in North-East Greenland are shown in several earlier maps where they are divided into age groups, Archaean, Palaeoproterozoic, Neoproterozoic, Silurian, Devonian and Palaeogene based on field relations and scarce age dating (Koch & Haller 1971; Bengaard 1992, Escher 2001). Geochemical investigations have been conducted outside the study area and it was shown that most Neoproterozoic and Silurian granites are peraluminous and interpreted to have formed by melting of Meso-Neoproterozoic metasediment (Kalsbeek et al. 2000, 2001a,b, 2008b).

The study area has been mapped several times and the number and character of magmatic rocks vary among the maps. The 1:250 000 scale map by Koch & Haller (1971) distinguishes between syn-tectonic, post-tectonic and Devonian granites. However, the Meso-Neoproterozoic age of the Krummedal sequence and Tonian age of some of the granites hosted by this sequence were not known in 1971. The Devonian magmatism is described and studied in some detail by scientists of the Lauge Koch expeditions, see Haller (1971), and no equally comprehensive study has been published later.

A five-year project, the Stordal campaign 1973-1977, performed an aeroradiometric survey over North-East Greenland from 72° to 76°N (Nielsen & Larsen 1974). The survey indicated that some presumed Tonian as well as many Silurian and Devonian granites were enriched in K, Th and U, relative to their host rocks and to many other common granites (Nielsen & Steenfelt 1977). The highest number of measured U anomalies including some indicating U-mineralisation was found in Hudson Land and Gauss Halvø, particularly associated within Devonian rhyolites and granites. Following this recognition, almost all previously known and new occurrences of rhyolite found during the radiometric survey in interior Hudson Land and Gauss Halvø were visited and sampled (Ryan & Sandwall 1975). New granite occurrences discovered along and across the Eastern Fault Zone (Figure 1) were also sampled (Cooper 1976). The majority of the samples (several hundreds) were analysed for U; the Devonian magmatic rocks also for a few other elements (Steenfelt 1982). It was clarified that the Devonian acid magmatic rocks comprise lavas, dykes and larger bodies with porphyries, aplites, pegmatites and granites, and that the occurrence at Parkinson Bjerg is granite, not rhyolite as in the Koch-Haller map (Figure 1). It was also noticed that in some of the outcrop areas of presumed Devonian granitic rocks, different and presumably older granites were also present (Ryan & Sandwall 1975; Thyrsted 1975).

A 1:250 000 scale map covering the western part of Hudson Land and Gauss Halvø resulted from new stratigraphic studies of the upper Proterozoic to Devonian rocks (Olsen & Larsen 1993; Bengaard 1992). This map includes some, but not all, rhyolite occurrences that were discovered during the Stordal campaign. The studies agree with Haller (1971) that the Devonian magmatic activity that also produced thin basaltic flows took place during the Upper Devonian.

The most recent map covering the study area is the 1:500 000-scale map of Escher (2001). In this map, all granites at Clavering Ø are depicted as granites of unknown age (930 or 430 Ma), whilst granites in Hudson Land are shown as Caledonian, including the ones previously mapped as Devonian. Devonian rhyolites are shown with much less accuracy than in previous maps. Figure 1 is based on this rather simple map, since the Koch & Haller map (1971) has not been digitised.

Exploration by Nordisk Mineselskab A/S, GEUS, Arc Mining and 21st North have shown that the Parkinson Bjerg granite hosts Sn-W-Mo-Nb-REE greisen-type mineralisation and abundant fluorite-tourmaline-quartz veining. Anomalous concentrations of these metals were detected in greisen veins and in secondary material, i.e., floats, stream sediment and heavy mineral concentrates not only close to Parkinson Bjerg but also further to the south, possibly implying the existence of a hidden granite body (Harpøth et al. 1986; Thomassen & Tukiainen 2010; Arc Mining 2014; C. Østergaard, 21th North, Pers. Com. 2016).

Ages of granites and rhyolites

In North-East Greenland, Tonian and Caledonian granites are described by Kalsbeek et al. (2008b) as intruding the metasedimentary rocks of the Late Mesoproterozoic-Neoproterozoic Krummedal supracrustal sequence and the overlying Neoproterozoic Eleonore Bay Supergroup (EBS). Most of them are S-type muscovite-biotite leucogranites and interpreted as having been formed by anatexis of schists and paragneisses of the Krummedal supracrustal sequence. The intrusions occur as plutons, sheets, pegmatites and aplites. Archaean and Palaeoproterozoic gneisses that form the crystalline basement underlying the supracrustal rocks seem not to have participated in the generation of these granites. Most of the Caledonian intrusive bodies are reported as Silurian of age (435-425 Ma) and leucogranitic, but some intrusions have more mafic compositions and include monzonites, diorites, granodiorites with minor amounts of granite. These types of intrusions are interpreted as I-type with geochemical and isotopic signatures typical of arc magmas and they span a larger age range from Middle Ordovician to Silurian (465-430 Ma). These relatively mafic granitoids were originally discovered and investigated by Kalsbeek et al. (2008) in the southernmost segment of the East Greenland Caledonides (in Milne Land, Renland and Liverpool Land), and have only recently been discovered on Clavering Ø (Bernstein & Thrane, 2019; Kokfelt 2019; Rosa 2019).

Only one single Devonian granite from the study area has been dated. A K-Ar analysis of mica was obtained from the granite at Kap Franklin, yielding an age of 395 ± 10 Ma (Haller 1971). Age determinations from granite samples from Clavering Ø are underway, but no accurate ages are available yet. The ages of the remaining samples are mostly inferred. However, few granites are demonstrably Devonian or younger as indicated by their stratigraphic levels. For example, the small intrusion that outcrops at Kap Franklin (Figure 1) and intrude Devonian sediments and, therefore, must be Devonian or younger. Other granites on the eastern part of Gauss Halvø were considered Devonian (D in Figure 1). The rhyolitic lavas and pyroclastic rocks are embedded into Devonian sediments. The stratigraphy of the sediments shows that eruptions took place intermittently over Middle and Upper Devonian in time (Haller 1971).

Several other granitic bodies and dykes were mapped as Devonian granites or rhyolites by Koch & Haller (1971). On the north side of inner Moskusoksefjord, at Högboms Bjerg a granite occurring together with rhyolite was considered Devonian. At this locality, rhyolites and granites, however, are intruding Neoproterozoic EBS such that an age cannot be further constrained based on stratigraphy. Other granites in Hudson Land are mapped as syn- or post-tectonic granites in relation to the Silurian deformation by Koch & Haller (1971).

In summary, previous studies have not clarified the ages and origins of granitic magmatism within the study region, and none of the previous maps reliably depict the setting and distribution of variably aged magmatic rocks.

Samples

This study presents new whole-rock geochemical analyses from a total of 106 samples (Figure 2), including 95 granite and monzonite samples and 11 rhyolite samples. Forty granite and monzonite samples were collected on Clavering Ø during the GEUS/MMR field season in 2019. Additional 58 samples, including 47 granite samples and 11 rhyolite samples are from Hudson Land and Gauss Halvø. The samples were collected during the Stordal campaign and were retrieved from the GEUS archives and re-analysed. To expand the population of Tonian granites in our study, we have included data from eight Tonian granites sampled in East Greenland outside of the study area (Kalsbeek et al. 2000, 2001).

Samples were preliminarily grouped as either Tonian, Caledonian or Devonian magmatic rocks, based on available cross-cutting relationships, deformation intensity, previous map legends and preliminary unpublished U-Pb geochronology. Through a stepwise process, a final classification was obtained by comparing the whole-rock geochemistry of these preliminary groups, creating six distinct groups based on age and geochemical signatures. From this iterative exercise, it emerged that the Devonian granitoids have two distinct geochemical signatures, justifying division into two groups, whose context is discussed below.

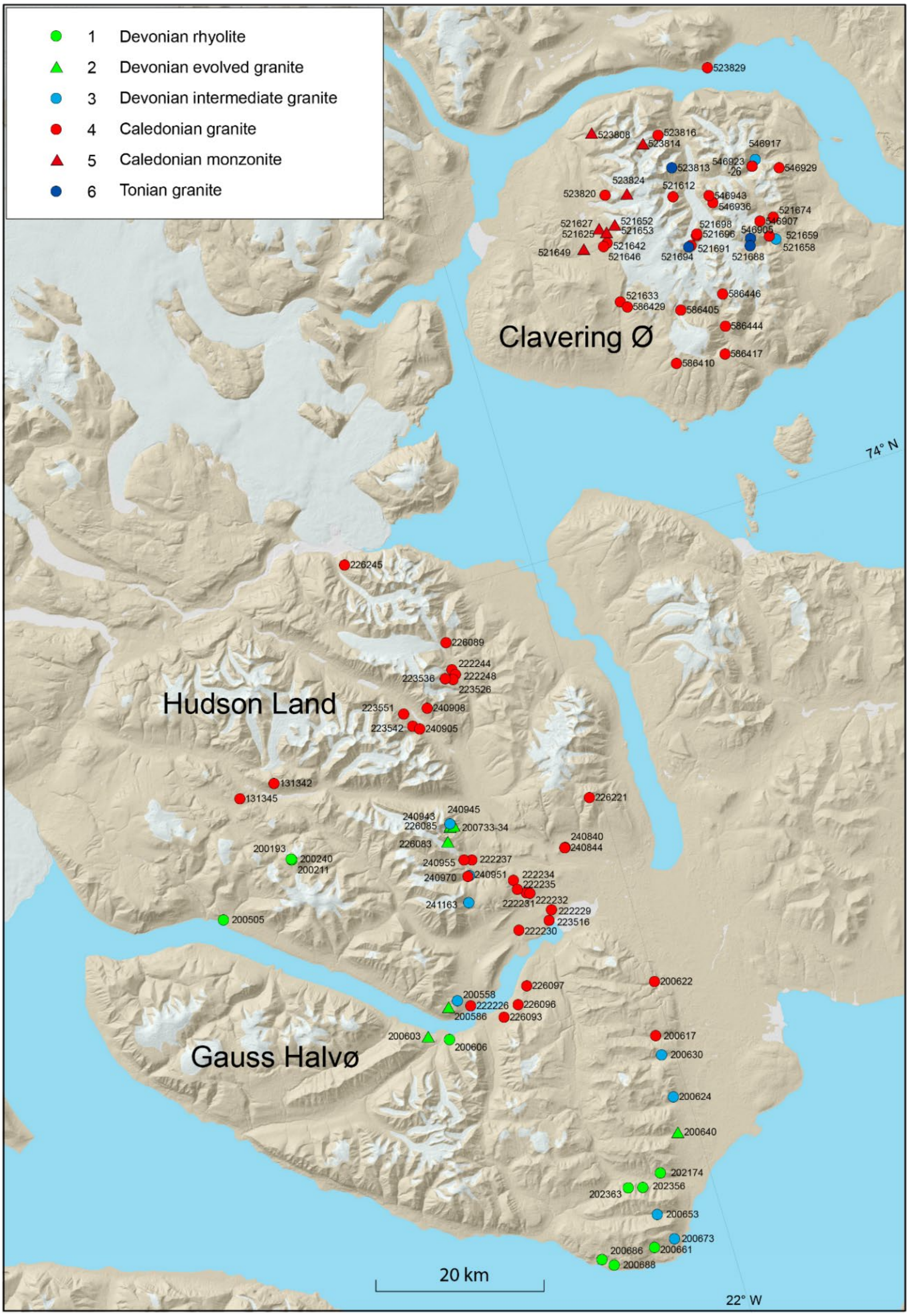

Figure 2 *Topographic map with sample localities.*

Analytical Method

The samples were analysed at three laboratories.

Bureau Veritas Commodities Canada Ltd.

A total of 68 analyses were carried out by Bureau Veritas Commodities Canada Ltd. (formerly ACME laboratory). This includes the samples from Clavering Ø and part of the pre-existing samples that were (re-)analysed in the last batch from Hudson Land. Both major and trace elements were analysed by Bureau Veritas Commodities Canada Ltd. using the analytical code LF600, which includes determination of major elements by XRF and trace elements by ICP-MS. In the batch from Clavering Ø, Fe was only reported as Fe_2O_{3t}, whereas from the Hudson Land samples, an extra analytical step was added to also determine the oxidation state of Fe, thus specified as FeO and Fe_2O_3.

Activation Laboratories Ltd.

Eight samples of presumed Devonian granites and rhyolites from Hudson Land and Gauss Halvø were analysed by Activation Laboratories Ltd. (Actlabs). Both major and trace elements were determined using the analytical code 4LITHORES. The samples were mixed with a flux of lithium metaborate and lithium tetraborate and fused in an induction furnace. The fused bead was dissolved in 5% nitric acid and run for major- and trace elements on an ICP-MS.

GEUS ICP-MS Laboratory

Analysis of the first batch of 30 samples from Hudson Land, Gauss Halvø as well as the additional Tonian granites from North-East Greenland was carried out at GEUS. Major elements were determined by GGU XRF (Kystol & Larsen, 1999).

The trace element concentrations were measured using a PerkinElmer Elan 6100DRC ICP-MS instrument. The majority of the analyses were carried out following the so-called Standard-method where 0.1 g of finely crushed material is treated with hydrofluoric and nitric acid in a closed Savillex vessel (polytetrafluorethylene polymer) on a hotplate at 130°C. After at least 24 hours the sample is dried on the hotplate at 100°C. Nitric acid is added and the sample is evaporated to dryness again. This is repeated once more. Nitric acid, internal standard solution (Ge, Rh, Re) and water is added. The vessel is closed and placed on the hotplate at 130°C for at least 12 hours. The sample is then diluted to 50 ml. Before measurement the sample is diluted further 11 times. For calibration of the instrument certified solutions containing REE's are used.

The analytical procedure for a couple of elements, Hf and Zr, was carried out using the Borate-method to ensure that the total amount of the element is in solution and determined correctly. During this procedure, 0.1 g of finely crushed sample is mixed with 0.9 of sodium tetraborate and fluxed for approximately 30 minutes in a Pt/Au crucible on a rotary table. The resulting glass-pearl is treated with nitric and hydrofluoric acid in a Savillex vessel placed on a hotplate at 180°C until the acids are evaporated. Nitric acid is added, and the sample is evaporated to dryness again. This is repeated. Nitric acid, internal standard solution (Ge, Rh, Re) and water is added. The vessel is closed and placed on the hotplate at 130°C for at least 12 hours. The sample is then diluted to 50 ml. Before measurement the sample is diluted further 11 times. For calibration of the instrument certified solutions containing REE's and some additional elements are used.

For both methods, solutions of the international reference materials BHVO-2 and BCR-2, as well as an inhouse standard (Disko-1) are prepared by the same method as the samples and analysed as unknowns.

Calibration is based on four international reference samples. In addition, two blanks (and one borate blank for the borate-method) are prepared and analysed at the same time as the samples.

The set-up, data-acquisition, calibration, and calculations are done using the Elan software version 2.3.2.

Results

The whole-rock geochemistry analyses are presented in Table 1 on the following pages, together with sample locality and short descriptions, further information on the samples can be found in the appendix.

Table 1 *Major (wt.%) and trace elements (ppm) for East Greenland granites and monazites.*

GGU#	200193	200211	200240	200505	200606	200661	200686
Group	(1) Devonian rhyolite	(1) Devonian rhyolite	(1) Devonian rhyolite	(1) Devonian rhyolite	(1) Devonian rhyolite	(1) Devonian rhyolite	(1) Devonian rhyolite
Lat. N	73.7668	73.7664	73.7673	73.7238	73.5383	73.2666	73.2699
Long. W	-23.1986	-23.1976	-23.1989	-23.5083	-22.8044	-22.2807	-22.4801
Area	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Gauss Halvø E	Gauss Halvø E
Field descrip.	U-mineralised rhyolite	blueish columnar rhyolite	banded rhyolite	rhyolite dyke	grey rhyolite	purple/grey lava	grey lava with brown altered feldspar
Major elements	**GGU-XRF**	**GGU-XRF**	**GGU-XRF**	**GGU-XRF**	**GGU-XRF**	**GGU-XRF**	**ACTLABS**
SiO_2	75.27	75.73	75.56	78.60	75.37	73.53	74.42
TiO_2	0.04	0.04	0.04	0.06	0.15	0.11	0.14
Al_2O_3	12.08	12.63	12.86	11.23	11.27	11.12	12.60
Fe_2O_3	0.79	1.08	1.36		0.06	1.61	1.81
FeO	0.36	0.36	0.16	0.98	1.28	0.28	
MnO	0.03	0.05	0.03	0.02	0.02	0.04	0.05
MgO	0.13	0.09	0.00	0.10	0.33	0.15	0.31
CaO	0.60	0.70	0.36	0.05	0.46	2.43	1.47
Na_2O	0.79	3.02	4.27	0.10	0.80	0.90	3.47
K_2O	7.09	4.59	4.81	6.38	7.62	6.57	2.93
P_2O_5	0.07	0.04	0.03	0.04	0.00	0.04	0.02
Vol	2.26	1.25	0.59	1.76	1.27	2.99	2.62
SUM	99.51	99.58	100.07	99.32	98.63	99.77	99.84
Trace elements	**GEUS-ICPMS**	**GEUS-ICPMS**	**GEUS-ICPMS**	**GEUS-ICPMS**	**GEUS-ICPMS**	**GEUS-ICPMS**	**ACTLABS**
Co	7	12	8	16	10	6	1
Ni	0	0	0	0	0	1	<20
Cu	3	3	3	6	2	4	<10
Zn	55	56	35	69	91	139	110
Ga	25	27	26	23	19	21	21
Rb	571	379	343	429	366	307	171
Sr	47	23	21	18	35	248	64
Y	70	102	107	125	94	140	70
Zr	165	182	196	239	247	275	266
Nb	45	53	53	38	36	54	32
Mo	0.37	0.29	0.50	3.60	1.21	1.43	<2
Cs	9.98	6.63	1.48	4.46	3.29	10.17	1.80
Ba	843	51	65	31	148	197	143
La	36.59	38.51	37.63	152.97	85.56	93.20	97.00
Ce	72.09	91.50	87.50	303.58	177.62	183.84	194.00
Pr	9.73	11.06	10.74	33.75	20.19	23.02	22.60
Nd	35.10	40.28	38.95	117.10	73.20	84.00	83.80
Sm	9.11	11.11	10.64	25.95	15.51	18.09	17.40
Eu	0.03	0.04	0.03	0.11	0.39	0.52	0.72
Gd	9.51	12.19	11.57	27.44	15.46	19.75	15.00
Tb	1.73	2.33	2.30	4.49	2.67	3.74	2.25
Dy	10.99	15.30	15.52	23.86	16.26	23.82	13.00
Ho	2.40	3.25	3.51	4.45	3.38	5.01	2.55
Er	7.61	9.81	10.86	11.08	9.87	14.53	7.77
Tm	1.27	1.60	1.78	1.55	1.56	2.15	1.17
Yb	8.02	9.82	10.91	8.78	9.49	12.23	7.97
Lu	1.21	1.45	1.60	1.27	1.36	1.71	1.19
Hf	7.94	8.85	9.44	9.67	9.37	10.08	9.00
Ta	4.35	4.87	4.92	3.35	2.98	3.15	2.60
Pb	59.05	41.03	42.76	49.31	65.01	57.66	120.00
Th	52.66	56.79	56.13	45.23	32.85	33.70	28.50
U	212.29	5.71	10.15	12.72	6.46	3.91	4.00
Li							
V	1.01	1.01	0.45	2.55	1.39	6.79	<5
Cr	1.44	1.10	0.85	0.89	2.15	1.25	<20
Sc	0.60	1.13	2.82	1.38	1.74	0.90	1.00
Ge							1.40
As							<5
Ag							1.00
In							0.10
Sn							7.00
Sb							0.30
W							0.80
Tl							0.96
Bi							<0.1
Cd							
Au							
Se							
Hg							
Be							

