GEOCHEMICAL AND GEOPHYSICAL FOLLOW-UP STUDIES IN LABRADOR

by
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INTRODUCTION

During 1977 and 1978, reconnaissance lake sediment and water data were collected from a 134,000 km^2 (52,000 mi^2) area of southeastern, central and western Labrador under the Canada-Newfoundland Uranium Reconnaissance Program (G.S.C. 1978 and 1979). In 1978, the Department of Mines and Energy initiated a follow-up program within the region, particularly where mineral rights were open, to further define and evaluate the significance of geochemically anomalous areas. During 1978, 10 such areas, all having anomalously high uranium contents, were variously investigated by high density lake sediment and water sampling, airborne gamma ray and ground work (McConnell 1978, Kerswill and McConnell 1979). Three new uranium occurrences within the Grenville province were found and subsequently were staked by private industry.

The continuation of the follow-up program in 1979 concentrated on two aspects. Firstly, 14 areas having abnormally high base metal or uranium contents in the reconnaissance data and having a variety of geological settings were investigated by high density lake sediment and water sampling and where appropriate, airborne gamma ray surveying with limited ground follow-up (see Figure). Secondly, work was continued on the G-1 Grid where uraninite mineralization in granitic rocks was discovered last year. The object of this second study was to characterize the geochemical dispersion pattern in the overlying till, peat and stream waters, and to test and compare the effectiveness of surveys for radon in soil gas and gamma radiation in bedrock and float as guides to mineralized areas.

REGIONAL FOLLOW-UP

Initial follow-up procedures on the 9 base metal, 4 uranium and one molybdenum-fluorine anomalies consisted of high density lake sediment and water sampling. In total 841 samples from 2900 km^2 were collected. Water samples from several of the base metal anomalies were analyzed colorimetrically in a field laboratory using a dithizone method. This proved to be a rapid, fairly simple and effective way of measuring the heavy metal content (principally zinc) of lake and stream waters thus permitting the field party to make immediate ground searches for the sources of high metal values. Subsequent comparison of the dithizone analyses with those obtained by atomic absorption spectrophotometry for zinc produced a good correlation even at low levels of a few parts per billion. Field determinations of pH were made on all water samples and U and F analyses will be done for waters collected over U anomalies. Lake sediment samples are being analyzed for U, Cu, Pb, Zn, Ni, Co, Mo, F, Ag, Mn and Fe and for loss-on-ignition.

Airborne gamma ray surveys were flown over anomalies 9, 10 and 11 using a McPhar Spectra II spectrometer with a 5 channel graphical output and a 4100 cm^3 crystal mounted in a Bell 206-B helicopter. The spectrometer equipment was on loan from the Geological Survey of Canada and was installed and operated by their representative. A total of 890 km line were flown using a one km line spacing.

Results of the regional follow-up survey will be published as an open file before the 1980 field season.

DETAILED FOLLOW-UP, G-1 GRID

Uranium mineralization in granitic rocks assaying up to 2900 ppm U was discovered in 1978 north of Lake Melville (see Figure). The area is characterized by about 1% outcrop, thin to thick till and peat cover and a tree cover of black spruce and balsam fir. Two streams transect the grid. Several geochemical and geophysical exploration methodologies were tested across the grid in the hope that the resulting data would offer a means of comparing the effectiveness of the various techniques in detecting similar uranium mineralization in comparable physiographic settings.

Of the various elements analyzed in the overburden samples (U, Cu, Pb, Zn, Ni, Co, Ag, Mo, Fe, Mn and F), U gives the best reflection of bedrock mineralization as indicated by scintillometer surveys. The anomaly definition is, however, considerably improved by considering the organic content of the sample as well. Regression analysis of uranium against loss-on-ignition reveals a strong positive correlation between the two, presumably because of the strong cation exchange capacity of the peat fraction relative to that of the mineral soils. Molybdenum in overburden samples, despite its observed association with uranium mineralization as molybdenite, gives very little geochemical relief and produces no identifiable pattern which may be correlated with that of uranium.

