

GEOCHRONOLOGY REPORT

An ongoing program of radiometric dating was initiated by the Department of Mines and Energy in 1977 to assist the regional mapping programs in Newfoundland and Labrador. The data obtained, in addition to hopefully providing the age of rock units and mineralization, were also intended to provide information on uplifts and cooling, and to aid in the interpretation of the evolution of magmas based on initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratios.

Three dating techniques were employed, namely Rb/Sr, U/Pb, and $^{40}\text{Ar}/^{39}\text{Ar}$.

The insular Newfoundland program is being co-ordinated by Dr. R. D. Dallmeyer of the University of Georgia, Athens. Dr. Dallmeyer completed the $^{40}\text{Ar}/^{39}\text{Ar}$ analyses, and Dr. A. L. Odom of Florida State University, Florida, the Rb/Sr and U/Pb analyses. Dr. Dallmeyer supervised sample collection in the field.

The initial program in Labrador was conducted by D. Kontak as part of an M.Sc. study under the supervision of Drs. H. Baadsgaard and R. Morton at the University of Alberta and was confined to Rb/Sr and U/Pb dating. The geochronology program was expanded in 1978 and Rb/Sr whole-rock dating was carried out by Dr. C. Brooks of the University of Montreal. In addition, $^{40}\text{Ar}/^{39}\text{Ar}$ investigations were conducted on rocks of the eastern Central Mineral Belt by Drs. D. Archibald and E. Farar of Queen's University, Kingston, and on rocks of the southern Labrador Trough by Dr. R. D. Dallmeyer. In these cases, sample collection was done under the guidance of the geochronologist.

The results and interpretations presented here (table 1 and 2) are preliminary, and more detailed discussions of the data will appear later in the Department's "Preliminary Report" series.

UNIT	METHOD	DATE (Ma)	INTERPRETATION
Burlington Granodiorite	1. Rb-Sr whole rock isochron	494 ± 39	1 & 2 suggest emplacement at approximately 475 ± 15 Ma. Indicates rapid cooling at pluton margin. Postmagmatic cooling in central portions of pluton where hornblende (3) and biotite samples (4) record similar dates.
	2. U-Pb zircon concordia	461 ± 15	
	3. ⁴⁰ Ar/ ³⁹ Ar (hornblende)	464 ± 5 pluton margin 406 ± 5 pluton interior 414 ± 10 interior	
	4. ⁴⁰ Ar/ ³⁹ Ar (biotite)	414 ± 5 interior 412 ± 5 409 ± 10	
Dunamagon Granite	1. U/Pb zircon concordia	460 ± 20	Indicates older emplacement age than previous dates (~425). Biotite date is markedly younger than previously published Rb-Sr and U-Pb dates of approximately 425 Ma. The biotite age probably dates time of postmetamorphic cooling.
	2. ⁴⁰ Ar/ ³⁹ Ar (biotite)	344 ± 5	
Mings Bight and Pacquet Harbour Groups	1. ⁴⁰ Ar/ ³⁹ Ar (hornblende)	345 - 362	Probably postmetamorphic cooling dates.
Swift Current Pluton	1. Rb-Sr whole rock isochron	548 ± 11	Slight discrepancy with U-Pb age may indicate postmagmatic heating.
	2. U-Pb zircon concordia	580 ± 20	Best date for time of emplacement.
	3. ⁴⁰ Ar/ ³⁹ Ar (hornblende)	560 ± 15 566 ± 15	Closeness in age to U-Pb date suggests pluton emplacement at shallow crustal level and rapid postmetamorphic cooling.
Love Cove Volcanics	1. U-Pb zircon concordia	590 ± 30	Age for volcanics; similarity to Swift Current Pluton age supports field evidence indicating volcanics are extrusive equivalents of plutonics.
	2. U-Pb zircon concordia	608 ± 25	
Bull Arm Rhyolite	1. U-Pb zircon	584 minimum	Samples unsuitable to yield a concordia age.
Ackley Granite	1. ⁴⁰ Ar/ ³⁹ Ar (biotite)	352 ± 10	Dates are similar to previously published Rb-Sr date of 354 ± 8 suggesting rapid postmagmatic cooling. Since pluton is essentially unmetamorphosed, the date provides an upper limit for Love Cove metamorphism.
		355 ± 10	
	(hornblende)	356 ± 10	
Love Cove Phyllites	1. ⁴⁰ Ar/ ³⁹ Ar (whole rock)	380 - 388 (6 samples) 353 - 367 (3 samples)	Dates time of regional metamorphism.
Chetwynd Granite	1. U-Pb zircon	377 ± 20	Date of emplacement
	2. ⁴⁰ Ar/ ³⁹ Ar (biotite)	(S) 372 ± 5 (N) 350 ± 5	Cooling dates for granite (S) Samples south of Bay d'Est Fault. (N) Samples north of Bay d'Est Fault Indicates more rapid cooling south of fault.
	(hornblende)	(N) 361 ± 5	
La Poile Batholith	1. ⁴⁰ Ar/ ³⁹ Ar (biotite)	360 ± 5	Cooling age of granite. Similar to postmetamorphic cooling age of Bay du Nord Group.
	2. ⁴⁰ Ar/ ³⁹ Ar (hornblende)	380 ± 5	
Hawks Nest Pond Porphyry (La Poile Group).	1. U-Pb zircon	410 ± 20	Emplacement of porphyry.
Bay du Nord Group Dolman Formation	1. U-Pb zircon	449 ± 20	Age for volcanics.
Metasediments Amphibolite	2. ⁴⁰ Ar/ ³⁹ Ar (biotite)	343 ± 5	Dates postmetamorphic cooling or uplift and cooling.
	(biotite)	353 ± 5	
	3. ⁴⁰ Ar/ ³⁹ Ar (biotite)	377 ± 5	
	(hornblende)	388 ± 5	
Rose Blanche grano- diorite/tonalite	1. ⁴⁰ Ar/ ³⁹ Ar (hornblende)	392 ± 10	Dates cooling.
Lockers Bay Granite	1. U-Pb zircon concordia	460 ± 20	Age of emplacement of granite. Markedly older than previously published Rb-Sr age of 300 ± 18 Ma.