GGU#	200688	202174	202356	202363	200586	200603	200640
Group	(1) Devonian rhyolite	(1) Devonian rhyolite	(1) Devonian rhyolite	(1) Devonian rhyolite	(2) Devonian evolved granite	(2) Devonian evolved granite	(2) Devonian evolved granite
Lat. N	73.2604	73.3409	73.3327	73.3275	73.5720	73.5473	73.3772
Long. W	-22.4430	-22.1838	-22.3014	-22.3095	-22.7744	-22.8772	-22.0785
Area	Gauss Halvø E	Gauss Halvø E	Gauss Halvø E	Gauss Halvø E	Hudson Land	Hudson Land	Gauss Halvø E
Field descrip.	grey qz fs porphyry	greyish-white rhyolite	grey qz-fz phenocrysts	large phenocrysts	red aplitic granite	pink microgra-nite dyke	leucogranite
Major elements	**GGU-XRF**	**GGU-XRF**	**GGU-XRF**	**GGU-XRF**	**GGU-XRF**	**GGU-XRF**	**GGU-XRF**
SiO_2	77.63	76.45	74.80	75.84	75.64	75.28	76.62
TiO_2	0.16	0.14	0.15	0.25	0.07	0.09	0.10
Al_2O_3	12.30	11.80	12.68	11.14	11.71	11.99	12.59
Fe_2O_3	0.18	1.32	0.53	1.98	0.85		0.15
FeO	0.40	0.28	0.16	0.16	0.30	1.46	0.16
MnO	0.02	0.05	0.01	0.00	0.04	0.02	0.03
MgO	0.15	0.09	0.27	0.15	0.05	0.18	0.11
CaO	0.02	0.12	0.36	0.65	0.36	0.07	0.25
Na_2O	0.03	0.25	1.97	0.79	2.58	0.10	2.85
K_2O	6.02	7.18	6.74	6.38	6.37	9.20	5.51
P_2O_5	0.03	0.06	0.05	0.05	0.03	0.05	0.14
Vol	1.77	1.86	1.83	1.94	0.87	1.10	0.61
SUM	98.71	99.60	99.55	99.33	98.87	99.54	99.12
Trace elements	**GEUS-ICPMS**	**GEUS-ICPMS**	**GEUS-ICPMS**	**GEUS-ICPMS**	**GEUS-ICPMS**	**GEUS-ICPMS**	**GEUS-ICPMS**
Co	9	19	11	16	29	9	23
Ni	0	0	1	0	0	0	1
Cu	2	3	10	4	3	9	4
Zn	31	41	21	29	96	85	17
Ga	26	23	24	21	27	18	20
Rb	285	357	228	254	476	396	288
Sr	17	18	42	86	15	39	73
Y	64	82	68	83	102	99	9
Zr	347	278	259	428	300	268	61
Nb	29	38	41	28	56	38	4
Mo	14.89	0.53	0.34	0.30	1.37	3.95	0.30
Cs	3.69	4.84	2.53	5.18	6.39	3.00	3.41
Ba	511	149	96	283	39	64	377
La	42.79	95.49	78.19	72.02	68.97	68.33	12.32
Ce	96.69	180.83	162.39	146.18	134.50	151.72	27.07
Pr	11.17	22.38	18.61	16.86	15.04	16.65	3.27
Nd	39.28	80.34	65.72	60.64	51.30	59.88	11.65
Sm	7.93	16.03	13.12	11.80	12.03	13.38	2.85
Eu	0.68	0.21	0.20	0.72	0.18	0.16	0.48
Gd	8.20	15.24	12.36	12.19	12.80	13.93	2.60
Tb	1.62	2.53	2.07	2.22	2.43	2.56	0.40
Dy	10.93	14.28	12.06	13.92	15.76	16.44	1.82
Ho	2.36	2.86	2.45	2.89	3.40	3.45	0.30
Er	7.15	8.01	6.98	8.14	10.50	10.02	0.74
Tm	1.16	1.24	1.06	1.18	1.70	1.56	0.10
Yb	7.21	7.49	6.50	6.80	10.42	9.22	0.59
Lu	1.07	1.09	0.92	0.97	1.48	1.34	0.08
Hf	10.27	9.75	9.69	11.24	12.57	10.20	2.06
Ta	2.40	5.23	3.62	3.69	9.71	2.81	0.86
Pb	34.09	42.43	11.95	20.66	31.90	43.95	22.22
Th	19.15	32.52	31.43	22.34	42.11	35.35	8.02
U	4.97	5.76	5.45	2.16	5.45	7.83	4.23
Li							
V	2.84	1.94	0.92	6.13	0.31	0.77	3.47
Cr	1.79	0.26	0.75	0.51	0.67	1.23	2.69
Sc	2.39	2.62	3.14	4.96	2.48	1.23	1.72
Ge							
As							
Ag							
In							
Sn							
Sb							
W							
Tl							
Bi							
Cd							
Au							
Se							
Hg							
Be							

GGU#	200733	200734	226083	226085	240943	200558	200624
Group	(2) Devonian evolved granite	(2) Devonian evolved granite	(2) Devonian evolved granite	(2) Devonian evolved granite	(2) Devonian evolved granite	(3) Devonian intermediate granite	(3) Devonian intermediate granite
Lat. N	73.7552	73.7552	73.7412	73.7554	73.7566	73.5757	73.4145
Long. W	-22.5693	-22.5693	-22.6084	-22.5842	-22.5812	-22.7365	-22.0587
Area	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Gauss Halvø E
Field descrip.	red granite	pink granite	aplitic facies in granite	granite	granite	fresh grey granite	grey granite. weakly porphyritic
Major elements	**GGU-XRF**	**GGU-XRF**	**ACMELABS**	**ACTLABS**	**ACTLABS**	**GGU-XRF**	**GGU-XRF**
SiO_2	76.31	75.21	76.78	76.74	76.54	72.06	67.90
TiO_2	0.00	0.19	0.02	0.15	0.07	0.33	0.90
Al_2O_3	12.29	11.72	12.43	12.21	12.08	14.43	15.48
Fe_2O_3	0.65	0.66	0.41	1.70	1.70		0.45
FeO	0.26	0.82	0.62			1.49	2.03
MnO	0.03	0.04	0.02	0.03	0.02	0.05	0.05
MgO	0.03	0.28	0.02	0.12	0.03	0.46	0.94
CaO	0.56	0.48	0.34	0.57	0.62	0.89	0.99
Na_2O	3.50	2.94	3.91	3.00	3.70	3.22	3.12
K_2O	5.00	5.33	4.46	5.67	4.78	5.62	6.15
P_2O_5	0.03	0.02	<0.01	0.02	0.01	0.12	0.27
Vol	0.37	0.71	0.36	0.41	0.50	1.23	1.15
SUM	99.03	98.40	99.37	100.61	100.05	99.90	99.43
Trace elements	**GEUS-ICPMS**	**GEUS-ICPMS**	**ACMELABS**	**ACTLABS**	**ACTLABS**	**GEUS-ICPMS**	**GEUS-ICPMS**
Co	32	33	24	1	<1	11	26
Ni	0	1	0	<20	<20	1	5
Cu	1	2	<0.1	<10	<10	1	7
Zn	17	45	15	40	<30	66	66
Ga	30	23	30	23	28	22	25
Rb	728	389	877	406	680	238	220
Sr	8	29	4	33	9	384	1369
Y	141	77	154	71	138	11	26
Zr	124	194	176	162	194	174	608
Nb	53	24	56	21	45	9	12
Mo	0.79	0.63	0.30	<2	<2	0.17	0.49
Cs	11.12	4.90	11.60	5.30	17.20	4.69	3.45
Ba	28	194	15	199	19	800	3496
La	48.97	68.49	65.70	59.80	36.10	41.83	179.48
Ce	104.44	137.52	162.80	121.00	85.10	86.96	355.03
Pr	12.73	15.57	20.31	13.30	11.60	9.95	37.80
Nd	44.13	53.24	65.40	47.80	44.60	35.90	126.36
Sm	11.96	11.49	16.68	10.40	13.50	6.22	17.96
Eu	0.04	0.47	0.02	0.48	0.08	0.89	2.74
Gd	13.33	11.54	17.03	9.73	14.60	4.42	11.71
Tb	2.74	2.10	4.00	1.78	3.02	0.56	1.42
Dy	19.52	12.96	28.63	11.30	21.00	2.21	4.91
Ho	4.34	2.70	6.49	2.43	4.42	0.39	0.93
Er	13.99	8.05	22.32	7.18	14.20	0.91	2.07
Tm	2.45	1.27	3.85	1.10	2.42	0.13	0.32
Yb	15.77	7.70	26.98	7.18	17.40	0.83	1.86
Lu	2.34	1.12	4.09	1.10	2.65	0.12	0.25
Hf	7.47	7.04	12.30	6.30	11.20	4.63	13.66
Ta	9.70	3.02	7.30	1.79	4.60	0.95	4.90
Pb	33.89	37.03	6.20	38.00	37.00	40.07	74.34
Th	56.92	47.89	54.90	52.40	93.40	15.23	48.04
U	14.03	8.18	22.30	10.40	14.30	3.06	4.27
Li							
V	0.58	4.67	<8	<5	<5	12.79	33.03
Cr	0.94	2.69		<20	<20	3.95	13.39
Sc	3.53	4.13		2.00	2.00	3.45	5.15
Ge				1.50	2.20		
As			3.00	<5	5.00		
Ag			<0.1	0.60	0.70		
In				<0.1	0.10		
Sn			33.00	7.00	19.00		
Sb			<0.1	<0.2	<0.2		
W			326.00	1.00	2.80		
Tl			1.10	2.10	3.25		
Bi			<0.1	0.10	<0.1		
Cd			<0.1				
Au			<0.5				
Se			1.00				
Hg			*				
Be			7.00				

GGU#	200630	200653	200673	240945	240951	241163	521658
Group	(3) Devonian intermediate granite	(3) Devonian intermediate granite	(3) Devonian intermediate granite	(3) Devonian intermediate granite	(3) Devonian intermediate granite	(3) Devonian intermediate granite	(3) Devonian intermediate granite
Lat. N	73.4608	73.2993	73.2696	73.7585	73.6999	73.6725	74.2529
Long. W	-22.0570	-22.2374	-22.2015	-22.5835	-22.5643	-22.5960	-20.7325
Area	Gauss Halvø E	Gauss Halvø E	Gauss Halvø E	Hudson Land	Hudson Land	Hudson Land	Hudson Land
Field descrip.	bt granite	grey granite in part gneissic	granite	porphyric granite	muscovite bearing leucogranite	granite	granite aplite
Major elements	**GGU-XRF**	**GGU-XRF**	**GGU-XRF**	**ACTLABS**	**ACTLABS**	**ACTLABS**	**ACMELABS**
SiO_2	70.41	70.41	73.98	68.37	74.83	68.80	69.47
TiO_2	0.38	0.33	0.03	0.50	0.05	0.66	0.26
Al_2O_3	15.02	14.39	13.19	15.87	14.48	15.00	16.54
Fe_2O_3	0.18	0.22	0.39	3.42	0.79	2.22	2.18
FeO	1.27	1.96	0.54				
MnO	0.04	0.05	0.03	0.05	0.03	0.02	0.03
MgO	0.51	0.55	0.10	0.98	0.06	0.40	0.59
CaO	0.93	0.92	0.24	1.60	0.41	1.26	1.12
Na_2O	3.45	3.18	2.30	3.73	4.20	2.86	4.53
K_2O	5.38	5.38	7.44	4.35	4.17	6.06	4.28
P_2O_5	0.17	0.11	0.12	0.17	0.18	0.37	0.17
Vol	1.51	1.80	0.88	1.29	0.72	1.70	1.03
SUM	99.25	99.30	99.24	100.33	99.92	99.34	100.20
Trace elements	**GEUS-ICPMS**	**GEUS-ICPMS**	**GEUS-ICPMS**	**ACTLABS**	**ACTLABS**	**ACTLABS**	**ACMELABS**
Co	8	15	28	7	<1	3	4
Ni	1	4	1	<20	<20	<20	3
Cu	1	3	0	<10	<10	20	22
Zn	63	44	7	80	40	50	27
Ga	22	22	15	24	27	26	22
Rb	197	207	286	287	549	322	139
Sr	297	166	92	162	16	576	229
Y	12	13	3	18	4	16	22
Zr	195	191	39	174	14	439	118
Nb	7	9	2	15	4	12	11
Mo	1.94	0.46	0.14	<2	<2	<2	<0.1
Cs	3.58	3.35	3.75	14.00	20.70	8.80	2.00
Ba	944	629	561	466	51	1387	507
La	48.74	47.23	8.62	51.50	4.27	191.00	43.20
Ce	99.35	95.34	16.74	104.00	9.67	367.00	89.90
Pr	11.60	10.70	1.94	11.90	1.02	39.80	10.79
Nd	40.89	37.29	6.64	42.10	3.14	135.00	39.10
Sm	7.03	6.92	1.18	7.95	0.75	18.10	7.92
Eu	1.12	1.08	0.65	1.23	0.04	2.92	0.82
Gd	5.07	5.34	1.01	5.91	0.42	8.49	6.26
Tb	0.65	0.70	0.15	0.80	0.08	0.87	0.88
Dy	2.35	2.83	0.63	4.14	0.57	3.77	4.47
Ho	0.42	0.46	0.13	0.66	0.14	0.57	0.79
Er	0.90	1.02	0.31	1.66	0.44	1.45	1.96
Tm	0.13	0.14	0.05	0.20	0.09	0.15	0.27
Yb	0.67	0.83	0.30	1.17	0.76	0.76	1.73
Lu	0.09	0.13	0.05	0.17	0.12	0.11	0.22
Hf	5.06	5.21	1.26	5.00	0.70	11.40	3.90
Ta	0.65	2.03	1.04	1.63	0.74	1.46	1.10
Pb	43.68	40.39	28.33	34.00	20.00	48.00	12.80
Th	17.13	22.99	3.88	21.40	5.16	58.20	17.10
U	3.01	6.32	2.73	6.69	15.90	7.06	6.00
Li							
V	14.63	19.50	5.75	41.00	<5	24.00	16.00
Cr	3.48	9.00	3.05	<20	<20	<20	
Sc	3.72	5.25	1.99	7.00	<1	3.00	
Ge				1.40	1.90	1.50	
As				<5	<5	<5	<0.5
Ag				0.50	<0.5	1.50	<0.1
In				0.30	0.10	<0.1	
Sn				13.00	19.00	7.00	
Sb				<0.2	<0.2	0.30	<0.1
W				1.00	0.50	3.90	0.50
Tl				1.86	3.54	2.09	0.10
Bi				0.20	1.50	0.10	<0.1
Cd							<0.1
Au							
Se							
Hg							
Be							

GGU#	546917	546923	131342	131345	200617	200622	222226
Group	(3) Devonian intermediate granite	(3) Devonian intermediate granite	(4) Caledonian granite	(4) Caledonian granite	(4) Caledonian granite	(4) Caledonian granite	(4) Caledonian granite
Lat. N	74.3403	74.3344	73.8499	73.8438	73.4824	73.5376	73.5667
Long. W	-20.7157	-20.7362	-23.1869	-23.3286	-22.0589	-22.0057	-22.6930
Area	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land
Field descrip.	bt-musc granite	granite pegmatite	light grey granitic rock	grey granite	big feldspar granite	granite	hbl-qtz granite
Major elements	**ACMELABS**	**ACMELABS**	**ACTLABS**	**ACTLABS**	**GGU-XRF**	**GGU-XRF**	**ACMELABS**
SiO_2	74.13	71.22	72.95	71.69	67.32	71.50	73.01
TiO_2	0.13	0.29	0.21	0.35	0.73	0.32	0.29
Al_2O_3	15.02	14.91	14.94	15.10	15.73	14.77	14.47
Fe_2O_3	1.50	1.88	1.41	2.03	0.28	0.57	0.48
FeO					3.16	0.78	1.34
MnO	0.02	0.02	0.02	0.02	0.08	0.04	0.03
MgO	0.23	0.43	0.27	0.46	1.07	0.29	0.44
CaO	0.88	0.48	0.98	0.86	2.05	0.75	0.93
Na_2O	3.17	2.98	3.74	3.24	3.70	3.56	3.92
K_2O	5.24	6.61	5.16	5.44	4.02	4.90	5.2
P_2O_5	0.07	0.11	0.31	0.24	0.21	0.21	0.12
Vol	0.45	0.50	0.58	0.96	0.78	1.13	0.66
SUM	100.84	99.43	100.57	100.39	99.13	98.82	100.89
Trace elements	**ACMELABS**	**ACMELABS**	**ACTLABS**	**ACTLABS**	**GEUS-ICPMS**	**GEUS-ICPMS**	**ACMELABS**
Co	1	3	3	4	14	8	2
Ni	1	2	<20	<20	5	1	2
Cu	2	10	<10	<10	5	2	11
Zn	39	27	70	100	70	60	77
Ga	22	17	26	34	24	28	18
Rb	223	184	336	345	195	330	210
Sr	141	134	77	123	235	175	185
Y	9	14	10	11	16	10	13
Zr	64	138	95	178	322	207	136
Nb	8	3	4	4	12	10	7
Mo	<0.1	0.50	<2	<2	0.11	0.09	0.60
Cs	7.60	0.60	5.10	4.60	7.21	4.39	1.70
Ba	584	382	254	373	746	449	661
La	26.70	37.20	27.60	60.00	42.92	52.34	33.60
Ce	49.50	79.50	61.70	136.00	87.41	109.92	69.70
Pr	5.81	10.00	7.32	16.00	9.77	12.36	8.54
Nd	20.60	37.90	26.40	58.00	35.03	41.95	30.90
Sm	3.89	7.75	6.45	10.80	6.04	6.37	5.32
Eu	0.52	0.79	0.59	0.90	1.53	0.70	0.77
Gd	2.97	4.88	4.45	5.93	4.91	4.29	3.70
Tb	0.36	0.58	0.54	0.61	0.66	0.54	0.48
Dy	1.67	2.70	2.00	2.35	3.00	1.97	2.38
Ho	0.29	0.44	0.31	0.40	0.57	0.34	0.41
Er	0.74	1.06	0.76	1.02	1.48	0.78	1.19
Tm	0.10	0.14	0.11	0.13	0.21	0.13	0.15
Yb	0.60	0.86	0.66	0.78	1.17	0.71	0.98
Lu	0.09	0.13	0.09	0.11	0.17	0.10	0.13
Hf	2.10	4.30	2.90	5.40	7.91	5.47	4.00
Ta	0.50	0.10	0.46	0.49	1.33	1.37	0.60
Pb	3.70	6.60	31.00	40.00	24.67	32.75	26.10
Th	11.00	21.40	14.80	41.80	12.36	27.62	13.70
U	4.70	3.50	6.96	7.19	2.73	3.10	2.50
Li							
V	<8	<8	9.00	20.00	41.07	12.09	19.00
Cr			<20	<20	11.72	2.58	
Sc			2.00	3.00	7.11	2.38	
Ge			1.30	1.00			
As	<0.5	<0.5	<5	<5			<0.5
Ag	0.10	<0.1	<0.5	0.60			<0.1
In			0.10	0.10			
Sn			8.00	8.00			4.00
Sb	<0.1	<0.1	<0.2	<0.2			0.10
W	1.20	<0.5	8.10	7.00			1.30
Tl	0.30	0.10	1.81	1.97			<0.1
Bi	0.30	<0.1	0.10	0.10			<0.1
Cd	<0.1	<0.1					0.30
Au							1.10
Se							<0.5
Hg							<0.01
Be							1.00