Scintillometer surveys, as expected, give a good definition of uranium mineralization in bedrock where outcrops are present. Additionally, readings taken on local float both within and outside of the area of outcrop exposure suggest a more extensive region of mineralization than can be known without trenching or drilling. Scintillometers were useful in identifying radioactive rock through peat cover to a depth of about 20-30 cm.

The radon survey indicates anomalously high values over the area of known mineralization in bedrock as defined by the spectrometer surveys. In addition, it reveals lower order anomalies in areas of deep overburden where outcrop and float are scarce or absent. The significance of these other anomalies is uncertain. One limitation of the method in this area was the frequent presence of waterlogged test sites which usually resulted in very low radon readings. Weather conditions during the survey were unusually severe; intermittent rain, often heavy, was continuous during the period.

Data from the detailed follow-up work at G-1 were published in October as Lab. Open File 457.

REFERENCES

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1978: Regional lake sediment and water geochemical reconnaissance data, Labrador 1977. Geological Survey of Canada, Open File 509, 510, 511, 512, and 513.

1979: Regional lake sediment and water geochemical reconnaissance data, Labrador 1978. Geological Survey of Canada, Open File 557, 558, 559, and 560.

Kerswill, J.A. and McConnell, J.W.
1979: The Grenville of Labrador: A possible target for uranium exploration in light of recent geological and geochemical investigations. Current Research, Part B, Geological Survey of Canada, Paper 79-1B, pages 329-339.

McConnell, J.W.
1978: Geochemical lake sediment, lake water, radiometric, rock and overburden surveys in Labrador: Follow-up studies of 10 anomalous areas within the 1977 Uranium Reconnaissance Program lake survey. Mineral Development Division, Newfoundland Department of Mines and Energy, Open File Lab 408.

INDEX TO ANOMALIES

Anomaly No.	Regionally Anomalous Elements	- Work Done - Lake Sediment/ Water Sampling	Airborne γ-Ray Survey
1	Zn, Ni, As	X	
2	As, Ni, Cu	X	
3	Zn, Cu, As, Ni	X	
4	Zn, Cu	X	
5	Cu, Ni	X	
6	Zn	X	
7	Zn, Cu, As, Ni, U	X	
8	Zn, Pb, Cu, Mo	X	
9	U	X	X
10	U, Cu, As	X	X
11	U	X	X
12	U, F, Zn	X	
13	Mo, F	X	
14	Cu, Ni, Zn	X	

G-1 A 1 x 1.4 km grid was cut and chained. Overburden, rock and water sampling and radon and spectrometer surveying were conducted.

GEOLOGY

GRENVILLE PROVINCE

HADRYNIAN — Supracrustal arkosic sedimentary rocks of the Double Mer Formation

HELIKIAN AND APHEBIAN — Metamorphosed equivalents of the Seal and Bruce River Groups

HELIKIAN AND EARLIER — Metamorphic rocks, mainly quartzofeldspathic gneisses

CHURCHILL PROVINCE

HELIKIAN — Supracrustal sedimentary and volcanic rocks of the Seal Group

APHEBIAN — Sedimentary and volcanic rocks of the Labrador Trough

APHEBIAN AND EARLIER — Metamorphic rocks, mainly quartzofeldspathic gneisses and granites

NAIN PROVINCE

HELIKIAN AND APHEBIAN — Supracrustal sedimentary and volcanic rocks of the Moran Lake and Bruce River Groups