TABLE 1

ROCK UNIT OR MINERALIZATION	METHOD	DATE (Ma)	INTERPRETATION
<u>Central Mineral Belt - Eastern</u>			
Pegmatite associated with Benedict Granodiorite	$^{40}\text{Ar}/^{39}\text{Ar}$ (Archibald & Farrar) plateau age, muscovite	1630 ± 10	Interpreted as age of emplacement of Benedict Granodiorite - similar to Walker Lake Granodiorite supporting contention that these two batholiths are related.
Walker Lake Granodiorite	$^{40}\text{Ar}/^{39}\text{Ar}$ (Archibald & Farrar) (a) plateau age, biotite (b) plateau age, hornblende (c) total fusion, biotite	2450 ± 15 1308 ± 10 1750 ± 10	(a) old age due to excess argon. (b) hornblende spectrum is disturbed, possibly due to inherited argon. (c) may date emplacement or may be disturbed due to inherited argon.
Major shear zone in Walker Lake - Benedict granodiorite	$^{40}\text{Ar}/^{39}\text{Ar}$ (Archibald & Farrar) total fusion, biotite	1004 ± 5	Shear zone was developed during the Grenvillian Orogeny.
Walker Lake granite	Rb-Sr whole rock isochron (Brooks)	1595 ± 34	Interpreted as age of emplacement.
Walker Lake granite	Rb-Sr whole rock isochron (Kontak)	1550 ± 50	Errorchron - upper limit of 1650. Data is compatible with Brook's age.
Foliated granite	Rb-Sr whole rock isochron (Brooks)	1795 ± 50	Interpreted as age of emplacement.
Upper Aillik Group felsic volcanics	Rb-Sr whole rock isochron (Kontak)	1767 ± 4	Interpreted as extrusive age.
Kitt's uranium deposit	U-Pb, pitchblende (Kontak)	1770	Indicates age of mineralization.
Burnt Lake Uranium deposit	U-Pb, pitchblende (Kontak)	1770	Probable age of mineralization, although there are variations in the U-Pb systematics.
<u>Central Mineral Belt - Central</u>			
Nebulitic granodiorite (Island Hr. Granite)	Rb-Sr whole rock isochron (Brooks)	1350 ± 200	"Errorchron": does not provide a precise age due to internal complexities in the granite and Rb-Sr systematics not obvious from the field specimens.
Bruce River Group volcanics at Bruce Lake	Rb-Sr whole rock isochron (Kontak)	1527 ± 39	Interpreted as extrusive age.
Bruce River Group volcanics at Minisinkwa Lake	Rb-Sr whole rock isochron (Kontak)	1538 ± 25	Geologically reasonable age in light of previous Rb-Sr data.
Otter Lake granite	Rb-Sr whole rock isochron (Kontak)	1496 ± 37	Intrudes the Bruce River Group. Age of crystallization.
Moran Lake "B" zone Uranium showing	U-Pb, brannerite (Kontak)	1785	Considered to be remobilized U from older rocks, since U occurs in leucogabbro dikes cutting the Bruce River Group.
Moran Lake "C" zone Uranium showing	U-Pb, pitchblende (Kontak)	1540	Epigenetic mineralization associated with carbonate altered rocks of the lower Bruce River Group.
Stormy Lake Uranium showing	U-Pb, pitchblende (Kontak)	860 - 990	Widely scattered data points, but suggests veins a product of Grenvillian deformation. Some hint of lead contamination ca. 500 Ma.