GGU#	222229	222230	222231	222232	222234	222235	222237
Group	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite
Lat. N	73.6412	73.6299	73.6658	73.6646	73.6823	73.6722	73.7153
Long. W	-22.3022	-22.4412	-22.3755	-22.3634	-22.4105	-22.4043	-22.5397
Area	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land
Field descrip.	granite homogenous	grey granite	bt-musc granite	porphyritic granite	porphyritic leucogranite	slightly porphyritic granite	mafic granite
Major elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
SiO_2	72.36	64.96	74.21	68.28	69.82	72.32	67.95
TiO_2	0.32	0.88	0.13	0.49	0.47	0.31	0.62
Al_2O_3	13.79	15.97	14.76	15.75	15.41	14.07	15.58
Fe_2O_3	0.92	0.89	0.27	0.68	0.5	0.34	1.41
FeO	0.83	3.89	0.78	2.44	2.14	1.5	2.18
MnO	0.02	0.07	0.01	0.03	0.04	0.04	0.05
MgO	0.32	1.63	0.2	0.99	0.98	0.63	1.27
CaO	1.47	2.38	0.54	1.3	1.33	1.04	1.55
Na_2O	3.53	3.83	3.89	3.6	3.75	3.65	3.78
K_2O	4.77	3.74	4.81	5.08	4.46	4.32	3.91
P_2O_5	0.13	0.23	0.19	0.21	0.19	0.14	0.21
Vol	1.6	1.81	0.6	1.29	1.39	1.43	1.44
SUM	100.06	100.28	100.39	100.14	100.48	99.79	99.95
Trace elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
Co	2	11	9	6	8	13	9
Ni	2	8	1	7	6	5	8
Cu	2	11	0	8	6	4	2
Zn	58	77	35	60	59	48	84
Ga	20	23	23	23	21	18	23
Rb	211	171	353	239	211	210	286
Sr	256	349	41	192	177	139	228
Y	8	21	13	16	16	15	20
Zr	166	269	63	184	151	114	201
Nb	6	16	10	12	12	10	14
Mo	0.50	0.60	<0.1	0.80	0.30	0.40	0.80
Cs	2.60	9.20	18.20	9.70	9.20	7.30	12.40
Ba	593	614	143	560	374	261	413
La	50.10	45.50	11.40	36.10	33.00	23.70	33.90
Ce	107.90	91.30	24.50	75.10	65.40	46.80	68.10
Pr	12.82	10.62	3.08	9.07	8.03	5.65	8.26
Nd	45.20	37.80	11.10	33.00	28.90	19.90	29.70
Sm	7.07	6.50	2.78	6.11	5.09	3.85	5.80
Eu	0.81	1.35	0.32	1.05	0.91	0.63	1.07
Gd	3.90	5.21	3.33	4.80	3.96	3.12	4.69
Tb	0.43	0.72	0.57	0.65	0.58	0.47	0.69
Dy	1.91	3.88	2.89	3.26	3.09	2.77	3.66
Ho	0.25	0.75	0.43	0.58	0.53	0.48	0.71
Er	0.65	2.07	0.94	1.52	1.50	1.41	1.99
Tm	0.08	0.29	0.10	0.20	0.22	0.21	0.25
Yb	0.54	1.79	0.65	1.27	1.44	1.32	1.56
Lu	0.08	0.28	0.07	0.18	0.21	0.20	0.23
Hf	4.90	6.80	2.10	5.00	4.10	3.30	5.30
Ta	0.40	1.00	1.80	1.10	1.60	2.10	1.40
Pb	12.90	10.30	8.80	14.10	9.50	10.50	10.10
Th	24.00	15.60	9.50	17.40	15.10	10.60	16.30
U	4.70	3.00	14.90	4.40	5.60	7.30	6.10
Li							
V	19.00	75.00	<8	43.00	34.00	22.00	45.00
Cr							
Sc							
Ge							
As	<0.5	0.80	0.90	1.30	0.50	1.40	1.90
Ag	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
In							
Sn	3.00	5.00	23.00	8.00	10.00	12.00	16.00
Sb	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
W	0.60	0.60	144.50	1.20	53.60	131.10	50.60
Tl	<0.1	<0.1	0.10	<0.1	0.10	0.10	0.60
Bi	0.10	<0.1	1.90	0.60	0.70	7.20	0.40
Cd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Au	1.40	1.00	2.70	1.20	<0.5	1.80	1.00
Se	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hg	<0.01	0.01	0.02	0.01	<0.01	0.02	0.02
Be	4.00	6.00	6.00	7.00	3.00	8.00	12.00

GGU#	222244	222248	223516	223526	223536	223542	223551
Group	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite
Lat. N	73.9154	73.9096	73.6312	73.9048	73.9081	73.8691	73.8841
Long. W	-22.4145	-22.4066	-22.3218	-22.4206	-22.4487	-22.6180	-22.6385
Area	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land
Field descrip.	musc granite	mafic bt gra-nite foliated	reddish granite	reddish granite	reddish granite	grey-white granite	reddish granite
Major elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
SiO_2	71.38	59.08	70.33	73.22	70.28	70.05	74.27
TiO_2	0.38	1.28	0.54	0.21	0.62	0.36	0.04
Al_2O_3	15.34	17.4	14.98	14.83	14.98	15.59	14.43
Fe_2O_3	0.62	1.63	1.51	0.39	0.79	0.44	0.06
FeO	1.42	5.33	0.34	0.61	1.89	2	0.48
MnO	0.02	0.11	0.03	0.01	0.02	0.03	0.01
MgO	0.51	3.85	0.2	0.26	0.74	0.64	0.07
CaO	0.91	4.53	1.1	0.63	1.12	1.23	0.28
Na_2O	3.34	3.17	3.16	3.6	3.16	3.68	4.12
K_2O	5.15	2.07	5.92	5.46	5.74	5.1	5.52
P_2O_5	0.27	0.43	0.29	0.13	0.24	0.41	0.1
Vol	1.08	1.62	1.52	0.94	0.65	0.59	0.24
SUM	100.42	100.50	99.92	100.29	100.23	100.12	99.62
Trace elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
Co	8	24	9	11	4	4	1
Ni	4	16	1	1	2	3	1
Cu	9	15	1	1	2	6	3
Zn	104	79	85	17	91	52	7
Ga	29	18	24	30	25	18	11
Rb	341	85	260	276	273	174	155
Sr	65	338	282	97	240	151	129
Y	10	28	17	6	8	27	4
Zr	191	192	365	105	405	171	41
Nb	5	19	11	5	6	8	1
Mo	0.20	0.50	1.00	0.30	0.50	0.40	0.20
Cs	4.70	7.80	3.80	3.90	8.10	3.30	2.80
Ba	283	395	668	308	871	609	508
La	50.20	28.70	152.80	33.90	111.40	36.50	3.00
Ce	119.30	63.30	309.30	68.00	233.20	72.80	5.20
Pr	15.47	7.92	38.25	8.12	28.14	9.12	0.59
Nd	57.30	30.90	127.30	28.20	98.30	32.20	2.40
Sm	9.54	6.09	17.20	5.63	13.34	5.89	0.51
Eu	0.65	1.42	1.19	0.75	1.16	1.19	0.66
Gd	5.45	5.62	8.10	3.51	6.68	5.03	0.54
Tb	0.54	0.86	0.85	0.34	0.56	0.85	0.10
Dy	2.20	4.98	3.36	1.29	2.05	4.90	0.63
Ho	0.30	0.97	0.45	0.16	0.23	0.93	0.12
Er	0.83	2.93	1.20	0.45	0.46	2.58	0.34
Tm	0.11	0.39	0.16	0.07	0.06	0.33	0.04
Yb	0.76	2.45	1.10	0.49	0.45	2.04	0.34
Lu	0.11	0.36	0.14	0.07	0.06	0.26	0.05
Hf	5.50	5.00	10.20	3.20	11.10	4.70	1.60
Ta	0.50	1.30	1.10	1.30	0.40	0.60	<0.1
Pb	7.70	4.90	16.80	19.20	7.90	9.00	7.10
Th	39.70	7.50	68.80	22.60	56.00	16.80	0.70
U	15.20	1.90	10.30	9.00	4.50	4.10	3.20
Li							
V	19.00	121.00	18.00	<8	29.00	28.00	13.00
Cr							
Sc							
Ge							
As	<0.5	0.70	0.80	<0.5	<0.5	<0.5	0.90
Ag	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
In							
Sn	8.00	2.00	5.00	4.00	5.00	5.00	2.00
Sb	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
W	61.00	56.20	103.80	129.50	3.30	0.80	<0.5
Tl	0.20	0.30	0.10	0.20	0.30	0.20	<0.1
Bi	0.50	0.10	0.20	<0.1	<0.1	0.60	0.20
Cd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Au	2.20	1.20	5.40	2.10	4.50	1.40	1.10
Se	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hg	0.02	0.02	0.03	0.04	<0.01	<0.01	<0.01
Be	5.00	2.00	6.00	2.00	5.00	7.00	3.00

GGU#	226089	226093	226096	226097	226221	226245	240840
Group	(4) Caledonian granite	(4) Caledonian granite	(4) Caledonian granite	(4) Caledonian granite	(4) Caledonian granite	(4) Caledonian granite	(4) Caledonian granite
Lat. N	73.9446	73.5453	73.5544	73.5708	73.7445	74.0532	73.7007
Long. W	-22.4073	-22.5849	-22.5212	-22.4714	-22.0463	-22.7027	-22.1876
Area	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land
Field descrip.	granite	granite weakly foliated	granit undeformed	bt-granite foliated	granite	dark diorite granite	aphyric granite
Major elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
SiO_2	71.64	69.07	71.12	65.31	65.71	68.55	73.36
TiO_2	0.39	0.57	0.42	0.78	0.33	0.77	0.2
Al_2O_3	14.1	15.78	14.63	15.61	16.09	15.12	15.33
Fe_2O_3	0.66	0.79	0.45	0.94	0.56	0.85	0.62
FeO	1.88	2.47	1.9	3.23	1.69	2.01	0.81
MnO	0.03	0.05	0.02	0.07	0.05	0.02	0.02
MgO	0.74	1.24	0.6	1.71	0.63	0.77	0.17
CaO	1.22	1.18	0.87	2.48	1.55	1.48	0.65
Na_2O	3.88	3.81	3.71	3.58	2.21	3.16	3.3
K_2O	3.62	4.23	4.48	4.01	8.06	5.75	5.62
P_2O_5	0.18	0.2	0.2	0.22	0.69	0.35	0.19
Vol	1.31	1.31	0.68	1.87	1.61	1.27	0.74
SUM	99.65	100.70	99.08	99.81	99.18	100.10	101.01
Trace elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
Co	11	11	3	13	6	13	2
Ni	5	7	2	7	4	4	2
Cu	7	8	3	15	3	5	2
Zn	72	73	71	74	64	102	39
Ga	22	23	21	21	26	26	23
Rb	171	226	201	205	473	251	272
Sr	130	175	233	268	91	650	68
Y	13	21	11	21	27	14	12
Zr	180	189	220	241	152	471	74
Nb	12	13	8	13	17	7	7
Mo	0.70	0.20	0.70	0.30	0.20	0.40	0.30
Cs	4.30	15.10	4.30	5.60	18.60	2.70	11.50
Ba	322	466	893	680	565	1318	263
La	34.80	40.50	53.80	47.60	21.80	190.70	17.20
Ce	70.10	81.30	104.80	96.50	48.00	383.80	36.50
Pr	8.55	9.75	12.79	11.58	6.14	45.73	4.59
Nd	31.30	34.90	46.30	40.30	23.60	151.90	17.00
Sm	5.95	6.55	7.01	7.04	5.51	19.30	4.17
Eu	0.79	1.16	1.04	1.23	0.86	2.31	0.57
Gd	4.43	5.02	4.51	5.37	4.93	9.36	4.02
Tb	0.60	0.76	0.51	0.73	0.85	0.89	0.62
Dy	2.69	4.02	2.46	3.77	4.76	3.27	2.71
Ho	0.42	0.72	0.38	0.71	0.81	0.41	0.41
Er	1.10	2.04	0.89	2.15	2.30	0.92	0.92
Tm	0.15	0.28	0.12	0.30	0.34	0.12	0.11
Yb	1.01	1.75	0.77	2.06	2.01	0.81	0.72
Lu	0.14	0.25	0.12	0.34	0.28	0.10	0.09
Hf	5.10	4.90	6.00	6.10	4.40	11.60	2.20
Ta	1.60	1.50	0.70	1.20	4.00	1.00	0.80
Pb	9.80	19.00	5.70	6.50	9.30	17.70	6.90
Th	17.80	17.90	17.90	19.60	8.00	72.60	10.20
U	4.90	6.20	2.60	5.40	5.00	5.40	10.50
Li							
V	25.00	42.00	19.00	63.00	23.00	30.00	9.00
Cr							
Sc							
Ge							
As	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.40
Ag	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
In							
Sn	7.00	9.00	5.00	8.00	37.00	2.00	14.00
Sb	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
W	110.60	52.50	<0.5	45.80	34.20	108.00	3.00
Tl	0.10	0.40	<0.1	0.10	0.10	0.60	0.10
Bi	0.70	0.70	0.30	0.60	1.30	<0.1	1.90
Cd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Au	<0.5	2.80	1.30	1.70	1.40	0.90	0.50
Se	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hg	0.03	0.03	<0.01	0.04	0.02	0.06	<0.01
Be	3.00	9.00	4.00	7.00	3.00	2.00	7.00

GGU#	240844	240905	240908	240955	240970	521612	521633
Group	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite
Lat. N	73.7007	73.8643	73.8834	73.7178	73.6999	74.3287	74.2390
Long. W	-22.1893	-22.5950	-22.5454	-22.5678	-22.5715	-21.0690	-21.3859
Area	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Hudson Land	Clavering Ø	Clavering Ø
Field descrip.	granite	pale granite interlayered with foliated schists	weakly porphyric granite	granite sheared vein hematite-stained	granite jointed	garnet leucogranite	garnet leucogranite
Major elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
SiO_2	72.74	67.94	69.94	69.96	72.34	73.93	69.28
TiO_2	0.23	0.73	0.45	0.37	0.3	0.12	0.30
Al_2O_3	15.24	15.41	15.57	14.81	14.61	13.90	16.09
Fe_2O_3	0.74	0.73	0.54	0.65	0.35	1.55	2.68
FeO	0.79	3.23	2.51	1.37	1.41		
MnO	0.02	0.05	0.03	0.03	0.02	0.03	0.03
MgO	0.19	0.97	0.83	0.49	0.4	0.37	0.98
CaO	0.78	1.13	1.25	1.44	0.79	0.56	1.66
Na_2O	3.06	2.82	3.02	3.12	3.47	2.69	3.89
K_2O	5.91	5.22	4.4	5.2	4.76	5.60	4.41
P_2O_5	0.23	0.32	0.1	0.26	0.23	0.11	0.13
Vol	0.7	0.74	1.3	1.45	0.88	0.74	0.66
SUM	100.63	99.29	99.94	99.15	99.56	99.60	100.11
Trace elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
Co	2	8	6	4	3	4	6
Ni	4	16	10	5	4	8	9
Cu	2	38	6	918	4	5	5
Zn	35	83	53	112	83	34	34
Ga	24	24	24	28	27	16	16
Rb	285	233	181	345	359	138	100
Sr	67	184	158	79	51	268	475
Y	19	32	9	10	8	17	15
Zr	93	424	141	205	145	56	65
Nb	9	15	11	5	4	3	2
Mo	0.50	0.90	1.00	0.80	0.50	<0.1	0.20
Cs	6.60	9.50	4.70	5.70	6.50	3.90	0.70
Ba	254	567	530	297	270	907	1030
La	22.60	129.90	38.30	50.00	39.60	23.70	23.10
Ce	47.40	279.50	78.80	119.50	87.20	43.90	45.40
Pr	6.10	35.12	9.01	16.20	11.63	5.15	5.55
Nd	22.50	125.50	31.50	58.70	42.80	17.40	20.90
Sm	5.56	19.13	5.33	10.09	7.51	3.08	4.08
Eu	0.60	1.33	0.99	0.67	0.51	1.55	1.87
Gd	5.73	11.38	4.01	5.33	4.13	2.29	3.37
Tb	0.94	1.42	0.50	0.54	0.42	0.37	0.46
Dy	4.30	6.76	2.16	2.16	1.69	2.42	2.69
Ho	0.60	1.07	0.32	0.30	0.23	0.54	0.51
Er	1.36	2.70	0.66	0.73	0.58	1.60	1.49
Tm	0.16	0.32	0.07	0.10	0.08	0.24	0.20
Yb	0.88	1.84	0.45	0.69	0.61	1.56	1.05
Lu	0.12	0.26	0.06	0.10	0.09	0.24	0.15
Hf	3.10	11.50	4.00	6.10	4.40	1.60	1.80
Ta	0.50	0.90	0.80	0.40	0.30	0.20	0.10
Pb	8.80	9.30	9.60	87.60	8.60	6.70	7.30
Th	17.20	93.00	17.50	38.60	28.80	8.10	7.30
U	19.40	14.30	3.60	440.60	7.20	0.90	0.50
Li							
V	<8	45.00	35.00	31.00	20.00	<8	32.00
Cr							
Sc							
Ge							
As	<0.5	0.60	<0.5	9.60	<0.5	<0.5	<0.5
Ag	<0.1	<0.1	<0.1	0.40	<0.1	<0.1	<0.1
In							
Sn	11.00	3.00	7.00	8.00	10.00		
Sb	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
W	3.50	0.90	2.20	1.20	1.30	<0.5	<0.5
Tl	0.20	0.80	0.10	0.20	0.20	0.10	0.20
Bi	0.60	0.10	0.80	0.40	0.40	<0.1	<0.1
Cd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Au	<0.5	1.20	<0.5	<0.5	<0.5		
Se	<0.5	<0.5	<0.5	<0.5	<0.5		
Hg	<0.01	0.05	0.01	0.02	<0.01		
Be	4.00	4.00	3.00	5.00	3.00		

GGU#	521642	521646	521659	521674	521691	521696	521698
Group	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite
Lat. N	74.3023	74.2997	74.2581	74.2759	74.2736	74.2818	74.2834
Long. W	-21.3693	-21.3860	-20.7546	-20.7174	-21.0574	-21.0255	-21.0229
Area	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø
Field descrip.	granite aplite	granite pegmatitic	granite aplite rust and/or jar-osite stained	granite aplite	gt-bt leucogranite	granite aplite	granite aplite
Major elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
SiO_2	73.55	71.24	75.22	73.82	73.48	74.73	74.88
TiO_2	0.08	0.14	0.06	0.20	0.20	0.11	0.08
Al_2O_3	13.97	16.80	13.72	14.08	13.70	14.59	14.67
Fe_2O_3	0.98	1.53	1.35	1.58	2.02	1.04	1.21
FeO							
MnO	0.01	0.02	0.05	0.02	0.02	0.02	0.04
MgO	0.15	0.41	0.12	0.27	0.34	0.16	0.14
CaO	0.46	1.26	0.56	0.53	0.66	0.63	0.55
Na_2O	2.77	3.81	3.43	2.58	3.10	3.37	3.55
K_2O	6.50	2.49	5.27	5.19	5.28	4.86	4.60
P_2O_5	0.03	0.04	0.23	0.08	0.34	0.14	0.12
Vol	0.78	1.42	0.36	0.80	0.40	0.61	0.66
SUM	99.28	99.16	100.37	99.15	99.54	100.26	100.50
Trace elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
Co	2	5	1	2	3	1	2
Ni	5	8	1	3	2	1	3
Cu	13	24	4	4	3	7	9
Zn	18	14	4	41	16	15	16
Ga	14	17	10	22	16	19	20
Rb	211	55	128	187	217	177	207
Sr	105	309	66	123	46	118	59
Y	16	8	6	8	12	8	9
Zr	61	37	20	94	86	50	40
Nb	9	2	2	7	11	4	9
Mo	0.30	0.10	<0.1	0.20	<0.1	<0.1	<0.1
Cs	4.80	1.10	0.90	2.10	1.10	20.50	4.80
Ba	375	865	247	534	185	330	230
La	20.00	10.70	4.20	31.70	11.60	11.50	10.00
Ce	40.00	16.50	8.20	69.20	24.60	21.80	21.20
Pr	4.71	1.86	1.03	7.89	3.27	2.67	2.47
Nd	17.10	6.40	4.00	27.80	11.90	9.60	8.80
Sm	3.70	1.18	1.06	5.62	3.32	1.89	1.98
Eu	0.49	2.49	0.46	0.68	0.47	0.55	0.31
Gd	3.52	1.19	1.13	3.88	3.78	1.42	1.97
Tb	0.49	0.20	0.20	0.44	0.59	0.21	0.31
Dy	2.70	1.27	1.14	1.88	2.76	1.32	1.75
Ho	0.49	0.26	0.21	0.28	0.40	0.25	0.32
Er	1.52	0.94	0.67	0.63	0.85	0.74	0.83
Tm	0.22	0.14	0.11	0.08	0.12	0.11	0.13
Yb	1.39	0.89	0.78	0.51	0.63	0.64	0.81
Lu	0.20	0.14	0.13	0.07	0.10	0.10	0.11
Hf	2.30	1.10	0.80	3.20	2.90	2.00	1.70
Ta	1.60	0.20	0.10	0.40	1.30	0.90	2.20
Pb	14.20	18.20	2.70	7.60	1.80	3.80	3.50
Th	10.80	1.40	0.50	17.10	2.30	4.20	4.70
U	5.30	0.60	0.70	5.20	3.20	1.90	4.30
Li							
V	<8	20.00	<8	<8	11.00	<8	<8
Cr							
Sc							
Ge							
As	1.40	2.40	<0.5	<0.5	<0.5	<0.5	<0.5
Ag	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
In							
Sn							
Sb	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
W	<0.5	3.20	<0.5	0.80	<0.5	1.30	1.30
Tl	<0.1	<0.1	0.30	0.20	0.20	0.70	0.20
Bi	<0.1	<0.1	0.20	<0.1	0.10	<0.1	2.20
Cd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Au							
Se							
Hg							
Be							