APHEBIAN — Metamorphosed sedimentary and volcanic rocks of the Aillik Group

ARCHEAN — Basement gneisses

SUPERIOR PROVINCE

ARCHEAN — Granulitic gneisses and felsic to mafic intrusives

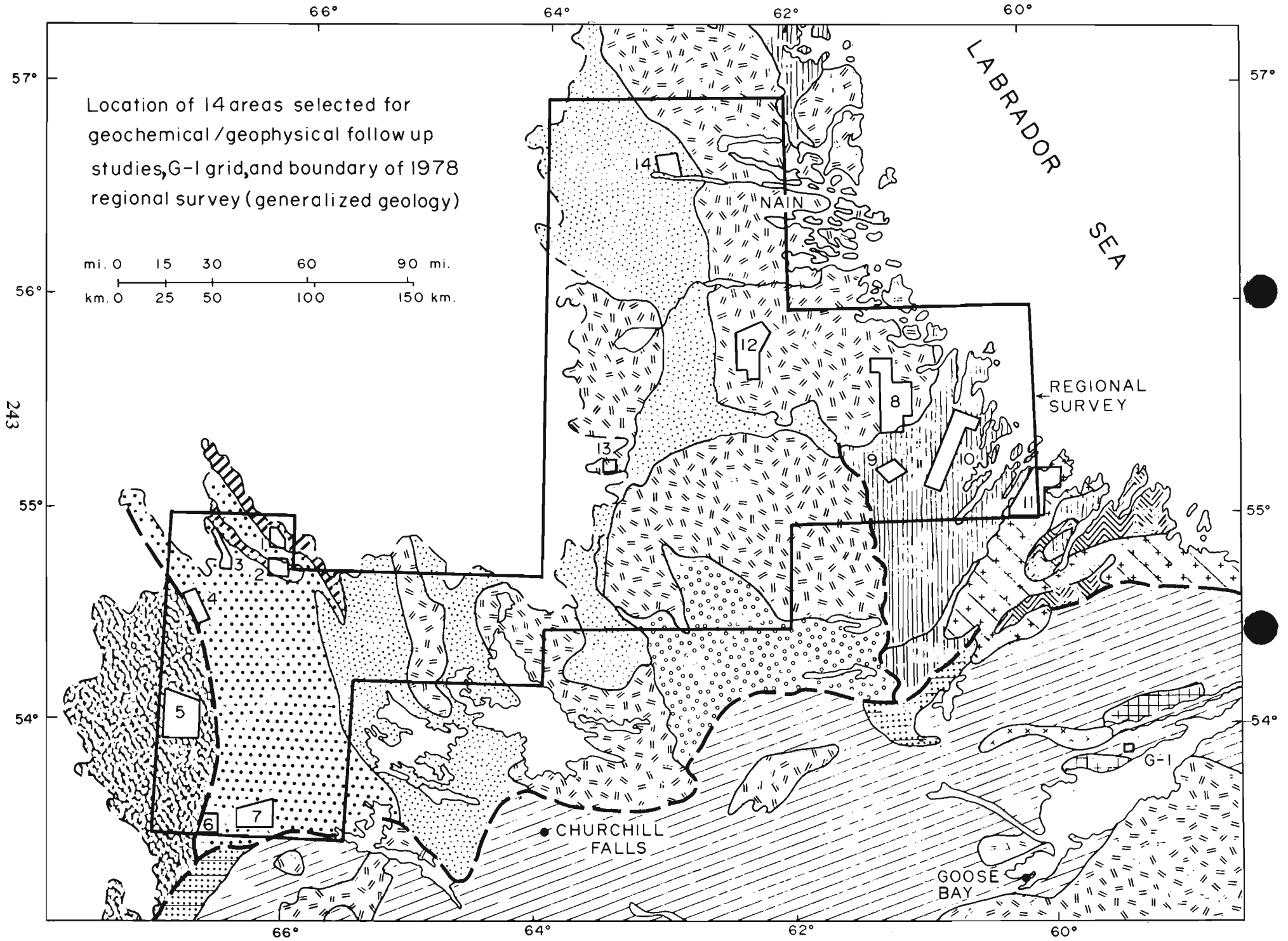
INTRUSIVE ROCKS

HELIKIAN — Anorthosites, gabbros and associated acidic intrusives and extrusives

HELIKIAN AND EARLIER — Massive to poorly foliated acidic intrusives

APHEBIAN — Acidic intrusives and associated metamorphic rocks

Gabbroic sills



1979: Geochemical and geophysical prospecting over a uranium occurrence in the Grenville Province, central Labrador. Mineral Development Division, Newfoundland Department of Mines and Energy, Open file, Lab. 457.