TABLE 2

ROCK UNIT OR MINERALIZATION	METHOD	DATE (Ma)	INTERPRETATION
<u>Central Labrador Trough</u>			
Shabogamo Intrusive Suite	Rb-Sr whole rock isochron (Brooks)	15 point 1685 ± 60	Errorchron based on combination of three separate isochrons determined for 3 separate sample sites. 1690 ± 50, 1695 ± 60, and a third isochron of 1040 ± 40, which is due to Grenville alteration. Altered samples were excluded from this isochron before combination with other isochrons. - Total rock errorchron probably good and reflects age of intrusion.
Blueberry Lake group	Rb-Sr whole rock isochron (Brooks)	1540 ± 40	Result is an errorchron and indicates either heterogeneity of initial Sr in samples or later alteration and redistribution of Sr ⁸⁷ . The age currently appears to be too young since the unit is believed to be intruded by the Shabogamo Intrusive Suite.
<u>Southern Labrador Trough</u>			
Shabogamo Intrusive Suite	Rb-Sr whole rock isochron (Brooks)	945 ± 180	Age of Grenvillian metamorphism.
	Rb-Sr whole rock isochron (Brooks)	935 ± 60	Age of Grenvillian metamorphism.
	Rb-Sr whole rock isochron	1570 ± 180	Age of emplacement.
Attikamagen Formation	Rb-Sr whole rock isochron (Brooks)	1450 ± 350	"Errorchrons", significance of older age not fully understood. Younger ages indicate Grenvillian Orogeny.
	Rb-Sr slabbed sample (Brooks)	1190 ± 400	
	Rb-Sr slabbed sample (Brooks)	960 ± 350	
Ashuanipi Metamorphic Complex (Grenville Province)	⁴⁰ Ar/ ³⁹ Ar (Dallmeyer)	2393 ± 20	Post-Kenoran cooling age.
Ashuanipi Metamorphic Complex (Grenville Province)	⁴⁰ Ar/ ³⁹ Ar biotite (Dallmeyer)	2093 ± 2	Disturbed spectrum - post-Kenoran cooling age partially reset during Grenvillian Orogeny.
Shabogamo Intrusive Suite	⁴⁰ Ar/ ³⁹ Ar - hornblende (Dallmeyer)	919 ± 15	Post Grenvillian cooling age - no evidence of Hudsonian Orogeny.
	⁴⁰ Ar/ ³⁹ Ar - biotite (Dallmeyer)	980 ± 15	Post Grenvillian cooling age - no evidence of Hudsonian Orogeny.
	⁴⁰ Ar/ ³⁹ Ar - hornblende (Dallmeyer)	1044 ± 15	
	⁴⁰ Ar/ ³⁹ Ar - biotite (Dallmeyer) ⁴⁰ Ar/ ³⁹ Ar - hornblende (Dallmeyer)	889 ± 15 928 ± 15	Post Grenvillian cooling - no evidence of Hudsonian Orogeny.
Menihok Formation	⁴⁰ Ar/ ³⁹ Ar - biotite (Dallmeyer)	940 ± 15	Post Grenvillian cooling age - no evidence of Hudsonian Orogeny.
<u>Davis Inlet Area</u>			
Char Lake monzonite	Rb-Sr whole rock isochron (Brooks)	1325 ± 55	Errorchron - Approximate age of crystallization.
Pyroxene granite	Rb-Sr whole rock isochron (Brooks)	1217 ± 24	Isochron - Approximate age of crystallization.
Peralkaline granite	Rb-Sr whole rock isochron (Brooks)	835 ± 50	Errorchron - Possible age of crystallization.
Felsic volcanics	Rb-Sr whole rock isochron (Brooks)	470 ± 120 (?)	Errorchron - No meaningful age data.
Flowers Bay Anorthosite	Rb - Sr whole rock isochron (Brooks)	1200 ± 210	Errorchron - Very approximate age of crystallization.

TABLE 2 (Cont.)