GGU#	523816	523820	523829	546907	546924	546925	546926
Group	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite
Lat. N	74.3957	74.3517	74.4483	74.2763	74.3344	74.3344	74.3344
Long. W	-21.0518	-21.3214	-20.7856	-20.7714	-20.7362	-20.7362	-20.7362
Area	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø
Field descrip.	granite cgr vein	granite leu-cocratic dyke	granite leu-cocratic dyke	granite leu-cocratic dyke	granite aplite dyke	granite pegm. dyke	granite leu-cocratic dyke
Major elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
SiO_2	73.63	67.07	72.54	74.66	75.64	75.36	75.43
TiO_2	0.29	1.00	0.08	0.12	0.07	0.03	0.13
Al_2O_3	14.44	16.27	14.79	14.56	14.54	14.69	14.19
Fe_2O_3	1.58	2.62	0.91	1.54	0.82	0.69	1.50
FeO							
MnO	0.01	0.02	0.01	0.02	0.01	0.02	0.02
MgO	0.54	0.87	0.18	0.21	0.13	0.07	0.34
CaO	0.41	1.00	1.51	0.57	1.03	0.74	1.20
Na_2O	2.11	2.91	3.21	3.62	3.21	3.05	3.40
K_2O	6.20	6.66	6.23	4.56	4.42	5.08	3.58
P_2O_5	0.09	0.34	0.03	0.16	0.10	0.07	0.08
Vol	0.84	0.18	0.41	0.41	0.69	0.78	0.56
SUM	100.14	98.94	99.90	100.43	100.66	100.58	100.43
Trace elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
Co	3	9	2	1	1	2	3
Ni	4	29	1	1	1	8	4
Cu	6	12	6	6	4	7	6
Zn	34	37	8	38	14	12	35
Ga	17	16	17	23	21	22	14
Rb	144	161	163	212	169	271	131
Sr	314	1537	320	99	91	30	189
Y	4	6	5	9	10	4	13
Zr	34	401	117	63	34	5	93
Nb	2	4	4	7	7	9	5
Mo	0.20	<0.1	0.60	<0.1	<0.1	<0.1	0.20
Cs	1.70	1.00	2.10	3.90	2.60	3.80	2.20
Ba	1721	3481	1478	381	235	39	691
La	41.70	180.90	36.70	21.70	11.20	1.00	28.80
Ce	80.70	314.10	72.80	41.50	21.00	1.80	55.60
Pr	9.64	34.64	8.49	5.07	2.50	0.19	6.39
Nd	36.50	114.50	30.30	17.80	9.30	0.70	22.80
Sm	5.86	13.39	5.50	3.59	2.14	0.24	4.44
Eu	1.76	3.20	1.23	0.50	0.41	0.09	1.02
Gd	3.27	5.81	3.17	2.72	1.92	0.38	3.15
Tb	0.30	0.53	0.33	0.37	0.29	0.08	0.40
Dy	1.07	1.94	1.27	1.73	1.66	0.60	2.07
Ho	0.12	0.15	0.16	0.30	0.27	0.11	0.34
Er	0.21	0.24	0.45	0.86	0.72	0.33	0.94
Tm	0.02	0.04	0.07	0.12	0.09	0.05	0.13
Yb	0.16	0.25	0.44	0.69	0.60	0.38	0.91
Lu	0.02	0.02	0.07	0.09	0.08	0.05	0.13
Hf	1.10	8.40	3.10	2.20	1.20	0.30	3.00
Ta	0.10	0.20	0.40	0.80	0.70	0.90	0.70
Pb	10.50	5.60	10.90	7.60	4.50	2.90	4.30
Th	13.60	22.90	13.30	8.30	4.60	0.40	10.90
U	1.30	1.30	5.00	3.70	2.60	0.70	6.10
Li							
V	11.00	57.00	15.00	<8	<8	<8	<8
Cr							
Sc							
Ge							
As	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.80
Ag	<0.1	<0.1	<0.1	<0.1	<0.1	0.30	<0.1
In							
Sn							
Sb	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
W	<0.5	<0.5	<0.5	0.80	1.30	1.20	<0.5
Tl	0.10	0.20	<0.1	0.20	0.10	<0.1	0.20
Bi	<0.1	<0.1	<0.1	0.20	0.30	2.40	0.20
Cd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Au							
Se							
Hg							
Be							

GGU#	546929	546936	546943	586405	586410	586417	586429
Group	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite	(4) Caledo-nian granite
Lat. N	74.3240	74.3099	74.3184	74.2116	74.1592	74.1532	74.2318
Long. W	-20.6375	-20.9260	-20.9326	-21.1702	-21.2473	-21.0573	-21.3661
Area	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø
Field descrip.	musc-granite pegmatite dyke	granite leucocratic dyke	bt-musc gran-ite slightly foli-ated	granite foliated dyke	granite dyke	granite sheet	granite pegm. dyke
Major elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
SiO_2	65.48	73.95	74.55	76.27	66.22	71.27	75.02
TiO_2	0.02	0.16	0.05	0.10	1.05	0.39	0.02
Al_2O_3	19.13	14.48	14.44	14.02	16.09	15.64	15.14
Fe_2O_3	0.65	1.72	1.01	1.20	4.47	1.23	0.35
FeO							
MnO	0.03	0.02	0.05	0.02	0.05	0.01	0.01
MgO	0.08	0.33	0.10	0.16	1.48	0.56	0.03
CaO	0.95	0.76	0.68	0.32	1.53	0.79	1.45
Na_2O	2.79	3.78	4.52	3.42	3.46	3.73	5.05
K_2O	9.59	4.08	3.37	4.39	4.12	5.72	3.23
P_2O_5	0.21	0.08	0.08	0.05	0.17	0.15	0.02
Vol	1.39	0.60	0.49	0.73	0.72	0.61	0.17
SUM	100.32	99.96	99.34	100.68	99.36	100.10	100.49
Trace elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
Co	1	3	1	2	12	3	1
Ni	2	10	1	2	26	2	0
Cu	24	6	3	4	12	1	1
Zn	10	42	22	28	70	40	1
Ga	21	17	20	18	19	22	16
Rb	608	180	210	150	110	188	57
Sr	75	579	52	128	734	369	526
Y	11	13	11	20	12	4	5
Zr	22	84	30	67	615	194	78
Nb	14	6	7	8	6	4	0
Mo	<0.1	<0.1	<0.1	0.10	0.30	<0.1	<0.1
Cs	17.90	8.30	9.50	1.90	0.80	2.30	0.20
Ba	667	956	120	348	2082	1318	978
La	3.00	19.20	8.50	15.20	413.20	86.90	2.70
Ce	5.50	35.50	15.50	30.90	706.80	162.40	4.60
Pr	0.64	4.27	1.87	3.85	78.17	18.75	0.50
Nd	2.60	15.20	7.10	14.10	252.10	65.30	1.80
Sm	0.68	2.52	1.47	3.31	27.71	8.45	0.34
Eu	0.20	0.78	0.21	0.46	3.20	2.12	0.73
Gd	1.12	2.16	1.48	3.63	11.02	3.85	0.33
Tb	0.25	0.32	0.28	0.57	0.88	0.28	0.09
Dy	1.65	2.02	1.77	3.46	3.04	0.98	0.68
Ho	0.34	0.42	0.35	0.70	0.36	0.10	0.17
Er	1.01	1.24	1.02	2.02	0.85	0.17	0.67
Tm	0.16	0.18	0.17	0.30	0.14	0.03	0.10
Yb	1.04	1.14	1.08	1.88	0.91	0.20	0.69
Lu	0.15	0.16	0.15	0.28	0.13	0.03	0.12
Hf	1.80	2.70	1.40	2.50	14.00	5.20	3.60
Ta	7.60	0.70	1.60	0.70	0.20	0.30	0.05
Pb	3.40	5.00	2.30	11.50	3.80	11.40	4.60
Th	0.60	7.40	4.00	7.80	81.50	33.70	<0.2
U	2.90	2.60	3.00	5.80	3.00	1.50	0.70
Li							
V	<8	8	<8	<8	54	30	<8
Cr							
Sc							
Ge							
As	1.40	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ag	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
In							
Sn							
Sb	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
W	1.60	<0.5	3.20	1.60	<0.5	0.70	<0.5
Tl	0.20	0.40	0.10	<0.1	0.30	0.20	<0.1
Bi	<0.1	<0.1	2.60	0.40	<0.1	<0.1	<0.1
Cd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Au							
Se							
Hg							
Be							

GGU#	586444	586446	521625	521627	521649	521652	521653
Group	(4) Caledo-nian granite	(4) Caledo-nian granite	(5) Caledo-nian monzonite (K-altered?)	(5) Caledo-nian monzonite (K-altered?)	(5) Caledo-nian monzonite (K-altered?)	(5) Caledo-nian monzonite (K-altered?)	(5) Caledo-nian monzonite (K-altered?)
Lat. N	74.1815	74.2149	74.3131	74.3155	74.3021	74.3162	74.3162
Long. W	-21.0229	-20.9954	-21.3659	-21.3797	-21.4653	-21.3211	-21.3211
Area	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø
Field descrip.	leucocratic granite	leucocratic granite	monzonite	monzonite	monzonite	monzonite	biotitic mafic enclave
Major elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
SiO_2	76.60	76.35	54.76	55.08	55.31	52.51	48.34
TiO_2	0.06	0.16	1.02	0.91	1.06	1.14	1.52
Al_2O_3	13.72	13.71	14.43	12.92	12.81	11.92	9.81
Fe_2O_3	1.12	1.68	8.48	8.32	9.79	10.12	13.39
FeO							
MnO	0.02	0.02	0.12	0.12	0.18	0.15	0.19
MgO	0.13	0.41	4.21	3.88	3.98	5.32	7.16
CaO	0.49	0.78	4.90	6.04	6.51	7.66	10.30
Na_2O	3.51	2.10	1.63	1.40	1.55	0.92	1.02
K_2O	4.34	4.69	8.30	8.93	8.22	8.28	6.04
P_2O_5	0.09	0.13	0.55	0.61	0.60	0.81	1.14
Vol	0.50	0.37	0.61	0.40	0.72	1.20	0.85
SUM	100.58	100.40	99.01	98.61	100.73	100.03	99.76
Trace elements	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**	**ACMELABS**
Co	1	3	27	26	28	34	42
Ni	1	4	27	22	25	37	48
Cu	1	6	55	31	154	75	15
Zn	18	28	60	53	71	70	88
Ga	17	16	17	13	11	9	7
Rb	158	132	288	334	275	288	239
Sr	66	116	993	1010	1112	960	847
Y	10	14	40	31	48	28	30
Zr	26	64	295	41	61	26	38
Nb	7	5	13	5	10	5	6
Mo	<0.1	0.30	<0.1	<0.1	<0.1	<0.1	<0.1
Cs	2.60	2.60	3.70	3.80	3.00	4.10	4.30
Ba	130	419	2178	2473	2262	3395	4087
La	4.90	19.20	56.10	45.20	58.20	32.70	39.10
Ce	10.80	40.10	117.70	105.20	135.00	85.00	97.30
Pr	1.20	4.99	15.03	14.14	18.44	13.00	14.15
Nd	4.30	18.10	58.30	59.40	75.80	57.10	63.80
Sm	1.33	3.97	12.01	12.13	15.27	12.31	13.43
Eu	0.23	0.72	2.58	2.48	3.22	2.54	2.70
Gd	1.52	3.56	10.44	9.85	12.80	10.30	10.84
Tb	0.29	0.50	1.40	1.25	1.76	1.26	1.37
Dy	1.81	2.62	7.74	6.55	9.60	6.33	6.90
Ho	0.35	0.49	1.51	1.15	1.79	1.10	1.13
Er	0.98	1.39	4.29	3.09	5.02	2.72	2.84
Tm	0.13	0.19	0.58	0.42	0.66	0.34	0.37
Yb	0.79	1.12	3.75	2.57	4.06	1.92	2.35
Lu	0.12	0.17	0.58	0.39	0.59	0.29	0.35
Hf	1.10	2.50	7.00	1.60	2.30	1.00	1.30
Ta	0.60	0.40	0.70	0.40	0.80	0.50	0.40
Pb	7.10	3.00	1.90	2.00	2.80	1.00	1.10
Th	2.90	9.10	9.00	2.00	4.60	3.30	4.20
U	5.20	3.80	0.50	0.20	0.40	0.50	0.70
Li							
V	<8	<8	166.00	201.00	202.00	215.00	283.00
Cr							
Sc							
Ge							
As	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ag	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
In							
Sn							
Sb	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
W	1.40	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tl	<0.1	0.30	0.30	0.40	0.20	0.60	0.70
Bi	0.30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Au							
Se							
Hg							
Be							

GGU#	523808	523814	523824	521688	521694	523813	546905
Group	(5) Caledo-nian monzonite (K-altered?)	(5) Caledo-nian monzonite (K-altered?)	(5) Caledo-nian monzonite (K-altered?)	(6) Tonian granite	(6) Tonian granite	(6) Tonian granite	(6) Tonian granite
Lat. N	74.4169	74.3925	74.3459	74.2546	74.2729	74.3583	74.2618
Long. W	-21.3004	-21.1210	-21.2412	-20.8377	-21.0683	-21.0391	-20.8278
Area	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø	Clavering Ø
Field descrip.	monzonite deformed	monzonite. deformed	monzonite. deformed	granitic augen gneiss	granitic augen gneiss	granitic augen gneiss	granitic augen gneiss
Major elements	ACMELABS	ACMELABS	ACMELABS	ACMELABS	ACMELABS	ACMELABS	ACMELABS
SiO_2	56.75	60.41	54.99	73.30	73.24	72.97	72.98
TiO_2	0.86	0.75	0.81	0.47	0.46	0.47	0.35
Al_2O_3	13.70	16.42	12.83	13.05	13.08	13.53	13.47
Fe_2O_3	7.76	4.48	7.71	3.80	3.67	3.75	2.83
FeO							
MnO	0.12	0.07	0.13	0.05	0.05	0.05	0.04
MgO	3.24	1.70	4.34	1.02	0.59	0.70	0.47
CaO	5.78	3.54	7.03	1.35	1.03	0.94	0.95
Na_2O	1.62	2.71	1.37	2.49	2.27	2.24	2.57
K_2O	9.15	8.82	9.12	3.99	5.44	5.64	5.46
P_2O_5	0.52	0.30	0.64	0.10	0.14	0.16	0.13
Vol	0.09	0.84	0.94	0.36	0.30	0.33	0.13
SUM	99.59	100.04	99.91	99.98	100.27	100.78	99.38
Trace elements	ACMELABS	ACMELABS	ACMELABS	ACMELABS	ACMELABS	ACMELABS	ACMELABS
Co	21	10	24	7	6	6	4
Ni	22	6	28	11	6	6	4
Cu	36	24	45	16	12	6	8
Zn	48	26	48	51	46	48	30
Ga	12	16	11	15	17	15	18
Rb	300	165	333	125	299	224	202
Sr	1059	1818	922	251	61	86	61
Y	32	28	24	45	54	60	60
Zr	50	173	31	290	253	193	167
Nb	7	15	3	4	9	9	5
Mo	0.10	<0.1	<0.1	0.20	0.20	0.10	<0.1
Cs	2.70	0.40	3.90	1.30	6.70	2.40	2.30
Ba	2330	4104	2285	653	329	414	328
La	41.70	88.00	38.30	57.70	44.50	41.10	35.20
Ce	98.00	208.20	82.10	121.00	92.00	83.60	73.50
Pr	13.53	28.13	11.11	14.58	11.22	10.16	9.03
Nd	55.20	107.90	48.10	52.50	40.00	38.40	33.70
Sm	11.38	17.65	9.60	8.82	8.71	7.88	7.16
Eu	2.27	3.26	1.82	1.31	0.82	0.90	0.80
Gd	9.31	10.77	7.61	6.42	9.20	8.29	7.26
Tb	1.21	1.28	0.95	0.93	1.60	1.53	1.37
Dy	6.44	6.10	5.05	6.58	9.96	10.18	9.37
Ho	1.20	1.03	0.89	1.63	2.03	2.13	2.01
Er	3.28	2.72	2.45	5.73	5.67	6.35	6.03
Tm	0.44	0.36	0.33	0.89	0.77	0.90	0.83
Yb	2.83	2.04	2.17	5.85	4.62	5.49	5.00
Lu	0.40	0.27	0.31	0.90	0.69	0.81	0.71
Hf	1.80	4.90	1.10	8.40	7.70	5.90	5.10
Ta	0.70	1.50	<0.1	0.20	0.60	0.70	0.20
Pb	1.50	7.60	1.00	5.00	3.10	3.60	3.40
Th	3.10	15.50	1.50	24.80	22.00	18.10	20.20
U	0.30	1.60	0.20	2.00	3.10	1.40	2.70
Li							
V	163.00	93.00	149.00	35.00	30.00	31.00	27.00
Cr							
Sc							
Ge							
As	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ag	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
In							
Sn							
Sb	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
W	<0.5	<0.5	<0.5	<0.5	0.50	1.00	<0.5
Tl	0.30	0.20	0.50	0.50	0.50	0.40	0.30
Bi	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cd	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Au							
Se							
Hg							
Be							

GGU#	344968	427410	427414	427433	427476	454850	454858	454860
Group	(6) Tonian granite	(6) Tonian granite	(6) Tonian granite	(6) Tonian granite	(6) Tonian granite	(6) Tonian granite	(6) Tonian granite	(6) Tonian granite
Lat. N	74.2219	73.2748	73.8350	73.1752	72.4050	74.2367	73.9767	73.4867
Long. W	-25.2250	-26.0960	-26.1500	-27.2640	-25.8833	-25.1167	-26.2000	-26.5500
Area	N of Bartholin Nunatak	Andrée Land	Andrée Land	Louise Boyd Land	Stauning Alper	Bartholin Nunatak	Andrée Land	Andrée Land
Field descrip.	musc-bt leucogranite foliated	musc-bt granite foliated	cgr bt augen granite. 1 km sheet	musc-bt granite foliated	musc-bt granite homogenous	granitic bt-augen gneiss	granitic bt-augen gneiss	granitic bt-augen gneiss
Major elements	GGU-XRF	GGU-XRF	GGU-XRF	GGU-XRF	GGU-XRF	GGU-XRF	GGU-XRF	GGU-XRF
SiO_2	70.46	76.59	67.36	76.09	72.81	73.24	68.78	72.82
TiO_2	0.52	0.10	0.77	0.21	0.67	0.29	0.59	0.38
Al_2O_3	13.98	12.99	15.02	12.90	13.46	13.37	14.91	13.62
Fe_2O_3	0.55	0.28	1.21	0.77	0.33	0.40	0.62	0.38
FeO	2.84	0.42	4.20	0.82	3.00	1.72	3.82	2.12
MnO	0.03	0.01	0.07	0.03	0.05	0.03	0.06	0.03
MgO	0.68	0.21	1.32	0.30	1.08	0.55	1.25	0.67
CaO	1.37	0.71	1.31	0.49	1.07	1.00	1.41	0.79
Na_2O	3.83	3.00	2.69	2.68	3.07	2.65	3.96	2.95
K_2O	4.03	4.89	4.69	5.23	3.68	5.00	3.09	4.59
P_2O_5	0.22	0.21	0.17	0.20	0.10	0.15	0.15	0.12
Vol		0.58	1.28	0.61	1.11	0.90	1.19	0.94
SUM	98.51	99.98	100.08	100.32	100.43	99.30	99.81	99.40
Trace elements	GEUS-ICPMS	GEUS-ICPMS	GEUS-ICPMS	GEUS-ICPMS	GEUS-ICPMS	GEUS-ICPMS	GEUS-ICPMS	GEUS-ICPMS
Co	36.74	10.26	16.72	14.77	14.72	17.69	17.64	13.93
Ni	8.03	0.26	18.67	1.80	15.76	5.19	18.94	7.08
Cu	1.79	0.69	31.19	1.77	15.74	5.18	8.29	10.35
Zn	23.00	13.78	83.87	34.80	64.83	35.87	73.83	37.83
Ga	24.43	13.15	24.88	18.48	18.02	17.91	19.80	17.89
Rb	249.48	126.19	267.32	387.30	156.86	221.59	156.17	291.87
Sr	89.62	92.96	68.80	19.59	108.63	72.95	109.67	50.54
Y	68.73	15.58	71.36	36.90	20.95	41.27	36.31	39.38
Zr	368.90	41.02	396.67	88.53	262.59	149.91	235.95	159.28
Nb	13.92	3.31	15.73	7.33	11.62	7.04	11.19	8.59
Mo	0.45	0.03	0.60	0.12	0.25	0.21	0.26	0.09
Cs	7.87	1.99	16.75	14.45	8.07	4.33	6.73	10.09
Ba	384.83	256.62	429.86	87.35	515.99	266.39	287.21	238.04
La	48.30	4.24	48.68	16.19	25.53	25.90	28.83	21.96
Ce	107.22	9.49	106.63	36.68	54.31	57.34	61.94	48.55
Pr	13.63	1.24	13.28	4.37	6.43	7.08	7.75	6.04
Nd	53.09	5.02	50.72	15.38	24.10	25.71	29.80	22.24
Sm	12.56	1.67	11.32	4.08	4.77	5.97	6.46	5.13
Eu	1.28	0.48	1.47	0.24	1.13	0.64	1.16	0.60
Gd	12.87	2.09	11.52	4.45	4.40	6.27	6.56	5.41
Tb	2.17	0.43	1.98	0.92	0.69	1.12	1.07	1.00
Dy	12.63	2.72	12.12	6.05	3.72	6.92	6.39	6.46
Ho	2.47	0.48	2.55	1.17	0.74	1.40	1.28	1.34
Er	6.58	1.17	7.20	3.21	2.02	3.90	3.58	3.78
Tm	0.97	0.16	1.13	0.50	0.32	0.60	0.54	0.59
Yb	5.89	1.52	6.86	2.99	1.71	3.45	4.50	3.54
Lu	0.84	0.14	1.01	0.41	0.31	0.48	0.49	0.49
Hf	9.53	1.35	10.61	3.16	6.94	4.55	5.80	4.50
Ta	1.00	0.50	1.19	1.04	1.31	1.08	0.90	0.92
Pb	14.82	48.02	27.62	20.49	21.60	34.17	24.87	24.35
Th	17.25	1.11	17.77	12.91	7.68	17.18	9.39	12.26
U	4.55	1.38	3.84	3.25	3.03	3.76	2.61	3.90
Li	57.62	17.32	69.39	53.00	43.69	28.06	33.51	54.75
V	22.25	2.29	56.15	5.75	48.85	15.04	48.00	22.82
Cr	12.58	1.40	34.69	3.56	32.02	9.79	32.83	14.93
Sc	9.19	2.88	14.32	4.19	9.48	4.49	11.01	5.34
Ge								
As								
Ag								
In								
Sn								
Sb								
W								
Tl								
Bi								
Cd	0.12	0.05		0.09		0.08	0.11	0.11
Au								
Se								
Hg								
Be								

Discussion

Rock alteration

The possibility of metasomatic alteration, which would affect the mobile element systematics, was briefly assessed using the Hughes (1973) diagram (Figure 3) which plots K_2O+Na_2O vs. $K_2O/(K_2O+Na_2O)$. This shows that the majority of the analysed samples falls within the igneous spectrum and can therefore be considered unaltered or weakly altered. However, the Caledonian monzonites and Devonian rhyolites plot in the field of potassic alteration. As a result, further petrography is warranted to evaluate whether the high potassium contents of these rocks are primary or secondary, and their characterization using mobile major element plots needs to be done cautiously and supplemented with information from immobile trace elements.

Several of the granitic and rhyolitic rock samples were collected where the radioactivity was high due to uranium mineralisation in fractures and hydrothermally altered rocks.

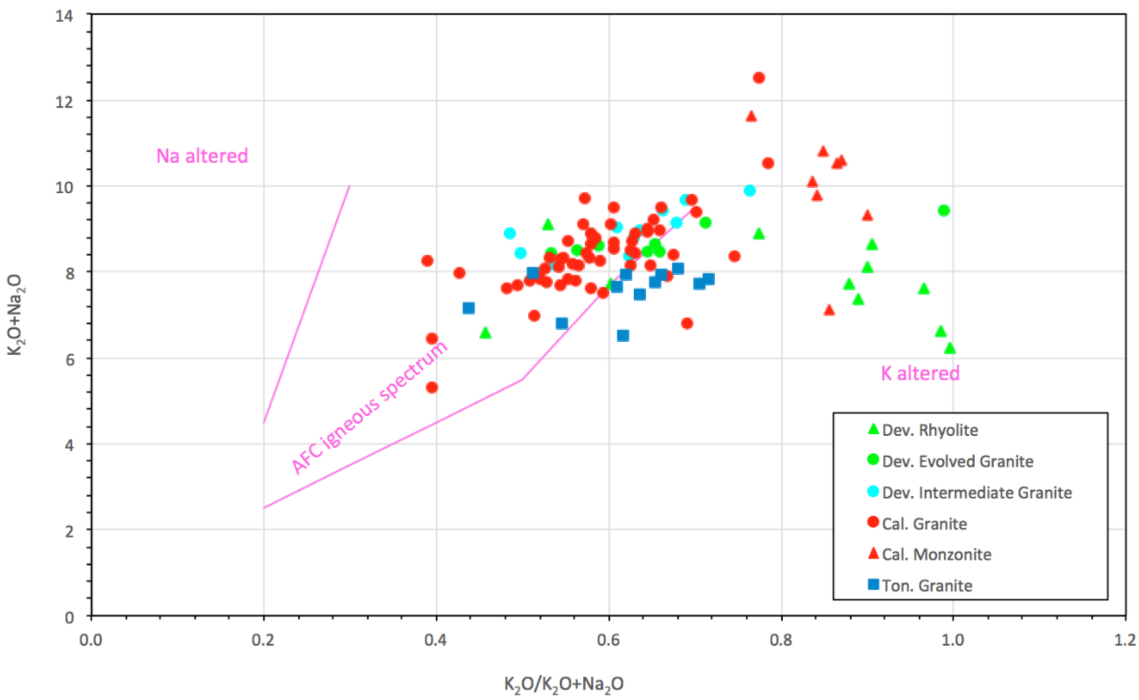

Figure 3 *Alteration diagram after Hughes (1973) plotting K_2O+Na_2O vs. $K_2O/(K_2O+Na_2O)$.*

Rock classification and tectonic setting

Major elements

Major element geochemistry of granitic rocks from Hudson Land, Gauss Halvø and Clavering Ø has been arranged according to the classification scheme of Frost et al. (2001). This scheme is based on three variables: Fe-number, modified alkali-lime index (MALI) and aluminum saturation (Figure 4a-c). The Caledonian monzonite samples stand out by being intermediate (SiO_2 = 53-61 wt.%), metaluminous, magnesian and alkalic in composition.

According to Frost et al. (2001), granitoids with these characteristics are formed in plutons inboard from Cordilleran batholiths, with the Yamato Mountains, in Antarctica, as a possible analogue (Zhao et al., 1995). As such, these monzonites are interpreted to reflect a magmatic arc stage. This contrasts with the remaining samples (Tonian and Caledonian granites, and Devonian granitoids), which are more evolved (SiO_2 > 67 wt. %), particularly some of the Devonian granitoids that stand aside by being peraluminous (Figure 4c), magnesian to ferroan (Figure 4a) and calc-alkalic to alkali-calcic compositions (Figure 4b) with only a few outliers in the calcic or alkalic fields.

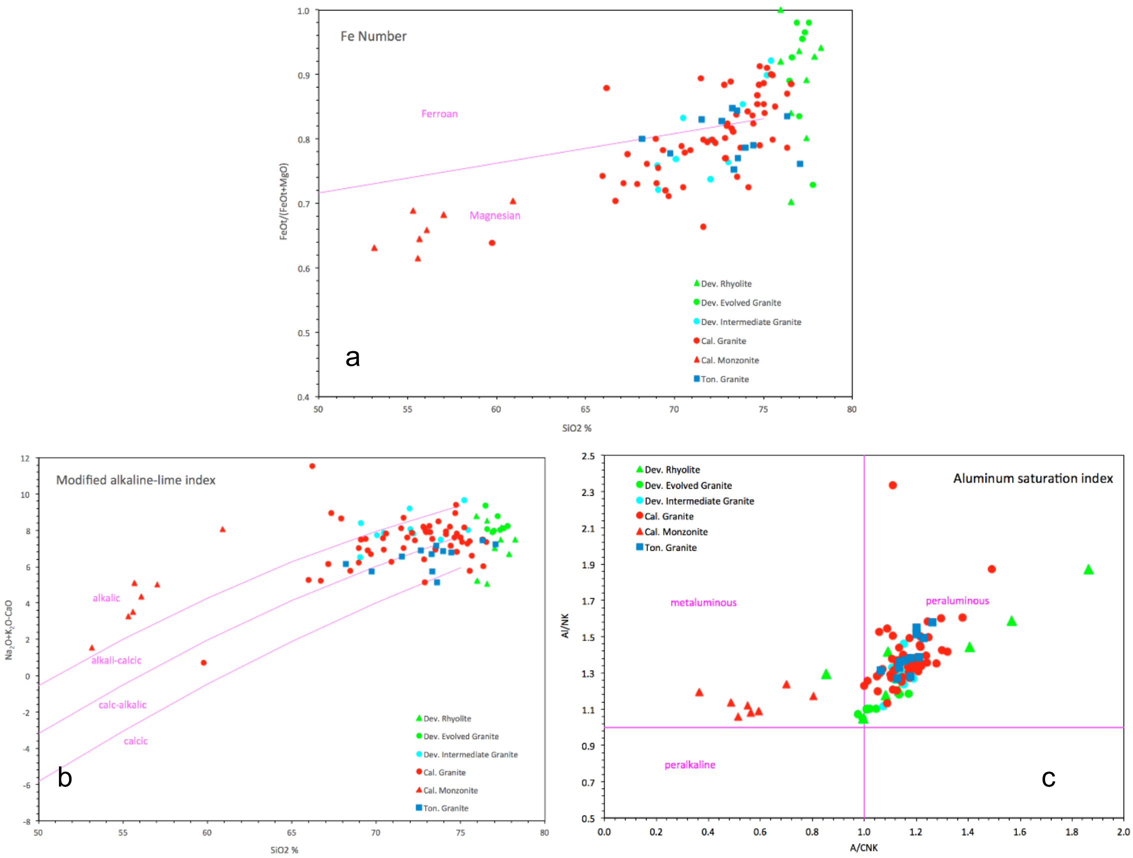

Figure 4 *Classification scheme after Frost et al. (2001) using (a) the three parameters Fe-number, (b) modified alkali-lime index (MALI) and (c) aluminium saturation index.*

Furthermore, the Tonian granites appear to be more calcic than the Caledonian granites. It is presently unclear whether intermediate compositions of Caledonian age are missing in the study area or whether this merely reflects a sampling bias in our compilation. If intermediate compositions indeed are lacking, the remaining samples can be grouped as peraluminous leucogranites that are typical of a syn-collisional stage (Frost et al. 2001). In terms of the classification by Chappel & White (1974), the Caledonian monzonite would classify as I-type, inferred to have formed from a meta-igneous source, in contrast with remaining analysed samples which would classify as S-type, inferred to have formed from melting of metasedimentary rocks.

Further insights into the major element geochemistry can be obtained using the Grebennikov (2014) ternary diagram (Figure 5). This diagram is used for samples with >67% SiO_2 and therefore does not include any of the Caledonian monzonite samples. The diagram suggests a distinction between Caledonian and Devonian granitoid samples, particularly the more evolved ones. The Caledonian granites plot mostly outside the A-type granitoid fields, which is typical of arc and syn-collisional granites, while the Devonian granitoids are centered within the A2 field. According to Grebennikov (2014), rocks plotting in the latter field are formed during post-collisional rifting caused by extension and thinning of continental crust, namely as a result of oblique convergence. The Tonian granite is not clearly classified in this diagram but could also be post-collisional (Figure 5).

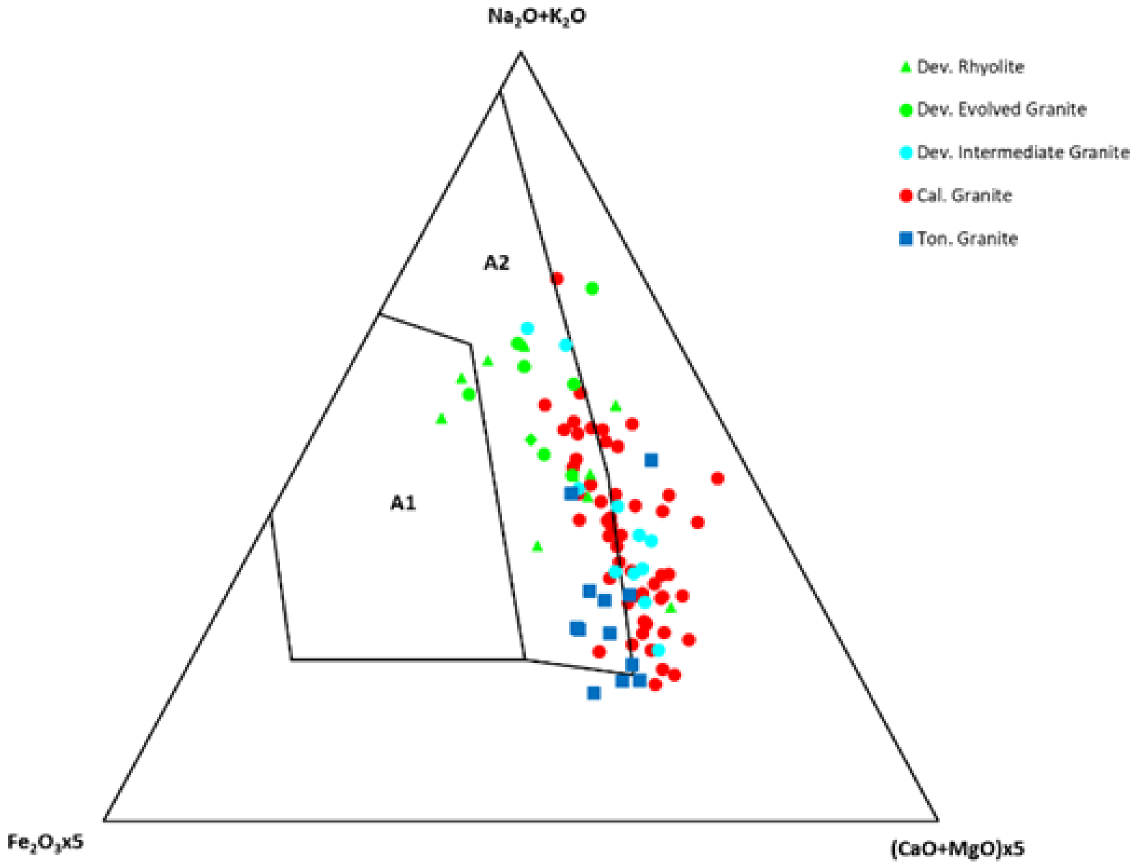

Figure 5 *Ternary diagram of Grebennikov (2014) plotting Fe_2O_3x5 – Na_2O+K_2O – (CaO+MgO)x5 to distinguish different A-type magmas (only SiO_2 > 67 wt% plotted). A1: within-plate geodynamic setting, oceanic islands, and continental rifts. A2: local extension zones of intracontinental and continental marginal areas.*

The SiO_2-Al_2O_3 and SiO_2-$FeO_t/(FeO_t+MgO)$ diagrams of Maniar & Piccoli (1989) highlight both the Tonian and Devonian evolved granitoids as post-orogenic (Figure 6a,b) e.g. from two different events.

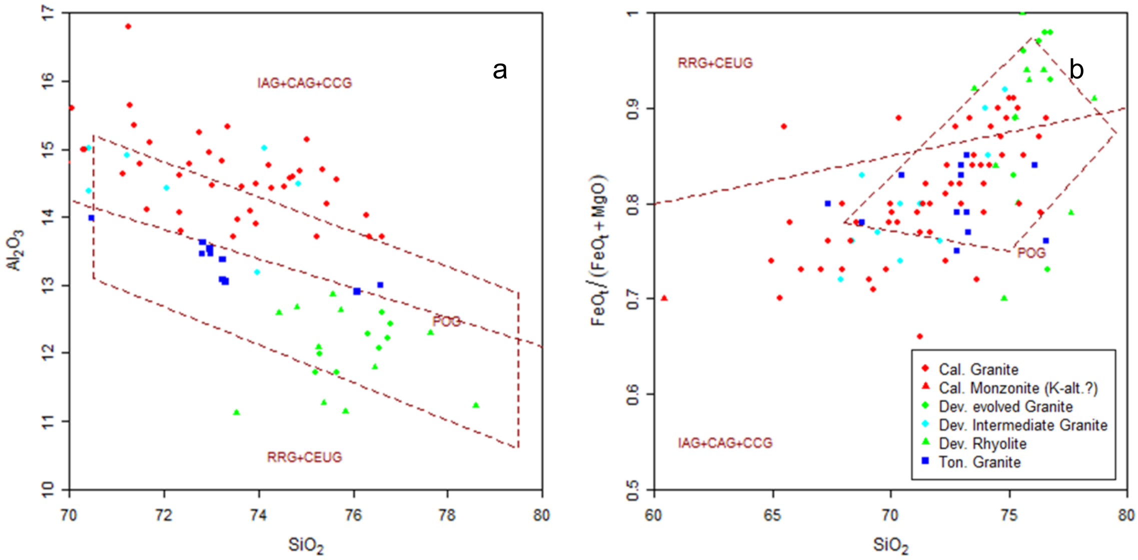

Figure 6 *Geotectonic scheme of Maniar & Piccoli (1989) plotting SiO_2 – Al_2O_3 and SiO_2 – FeOt/(FeOt+MgO). IAG: island arc granitoids, CAG: continental arc granitoids, CCG: continental collision granitoids, POG: postorogenic granitoids, RRG: rift-related granitoids, and CEUG: continental epeirogenic uplift granitoids.*

Trace elements

The distinct geochemistry of the more evolved Devonian rocks is also apparent on the Whalen et al. (1987) and Pearce et al. (1984) diagrams using trace elements that are considered fluid-immobile and therefore robust with respect to seeing through alteration processes.

On the Whalen et al. (1987) diagrams, utilising trace elements Nb, Y and Ce vs. Ga/Al (Figure 7a,b), the Devonian evolved granites have high Ga/Al ratios and high Nb, Y (especially), but also Ce concentrations, that distinguish them from all of the other analysed rocks, and are characteristic of A-type granitoids. As further defined by Grebennikov (2014), A-type granitoids can be subdivided into peralkaline (A1) and peraluminous (A2), reflecting distinct geotectonic settings, and the studied Devonian evolved granite belongs to the latter group (Figure 5).

On the Pearce et al. (1984) diagrams (Figure 8), the Devonian evolved granites clearly plot in the within-plate field. The remaining analysed rocks tend to plot in the volcanic arc and/or syn-collisional fields, the Caledonian monzonites tendentially in the volcanic arc field, while the Caledonian granites are straddling the volcanic arc - syn-collisional boundary. The Tonian granites plot across different fields, which possibly reflects the influence of a variety of sources typical of post-collisional granitoids.

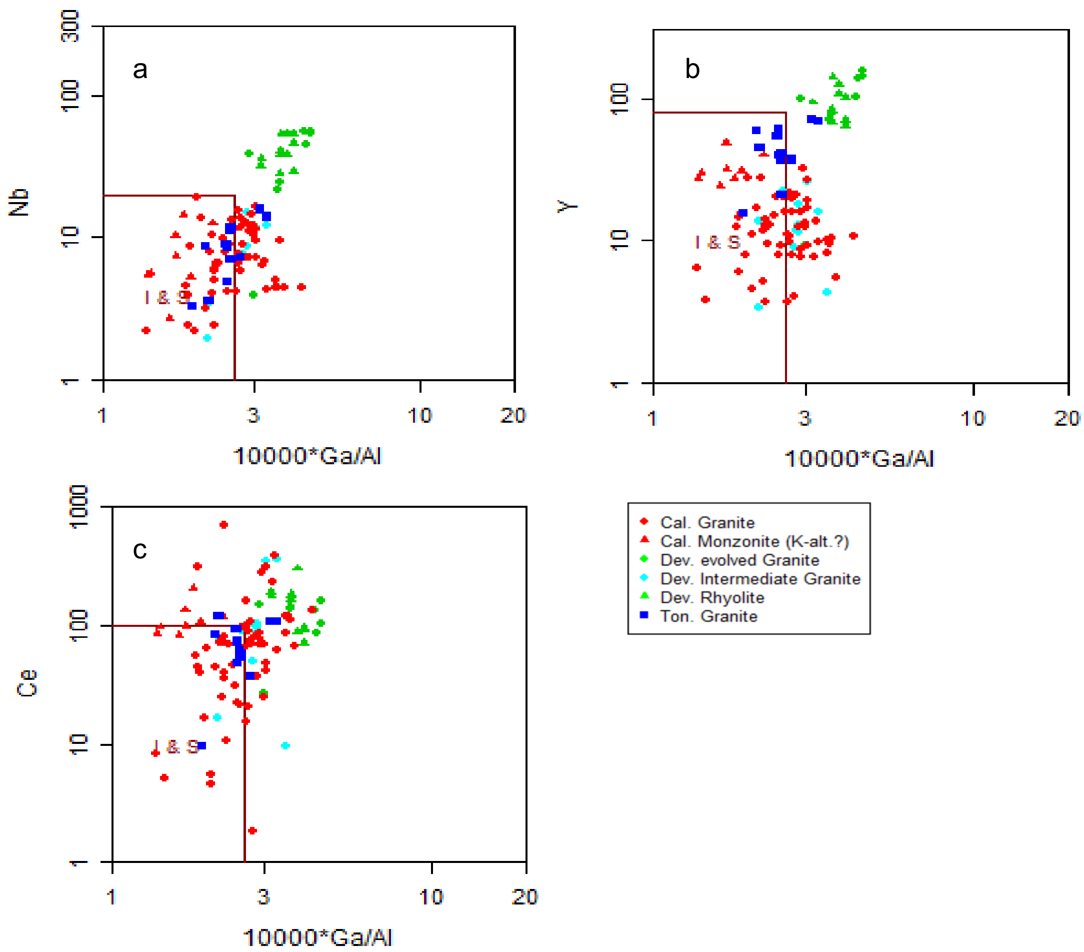

Figure 7 *Whalen et al. (1987) diagrams utilizing trace elements Y, Nb and Ce vs. Ga/Al. The boxed field marked 'I & S' represents the compositional field of I- and S-type granitoids according to the definition of White & Chappell (1977), while A-type granitoids occupy the area outside the box.*

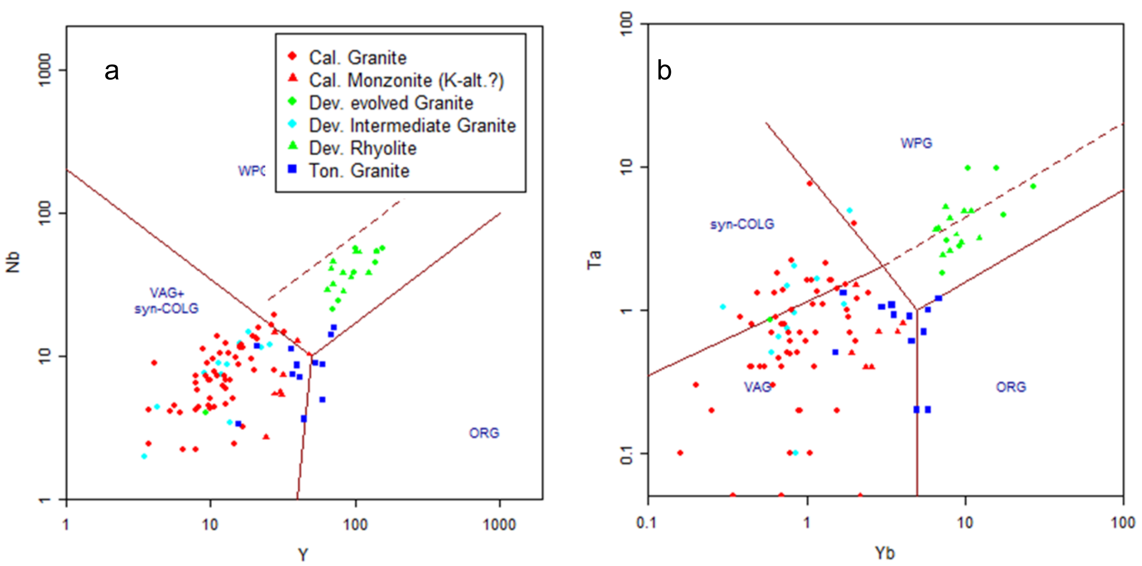

Figure 8 *Geotectonic discrimination diagrams after Pearce (1984) plotting Yb vs. Nb and Y vs. Ta.*

Figure 9 and Figure 10 includes chondrite-normalised rare earth element (REE)-diagrams and extended trace element plots normalising to primitive mantle. In the REE-diagrams (Figure 9) the evolved Devonian group stands out as by a moderate LREE enrichment, relatively flat, elevated heavy (H)REE patterns, and deep negative Eu-anomalies, the latter signifying extensive plagioclase fractionation to have played a role.

The Caledonian granites show comparatively more variation and have steeper LREE/HREE slopes and less distinct negative Eu-anomalies, occasionally positive in a few samples. The intermediate Devonian granites overlap completely with the Caledonian granites. The Tonian granites have intermediate patterns relative to the Caledonian and Devonian granites.

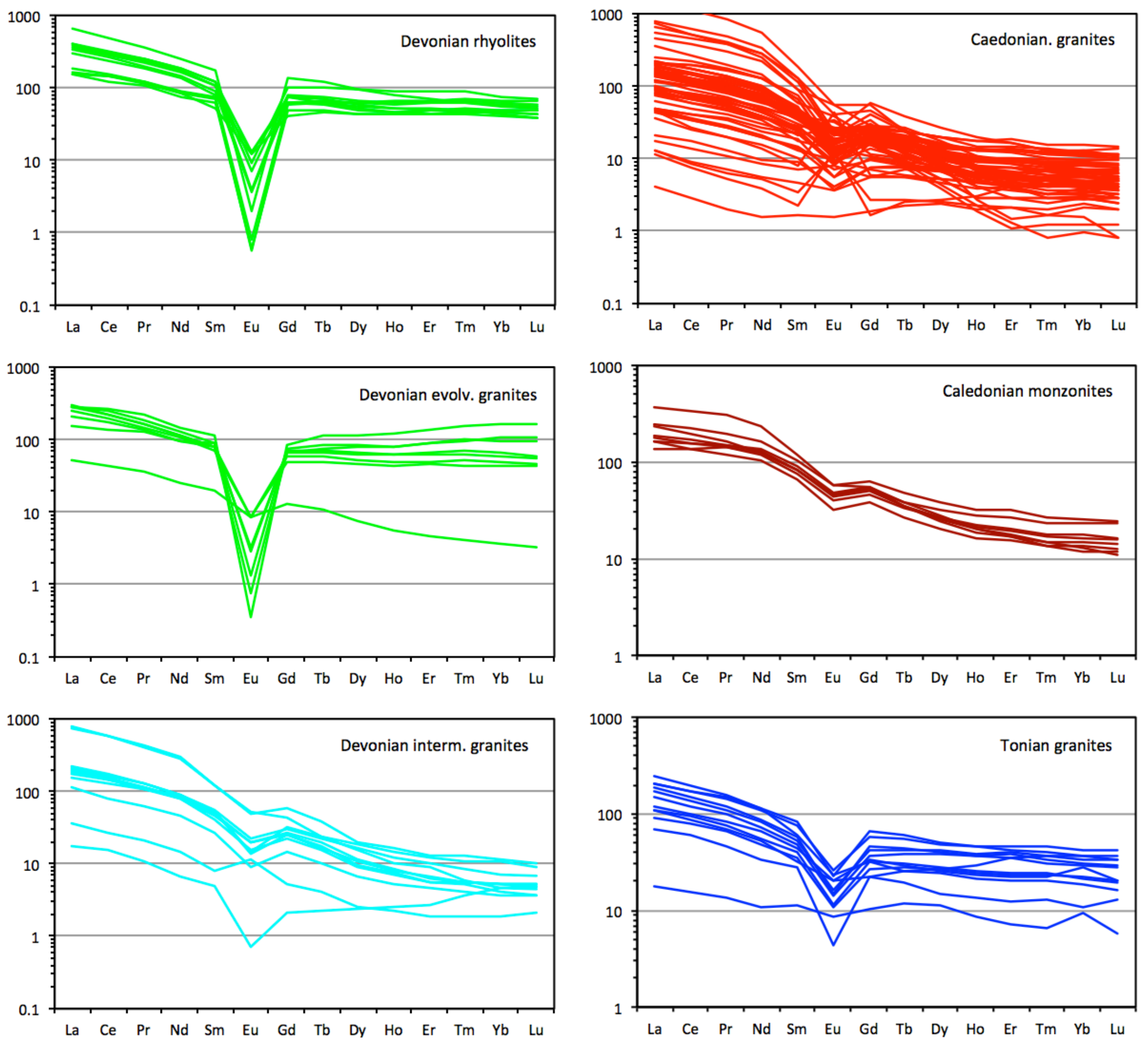

Figure 9 *'Spider' diagrams for the East Greenland granitoid samples showing concentrations of rare earth elements (REE) normalised to chondrite (Boynton 1984).*

In the multi-element diagrams (Figure 10) the three main groups also stand apart. Again, the evolved Devonian granites show the most extreme 'saw-tooth' patterns with strong negative anomalies for Ba, Sr, P, and elevated contents of Nb + HREE+Y. The Caledonian granites + intermediate Devonian granites show a relatively wide and scattered range with generally higher Ba and Sr and lower HREE+Y. The Tonian granites show a comparatively restricted intermediate range between the other two groups.

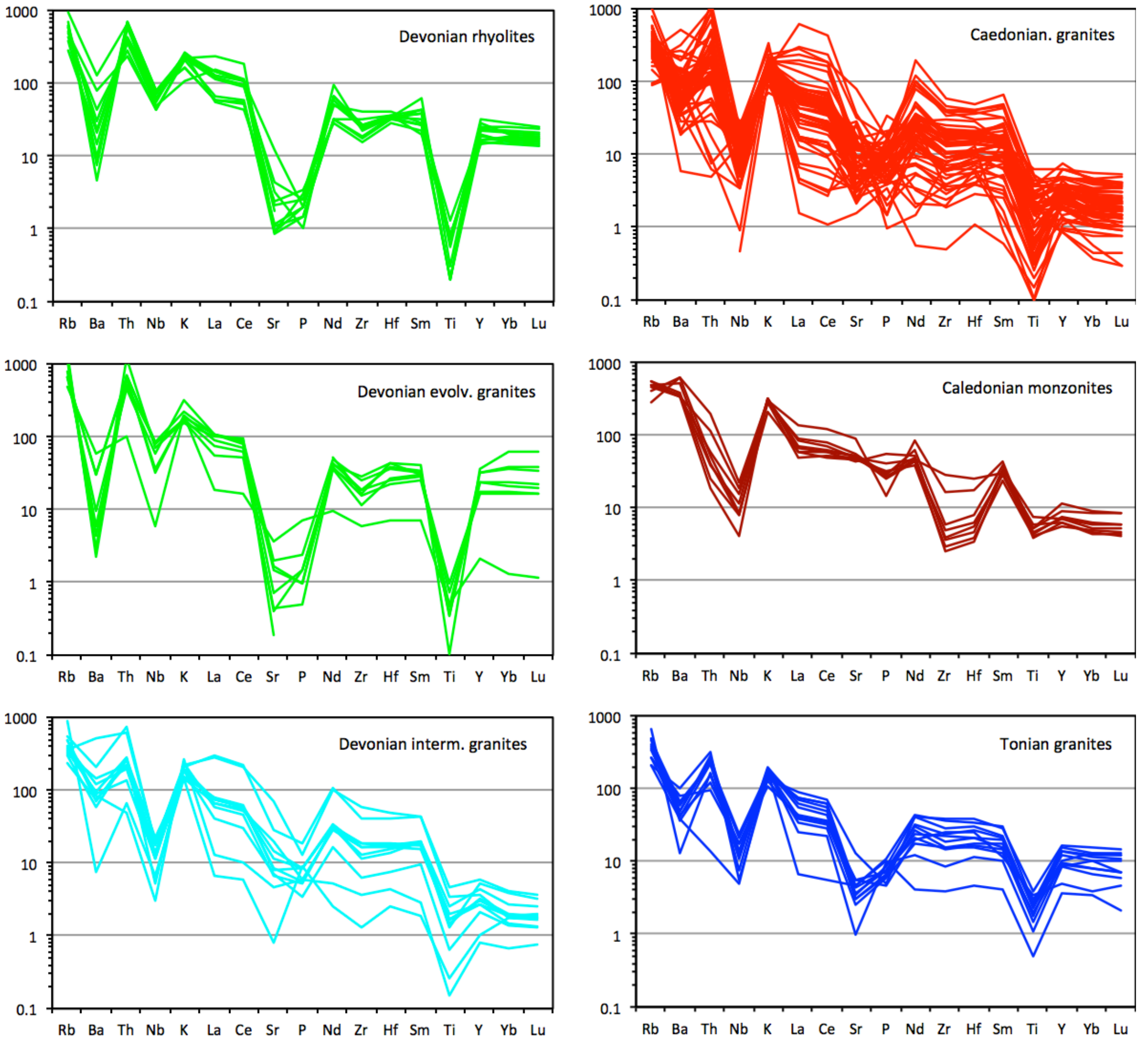

Figure 10 *'Spider' diagrams for the East Greenland granitoid samples showing multi-element concentrations normalised to primitive mantle (McDonough & Sun 1995).*

In summary, the studied rocks appear on geochemical grounds to record different geotectonic settings. The geochemical signature of the Tonian granites is generally similar to that of the Caledonian granites, with the noticeable exception of the Tonian granites having consistently higher FeOt and lower Al_2O_3 compared to the Caledonian granites (Figure 5 and 6a), which indicates different sources for these two rock groups. Despite the limited number of Tonian granites analysed, they do form a rather tight group that seems to be consistent with a post-collisional setting in an Early Neoproterozoic orogeny (Figure 6). For the Caledonian orogeny, it is suggested that the Caledonian monzonites formed during the magmatic arc stage, that the Caledonian granites possibly formed during the syn-collisional stage and, finally, the Devonian evolved granitoids already reflect a post-collisional stage. The Devonian intermediate granites consistently plot together with the Caledonian granites, and it is therefore suggested that the former should potentially be considered part of the latter, and the classification used in the Haller (1971) map should be reevaluated. Alternatively, the indicated change of tectonic setting took place during the Devonian. In the latter option, it is hypothesized that the Devonian intermediate granite could be Early Devonian, formed still during the syn-collisional stage prevailing during the Caledonian, while the Devonian evolved granitoids could be Late Devonian, already formed during the subsequent post-collisional stage. However, this has to be investigated, and supported further through fieldwork and geochronology before it can be resolved.

Magma fertility

Empirical and theoretical evidence supports a strong correlation between the compositional character of granites and metal associations in related mineralisation (Blevin & Chappell 1992, 1995; Meinert 1992). According to these authors, the parameters that control magma fertility are granite type, evolutionary stage and oxidation state. Figure 11 plots K/Rb vs. SiO_2 and shows that the studied granitoids range from moderately to strongly differentiated, with some of the Devonian granitoids being particularly fractionated with SiO_2 >75 wt% and low K/Rb ratios (<250). This suggests that these rocks can be associated with Mo-W-Sn mineralisation. Which of these metals dominate will depend on the magma oxidation state, which is essentially inherited from its source, although the effects of wall rock interaction can be locally important. In reduced S-type magmas, such as the studied Caledonian and Devonian granitoids, Sn and (to a lesser degree) W both behave incompatibly and build up in the magma during differentiation. Figure 12 plots Fe_2O_3/FeO vs. Rb/Sr and shows that Tonian and Caledonian granites are indeed relatively reduced and would be favorable for W and Sn-W mineralisation. These would be core element associations, i.e. the most intrusion-proximal element association, but base metal, precious metal and U-F mineralisation can be expected to be found more distally to the intrusion. In contrast, Devonian rhyolites display high oxidation states on Figure 12. However, these are interpreted to reflect magma oxidation during shallow emplacement within oxidizing wall rocks and/or subsequent rock oxidation due to alteration or weathering. This is supported by the fact that possible secondary processes were already highlighted (Figure 3) to have been potentially important for these rocks. When plotted on a diagram of Ba/Th vs. La/Sm by Li et al. (2017) (Figure 13), the Devonian evolved granitoids plot in the field of the Yanshanian granite related to Sn and W deposits, while the Caledonian granites and Devonian intermediate granites plot in the field of the Yanshanian granite related to W and base metal deposits, which these authors interpret to reflect relatively lower and higher magma oxidation, respectively.

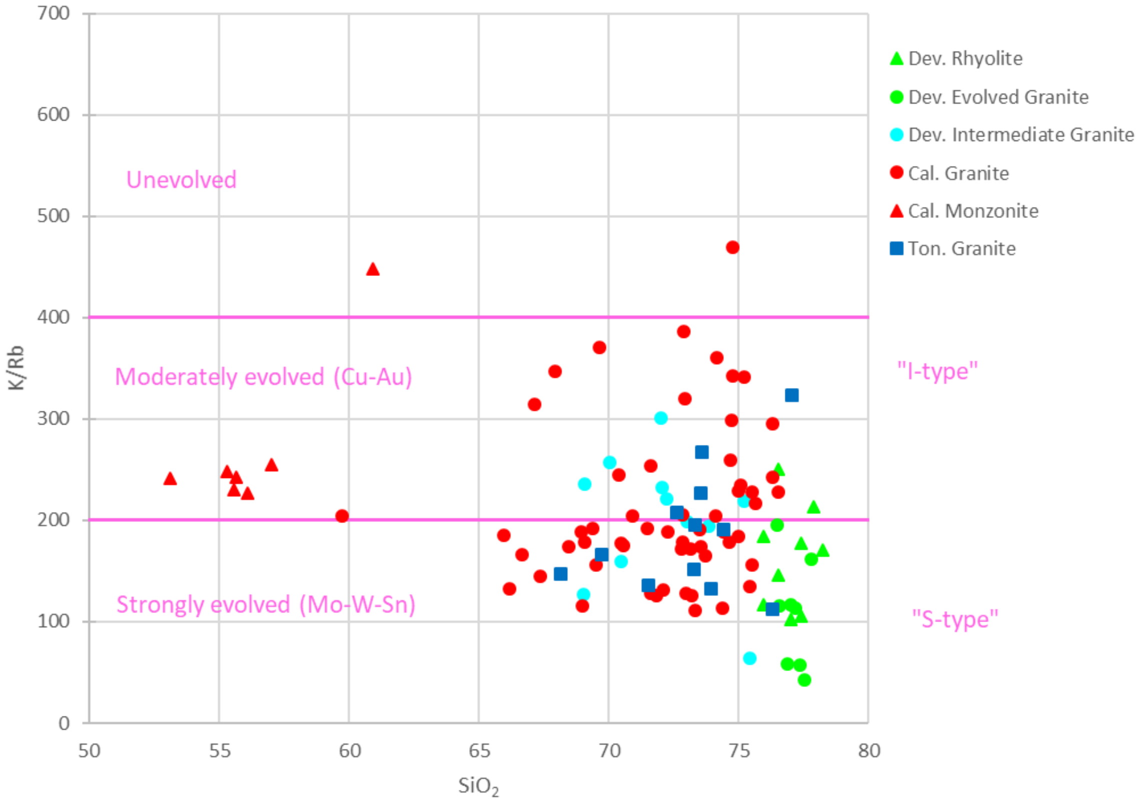

Figure 11 *K/Rb – SiO_2 after Blevin & Chappell (1992, 1995) showing granite types and their typical associated mineralisation.*

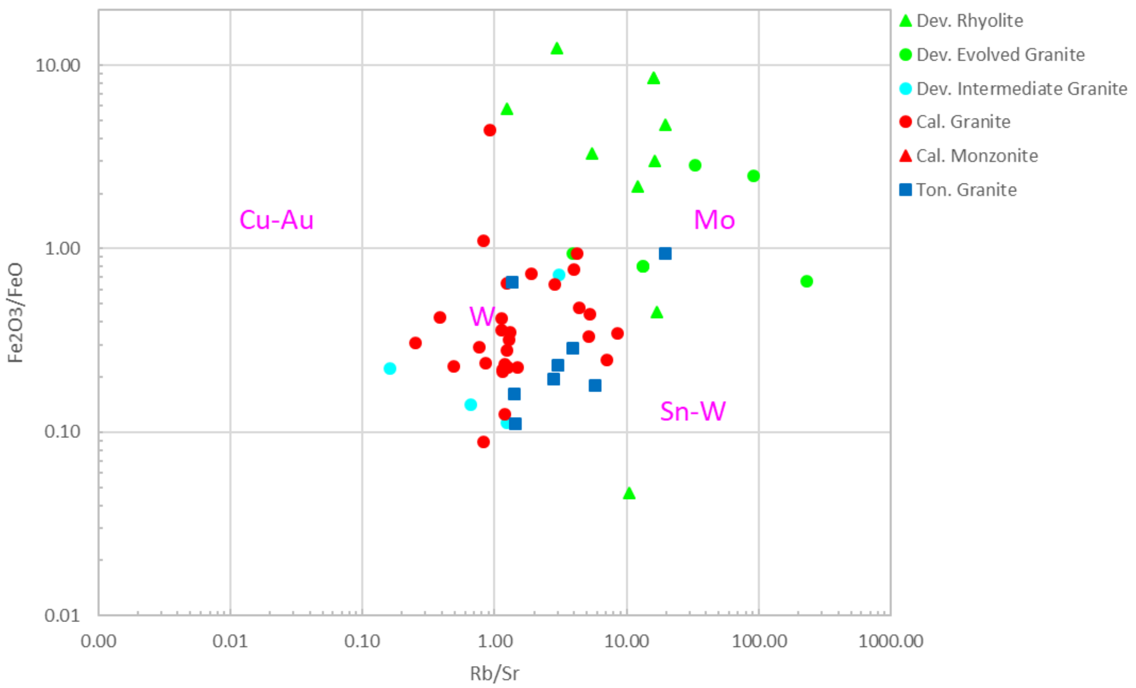

Figure 12 *Fe_2O_3/FeO – Rb/Sr after Blevin & Chappell (1992, 1995) with fields for associated mineralisation type.*

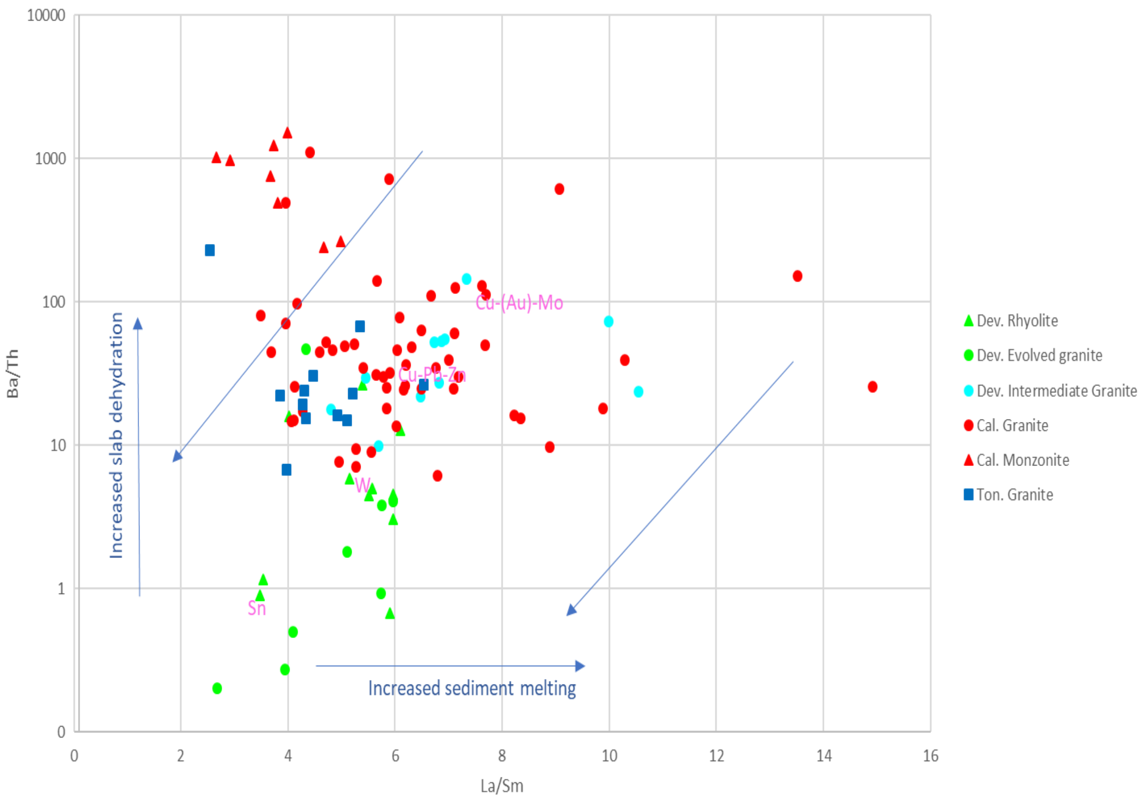

Figure 13 *Ba/Th - La/Sm after Li et al. (2017).*

It should be noted that magma fertility, *per se*, does not necessarily predict whether a given granitoid is mineralised. In addition to the magma fertility, assessed through the igneous rock geochemistry carried out during this study, physical parameters such as the level of magma emplacement, erosional level and volatile content need to be considered for a more complete evaluation. In any case, the Caledonian and Devonian granitoids studied can be considered favourable for W and Sn mineralisation. The Devonian evolved granitoids, in particular, have undergone extensive fractionation during which Sn, W and other metals could have built up in the relatively reduced magma.

Summary and evaluation/further studies

The spatial distribution of granite localities over especially Clavering Ø and central Hudson Land illustrates the observation made during earlier investigations that granites are more abundant than shown on presently available geological maps. Clearly, more accurate field mapping is desired perhaps assisted by hyperspectral data and photointerpretation to obtain a better map. It is still an open question whether the individual granite outcrops are small, isolated bodies, or they are connected at depth and are parts of larger bodies. Neither is it revealed if they are of the same age. Geochronological and petrological studies of the acquired samples are warranted to get closer to the number and character of granite generations. Re-analysis of a large number of archived stream sediment samples (presently underway) may help to outline the area hosting Sn-W-Nb-Y granites.

Our study of the geochemical data has shown that three groups are distinct from the remaining bulk part of the samples: the Devonian rhyolites and evolved granites in Hudson Land, and the monzonites of presumed Silurian age at Clavering Ø. The Devonian extrusive and intrusive rocks are clearly geochemically related and exhibit the characteristics of A-type granites, such as high Nb, Ta, Y, low Sr, and negative Eu-anomaly. The samples of monzonite are more basic than all others and combined with high K this may indicate a distinct magma type. The intermediate Devonian and the Caledonian are not clearly discriminated by the criteria used here. The intermediate Devonian granite group resembles the Caledonian granite group, and it is possible that the two groups are part of the same population. Isotopic age data or other evidence are clearly needed to ascertain if the presumed Devonian intermediate granite is indeed Devonian. The Tonian granites do seem to be distinct from the aforementioned granites by having higher FeO_t and lower Al_2O_3, which possible reflects derivation from another source.

Closer inspection of the geochemical data in relation to the geography, the intrusion type, grain size, character of host rock and mineralogy (thin section) could potentially provide a basis for subdivision of the large group of Caledonian granites.

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Appendix

This appendix describes all the samples analysed from the study area. The samples are divided into three sections by area, namely Clavering Ø, Hudson Land and Gauss Halvø. Within each section, the samples are listed numerically. It has not been possible to retrieve photos of all the samples, and the extent of the descriptions vary. The sample names in the appendix follow the classification in the table and figures in the report, namely as Tonian granite (●), Caledonian monzonite (▲), Caledonian granite (●), Devonian intermediate granite (●), Devonian evolved granite (▲) and Devonian rhyolite (●). The ages of the samples have been classified based on available cross-cutting relationships, deformation intensity, previous map legends and preliminary unpublished U-Pb geochronology. Through a stepwise process, a final classification was constructed using the whole-rock geochemistry.

Clavering Ø

Granite – 521612

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

●

Coarse-grained, garnet leucogranite.

Monzonite – 521625

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Medium-grained monzonite, foliation marked by pegmatite veining, cut by finer grained monzonite. Close to contact with migmatitic gneiss. This lithology was mapped out as a post-tectonic granite ("O") by Haller & Koch (1971).

Monzonite – 521627

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Coarse-grained monzonite. Intense reddening of feldspar. This lithology was mapped out as a post-tectonic granite ("O") by Haller & Koch (1971).

Granite – 521633

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Garnet leucogranite sheet in migmatitic gneiss.

Granite – 521642

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Aplite granite, foliated.

Granite – 521646

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Tourmaline and muscovite pods, within pegmatite dyke intruding metasedimentary rock.

Monzonite – 521649

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Weakly foliated monzonite, apparently intruding gneiss and quartzite, and overlain by red sandstone. Reddening of feldspars. This lithology was mapped out as a post-tectonic granite ("O") by Haller & Koch (1971).

Monzonite – 521652

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Coarse-grained monzonite cut by discordant pegmatite. This lithology was mapped out as a post-tectonic granite ("O") by Haller & Koch (1971).

Monzonite – 521653

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Biotitic mafic enclave, within monzonite. This lithology was mapped out as a post-tectonic granite ("O") by Haller & Koch (1971).

Granite – 521658

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Aplitic granite intrusion cutting the foliation in the host gneiss.

Granite – 521659

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Rust and jarosite stained aplite body of ~100 m.

Granite – 521674

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Shallow-dipping, weakly foliated aplite dyke, with green pyroxene (?) and white mica, hosted within migmatitic gneiss.

Granite – 521688

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Foliated, K-feldspar-megacrystic, biotite-garnet-bearing ~3 m-thick granitic leucosome (?) pod from migmatite.

Granite – 521691

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Medium-grained, foliated, garnet-biotite leucogranite.

Granite – 521694

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Augen gneiss, strongly foliated, garnet- biotite with 2 cm sized K-feldspar augen.

Granite – 521696

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Medium-grained aplite lens, within pegmatite body, which is emplaced in fine grained biotite gneiss.

Granite – 521698

Locality: Central Clavering Ø
Collector: Rosa
Collected: 2019

Medium-grained 30-40 cm subhorizontal aplite, cutting amphibolite.

Monzonite – 523808

Locality: Northern Clavering Ø
Collector: Thrane
Collected: 2019

Homogeneous, medium grained monzonite. It contains spots of amphibole aggregates in an alkali-feldspar matrix. Has seen deformation and been cut by thin pegmatitic veins. The contact is not exposed.

Granite – 523813

Locality: Northern Clavering Ø
Collector: Thrane
Collected: 2019

Pegmatitic leucocratic augen gneiss, dominated by large feldspar augens up to 8 cm long. Outcropping on a mountaintop. It represents a large pluton.

Syenite – 523814

Locality: Northern Clavering Ø
Collector: Thrane
Collected: 2019

Leucocratic quartz-amphibole granite, strongly deformed. Contain lenses of and layers of amphibolite. The body is cut by undeformed granites and pegmatites.

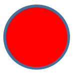
Granite – 523816

Locality: Northern Clavering Ø
Collector: Thrane
Collected: 2019

Coarse grained to pegmatitic, leucocratic granite vein, intruding into migmatitic metasedimentary rocks. The vein is up to a couple of meters wide.

Granite – 523820

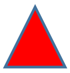
Locality: Northern Clavering Ø
Collector: Thrane
Collected: 2019



Thin, fine grained, leucocratic dyke with garnets, crosscutting the metasedimentary rocks.

Monzonite – 523824

Locality: Northern Clavering Ø
Collector: Thrane
Collected: 2019



Deformed monzonite.

Granite – 523829

Locality: Northern Clavering Ø
Collector: Thrane
Collected: 2019

Leucocratic granitic dyke cross cutting the Palaeoproterozoic orthogneiss.

Granite – 546905

Locality: Central Clavering Ø
Collector: Kokfelt
Collected: 2019

Coarse grained augen gneiss.

Granite – 546907

Locality: Central Clavering Ø
Collector: Kokfelt
Collected: 2019

Fine grained leucocratic vein intruding into the migmatitic metasedimentary rock.

Granite – 546917

Locality: Djævlekløften, Clavering Ø
Collector: Kokfelt
Collected: 2019

Medium grained, weakly foliated 2-mica granite. Represents a larger intrusion 2-300 m wide in the north part of the valley.

Granite – 546923

Locality: Central Clavering Ø
Collector: Kokfelt
Collected: 2019

Subvertical granitic pegmatite. Semi concordant with the host migmatitic metasedimentary host rock. Sampled at same locality as 546924, -25 and -26.

Granite – 546924

Locality: Central Clavering Ø
Collector: Kokfelt
Collected: 2019

Subhorizontal thin pegmatite dyke intruding the host migmatitic metasedimentary rock discordantly, Concordant aplitic part of pegmatite is sampled
Sampled at same locality as 546923, -25 and -26.

Granite – 546925

Locality: Central Clavering Ø
Collector: Kokfelt
Collected: 2019

Subhorizontal, coarse grained pegmatite
Sampled at same locality as 546923, -24 and -26.

Granite – 546926

Locality: Central Clavering Ø
Collector: Kokfelt
Collected: 2019

Discordant aplite, cut by pegmatite dyke.
Sampled at same locality as 546923, -24 and -25.

Granite – 546929

Locality: Central Clavering Ø
Collector: Kokfelt
Collected: 2019

Very coarse grained discordant pegmatite, with white mica.

Granite – 546936

Locality: Central Clavering Ø
Collector: Kokfelt
Collected: 2019

Leucocratic dyke, two-mica granite, biotite dominated. Foliated.

Granite – 546943

Locality: Central Clavering Ø
Collector: Kokfelt
Collected: 2019

Leucocratic two-mica granitic dyke, intruding amphibolite and slightly foliated.

Granite – 586405

Locality: Southern Clavering Ø
Collector: Saalmann
Collected: 2019

Fine-medium grained, foliated granite belonging to granitic dykes that contain up to 0.4 mm large muscovite grains. Intruding strongly foliated migmatitic metasedimentary rocks.

Granite – 586410

Locality: Southern Clavering Ø
Collector: Saalmann
Collected: 2019

Cross-cutting granitic dyke, forming the rim of pegmatite. The dykes are clearly cross-cutting the foliation of the migmatitic metasedimentary rock.

Granite – 586417

Locality: Southern Clavering Ø
Collector: Saalmann
Collected: 2019 loc. 27

Fine grained leucocratic biotite granite c. 25-30 m thick sheet in the host gneisses. A-feldspar-quartz dominated with subordinate biotite and garnet. The granite is foliated, and the foliation, marked by SPO of biotite, is mainly magmatic with some subsolidus overprint.

Granite – 586429

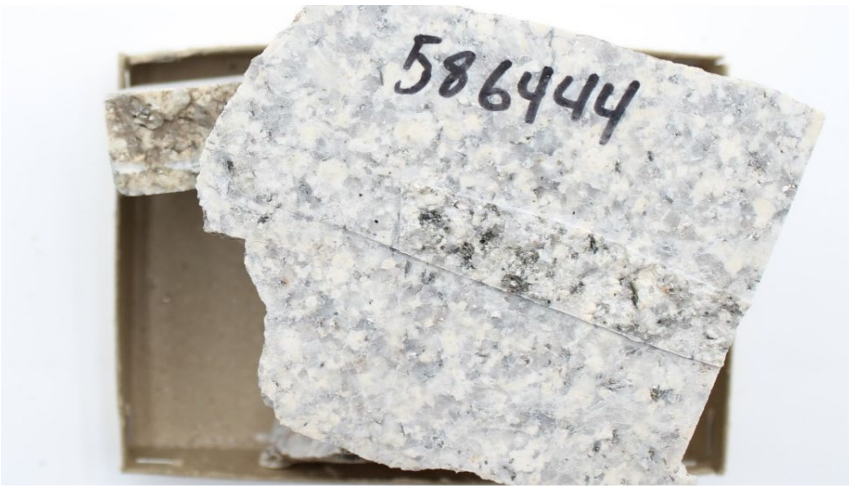
Locality: Southern Clavering Ø
Collector: Saalmann
Collected: 2019 loc 57

Leucocratic, pegmatitic dyke, up to 3 m thick. Intruding the migmatitic paragneiss and folded. The sample is from the finer grained part of the dyke.

Granite – 586444

Locality: Southern Clavering Ø
Collector: Saalmann
Collected: 2019 loc. 84

Medium to coarse grained, leucocratic granite. Biotite-muscovite-quartz-feldspar assemblage. Weak foliation which most probably is magmatic.



Granite – 586446

Locality: Southern Clavering Ø
Collector: Saalmann
Collected: 2019 loc. 87

Fine grained leucocratic granite sheet, cross-cutting migmatitic paragneiss. Garnet-biotite assemblage.

Hudson Land

Granite – 131342

Locality: Ritom Sø
Collector: Steenfelt
Collected: 1974

Light grey granitic rock

Granite – 131345

Locality: Ritom Sø
Collector: Steenfelt
Collected: 1974

Grey granite

Rhyolite – 200193

Locality: Hochwacht
Collector: Steenfelt
Collected: 1975

Uranium mineralised rhyolite

Rhyolite – 200211

Locality: Hochwacht
Collector: Steenfelt
Collected: 1975

Blueish columnar rhyolite

Rhyolite – 200240

Locality: Hochwacht
Collector: Steenfelt
Collected: 1975

Banded rhyolite

Rhyolite – 200505

Locality: Muskkox Fjord, Northwest
Collector: Ryan
Collected: 1975

Rhyolite dyke

Granite – 200558

Locality: Muskox Fjord east, North side
Collector: Ryan
Collected: 1975

Fresh grey granite

Granite – 200586

Locality: Muskox Fjord east, North side
Collector: Ryan
Collected: 1975

Red aplitic granite

Granite – 200733

Locality: Dybendal
Collector: Ryan
Collected: 1975

Red granite

Granite – 200734

Locality: Dybendal
Collector: Ryan
Collected: 1975

Coarse pink granite

Granite – 222226

Locality: Hudson Land
Collector: Cooper
Collected: 1976

Medium-grained hornblende-quartz granite

Granite – 222229

Locality: Salévebjerg
Collector: Cooper
Collected: 1976

Fine- to medium-grained, non-porphyritic granite.

Granite – 222230

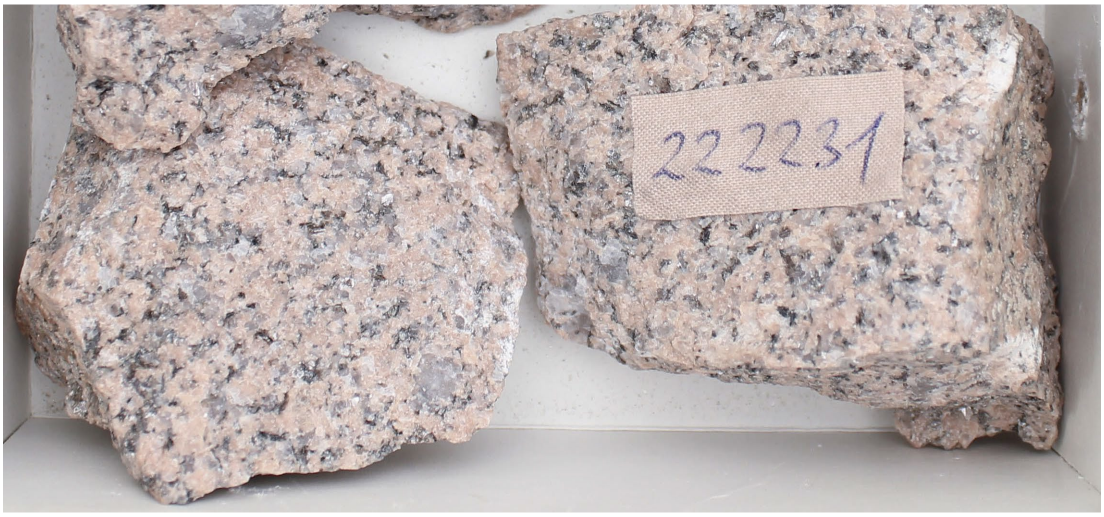
Locality: Salévebjerg
Collector: Cooper
Collected: 1976

Grey granite

Granite – 222231

Locality: Salévebjerg
Collector: Cooper
Collected: 1976

Pink biotite-muscoviet granite



Granite – 222232

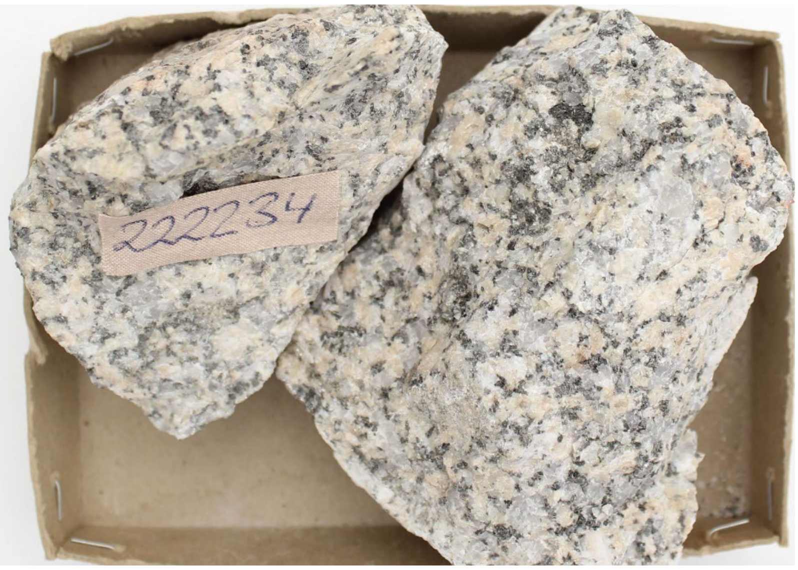
Locality: Salévebjerg
Collector: Cooper
Collected: 1976

Porphyritic, pink granite

Granite – 222234

Locality: Salévebjerg
Collector: Cooper
Collected: 1976

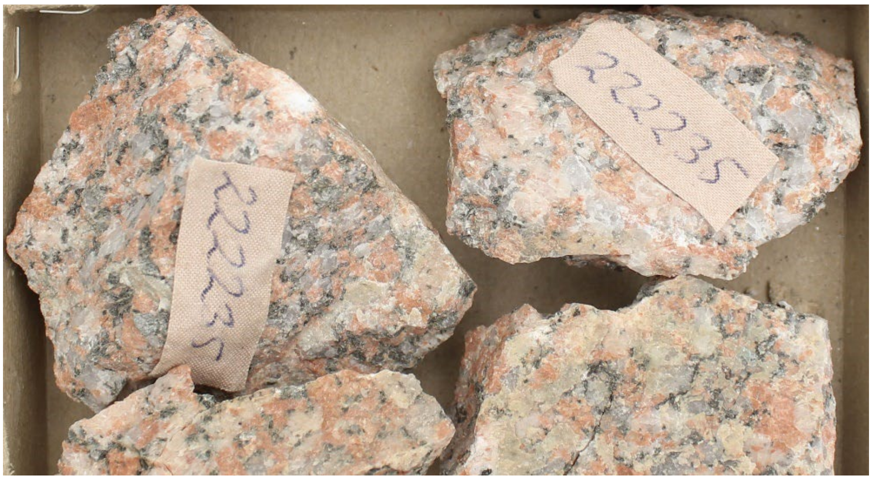
Porphyritic, white granite



Granite – 222235

Locality: Salévebjerg
Collector: Cooper
Collected: 1976

Coarse-grained, slightly porphyritic granite



Granite – 222237

Locality: Salévebjerg
Collector: Cooper
Collected: 1976

Mafic granite

Granite – 222244

Locality: Passagedal
Collector: Cooper
Collected: 1976

Porphyritic muscovite-rich granite.

Granite – 222248

Locality: Passagedal
Collector: Cooper
Collected: 1976

Fine-grained, slightly foliated, mafic biotite granite

Granite – 223516

Locality: Salévebjerg
Collector: Rasmussen
Collected: 1976

Medium-grained pink granite

Granite – 223526

Locality: Passagedal
Collector: Rasmussen
Collected: 1976

Medium-grained, homogeneous, red granite

Granite – 223536

Locality: Passagedal
Collector: Rasmussen
Collected: 1976

Medium-grained, homogeneous, slightly foliated, red granite.

Granite – 223542

Locality: Storelv
Collector: Rasmussen
Collected: 1976

Fine- to medium grained white-grey granite.

Granite – 223551

Locality: Storelv
Collector: Rasmussen
Collected: 1976

Medium-grained, red granite.

Granite – 226083

Locality: Blokadedal
Collector: Steenfelt
Collected: 1976

Aplitic facies in granite.

Granite – 226085

Locality: Parkinson Bjerge
Collector: Steenfelt
Collected: 1975

Granite – 226089

Locality: Passagedal
Collector: Steenfelt
Collected: 1976

Granite intrusive in metamorphosed EBG

Granite – 226221

Locality: Nordhoek Bjerge
Collector: Steenfelt
Collected: 1976

Course-grained, undeformed.
This lithology was mapped out as a post-tectonic granite (“O”) by Haller & Koch (1971).

Granite – 226245

Locality: Rungsted gletcher
Collector: Steenfelt
Collected: 1976

Dark dioritic granite

Granite – 240840

Locality: Northwest of Stordal base
Collector: Steenfelt
Collected: 1976

Aphyric granite

Granite – 240844

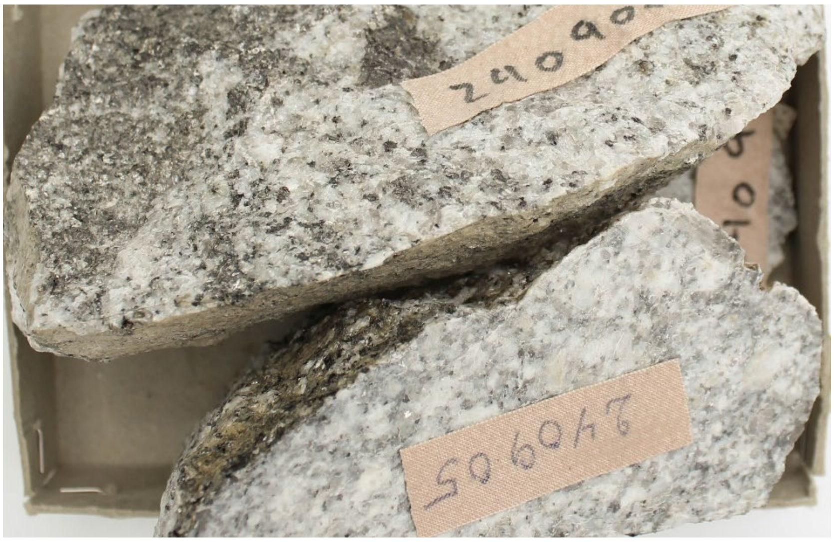
Locality: Northwest of Stordal base
Collector: Steenfelt
Collected: 1976

Fine- to course-grained granite

Granite – 240905

Locality: Storelv
Collector: Steenfelt
Collected: 1976

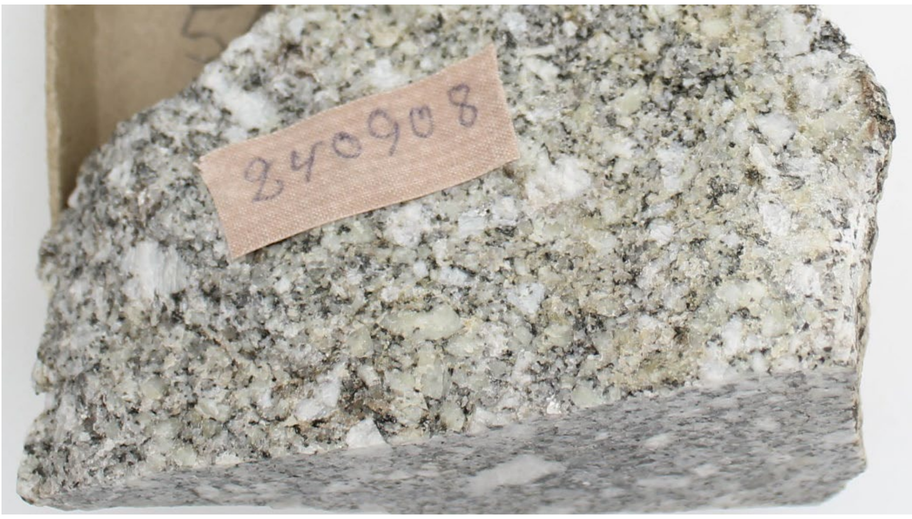
Medium-grained, grey-white, mica granite, interlayered with foliated schist.



Granite – 240908

Locality: Storelv
Collector: Steenfelt
Collected: 1976

Medium-grained, weakly porphyritic, grey granite, below biotite-schist.



Granite – 240943

Locality: Parkinson Bjerge
Collector: Steenfelt
Collected: 1977

Granite – 240945

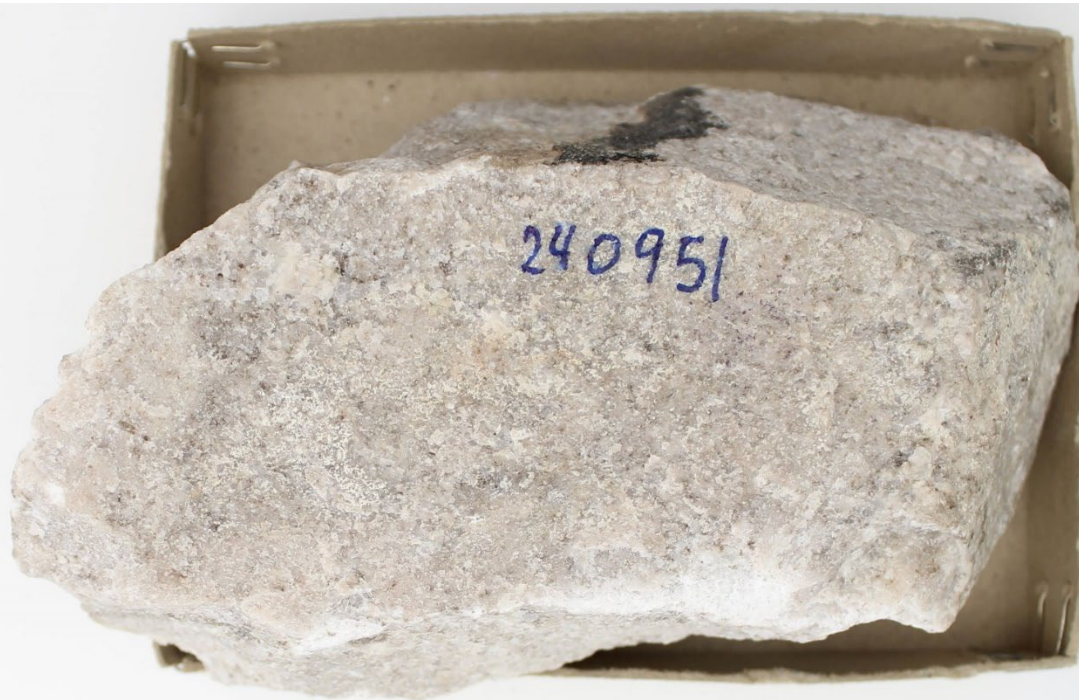
Locality: Parkinson Bjerge
Collector: Steenfelt
Collected: 1977

Porphyric granite intruding EBG

Granite – 240951

Locality: Parkinson Bjerge
Collector: Steenfelt
Collected: 1977

Muscovite bearing leucogranite



Granite – 240955

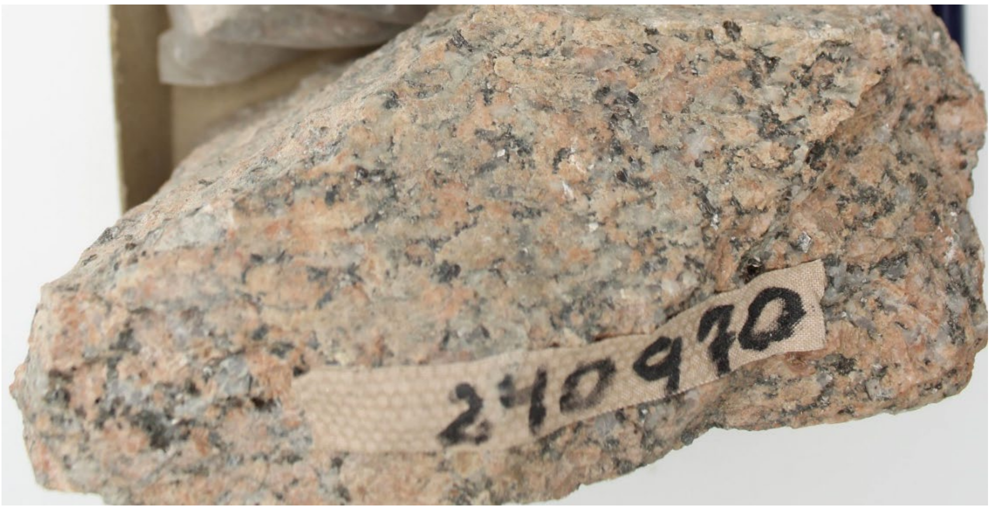
Locality: South of Parkinson Bjerge
Collector: Steenfelt
Collected: 1976

Fine-medium grained, sheared hematite stained granite vein (700 cps).

Granite – 240970

Locality: Afgrunden, North side
Collector: Steenfelt
Collected: 1976

Fine- to course-grained pink granite.



Granite – 241163

Locality: Sernander Bjerge
Collector: Steenfelt
Collected: 1977

Granite intruding EBG

Gauss Halvø

Granite – 200603

Locality: Muskox Fjord east, South side
Collector: Ryan
Collected: 1975

Pink microgranite dyke

Rhyolite – 200606

Locality: Muskkox Fjord East, South side
Collector: Ryan
Collected: 1975

Grey rhyolite

Granite – 200617

Locality: Giesecke Bjerge, North
Collector: Ryan
Collected: 1975

Granite with large feldspar crystals.

Granite – 200622

Locality: Giesecke Bjerge, North
Collector: Ryan
Collected: 1975

Granite – 200624

Locality: Giesecke Bjerge, South
Collector: Ryan
Collected: 1975

Grey granite, weakly porphyritic.

Granite – 200630

Locality: Giesecke Bjerge, Central
Collector: Ryan
Collected: 1975

Homogeneous biotite granite.

Granite – 200640

Locality: Giesecke Bjerge, North
Collector: Ryan
Collected: 1975

Leucogranite.

Granite – 200653

Locality: Vilddalen
Collector: Ryan
Collected: 1975

Grey granite.

Lava – 200661

Locality: Kap Franklin
Collector: Ryan
Collected: 1975

Purple-grey lava.

Granite – 200673

Locality: Kap Franklin, West
Collector: Ryan
Collected: 1975

Rhyolite – 200686

Locality: Kap Franklin
Collector: Ryan
Collected: 1974

Purple-grey lava with brown altered feldspar.

Rhyolite – 200688

Locality: Kap Franklin, West
Collector: Ryan
Collected: 1975

Grey quartz feldspar porphyry.

Porphyry – 202174

Locality: Randbøldal, North
Collector: Thyrsted
Collected: 1975

Greyish-white rhyolite.

Rhyolite – 202356

Locality: Randbøldal, South
Collector: Thyrsted
Collected: 1975

Grey rhyolite with quartz-feldspar phenocrysts.

Rhyolite – 202363

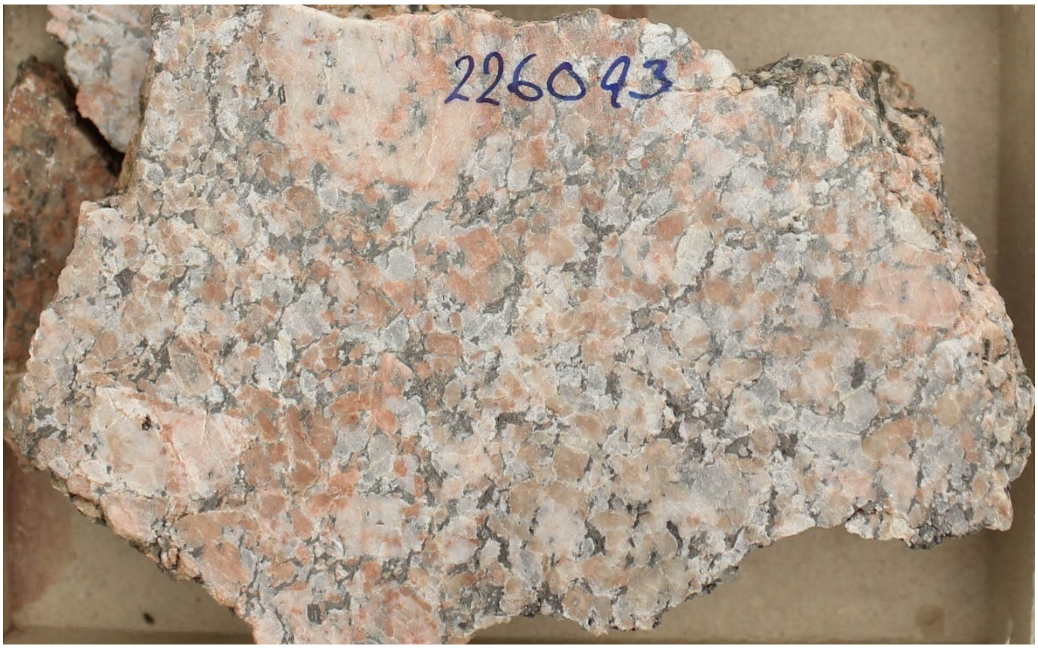
Locality: Randbøldal, South
Collector: Thyrsted
Collected: 1975

Rhyolite with large phenocrysts.

Granite – 226093

Locality: Skyggedal, Gastisdal
Collector: Steenfelt
Collected: 1976

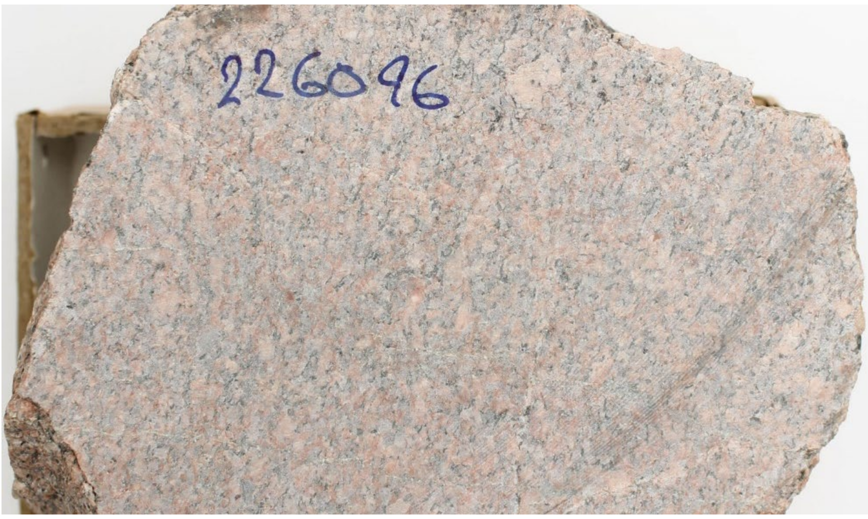
Fine- to coarse grained pink granite, weakly foliated.



Granite – 226096

Locality: Gastisdal
Collector: Steenfelt
Collected: 1976

Fine-grained, pink, undeformed post-orogenic granite (110 cps).



Granite – 226097

Locality: East of Lacours Bjerge
Collector: Steenfelt
Collected: 1976

Medium-grained, foliated biotite-rich granite.