

Trace element chemistry of mineralized rocks, Livingston Island (South Shetlands), Gerlache Strait, and southern Anvers Island

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Composite rock-chip samples collected during cruise 81-3 of R/V *Hero* (Pride, Moody, and Rosen 1981) have been analyzed quantitatively for copper, molybdenum, lead, zinc, gold, silver, tungsten, and fluorine. A total of 124 samples was collected from the South Bay and False Bay areas of Livingston Island, from islands and along the mainland coast of the Gerlache Strait, and from islands and along the coast of southern Anvers Island from Arthur Harbor to Cape Monaco (figure). Each composite sample consisted of 10 to 20 small rock chips, collected specifically to provide representative samples of the mineralized and altered rocks. Unmineralized material also was collected from several of the localities. With few exceptions, the mineralization and alteration is fracture-controlled and occurs as veins. Representative hand specimens also were collected at

each sample station, and these now are being studied in thin section and by polished surface microscopy.

The table summarizes the chemical data from the composite samples. Mean element abundances and the ranges in concentrations are given for the localities visited during cruise 81-3.

The elements studied typically are present within mineralized systems that contain porphyry-type copper and molybdenum. Lead, zinc, gold, and silver commonly are present in veins peripheral to porphyry copper and molybdenum mineralization. Fluorine and, sometimes, tungsten occur with porphyry molybdenum mineralization.

Anomalous concentrations of copper, lead, zinc, silver, and perhaps gold are present in two areas: (1) the eastern Gerlache Strait area, along the coast north of Bahia Frei (Recess Cove), at Eckener Point and Pelseneer Island, and at the point designated "Marc?" by Alarcón and others (1976); and (2) along the east shore of South Bay, Livingston Island. The mineralization in the eastern Gerlache Strait is of greatest interest. Anomalous cop-

per-molybdenum-tungsten, probably representing a higher temperature hydrothermal environment, was found also at two localities: (1) in the Arthur Harbor area (Palmer Station vicinity, Norsel Point, and the immediate offshore islands); and (2) along the northeast shore of False Bay, Livingston Island.

Anomalous gold (averaging nearly 200 parts per billion for 24 samples) is present within the vein system that carries the anomalous molybdenum in the vicinity of Palmer Station, southern Anvers Island. Lower concentrations of gold (11-33 parts per billion) also were found in rocks from the east South Bay area, Livingston Island, and from Pelseneer Island and the point designated "Marc?" in the Gerlache Strait.

Molybdenum is an important component of porphyry copper mineralization in Chile, and it is conspicuous (as molybdenite) in rocks of the peninsula region. Investigations by Cox, Ciocanelea, and Pride (1980) and by Pride and others (1981) have noted molybdenite along joint surfaces and within veins in rocks from Palmer Station and from the northeastern False Bay

Mean element concentrations, Livingston Island, Gerlache Strait, and southern Anvers Island

Location	Number of samples	Copper (ppm) ^a	Molybdenum (ppm)	Lead (ppm)	Zinc (ppm)	Gold (ppb) ^b	Silver (ppm)	Tungsten (ppm)	Fluorine (ppm)
Livingston Island									
South Bay	37	673 (0-6,371) ^c	0	1,550 (8-15,114)	1,081 (78-13,174)	33.1 (0-570)	4.6 (0-10)	0.1 (0-4)	244 (40-617)
East False Bay	10	3,534 (14-10,803)	57.4 (0-561)	10.5 (2-25)	50.7 (1-114)	14 (1-50)	2.7 (0-4)	3.8 (0-16.8)	269 (40-427)
Gerlache Strait		23.5	0.03	309	102	4	56.2	1	425
Eckener Point	4	(14-36)	(0-1)	(10-1,173)	(36-140)	(2-6)	(3-152)	(0-4)	(203-650)
Coast north of Bahia Frei (Recess Cove)	2	450 (160-740)	0	44,660 (40-89,292)	14,556 (84-29,027)	7 (3.5-9)	24.5 (5-44)	0	558 (292-824)
Andrée Island	4	7 (0-28)	0	22 (11-36)	54.5 (25-140)	10 (4-25)	4 (3-5.5)	2 (0.4)	249 (110-568)
Marc(?) ^d	4	6 (0-8)	0	11.5 (8-16)	75 (42-97)	11 (4-17)	2.8 (2-3)	3.1 (0-8.4)	272 (122-487)
Pelseneer Island	8	12.7 (0-70)	1.3 (1-2)	12.6 (2-25)	48.3 (18-96)	24 (0-180)	23.1 (1-160)	1 (0-4)	110 (40-385)
Thompson Peninsula (Anvers Island)	2	36 (18-54)	0	17 (12-22)	105 (98-112)	3.5 (3.4)	4 — ^e	2 (0-4)	237 (213-261)
Southern Anvers Island									
Palmer Station vicinity and Bonaparte Pt.	24	1,173 (0-8,553)	44 (0-615)	370 (6-7,096)	109 (2-732)	198 (2-3,100)	23.7 (0-230)	3.7 (0-39.3)	336 (40-1,257)
Norsel Point	7	157 (0-797)	0.2 (0-1)	13.4 (8-18)	78.7 (32-182)	12 (3-30)	3.9 (2-5)	2.5 (0-5.6)	144 (40-280)
Offshore islands (Arthur Harbor)	15	49.2 (0-370)	0.1 (0-1)	225 (6-3,154)	73.7 (24-142)	6 (0-40)	8.6 (2-67)	0.3 (0-4)	202 (89-452)
Cape Monaco and Gossier Islands	5	4.8 (0-14)	0	16 (10-22)	47 (37-57)	2.7 (2-3.5)	11.6 (2-48)	0	270 (205-392)
Joubin Islands	2	0	1.4 (0-2.8)	9,684 (8-19,360)	40 (38-42)	4 — ^e	72 (8-135)	2 (0-4)	77 (40-114)

^appm = parts per million.

^bppb = parts per billion.

^cNumbers in parentheses indicate range in concentrations from which the mean was calculated.

^dPoint designated "Marc?" in Alarcón and others (1976).

^eConcentration of both samples was 4.

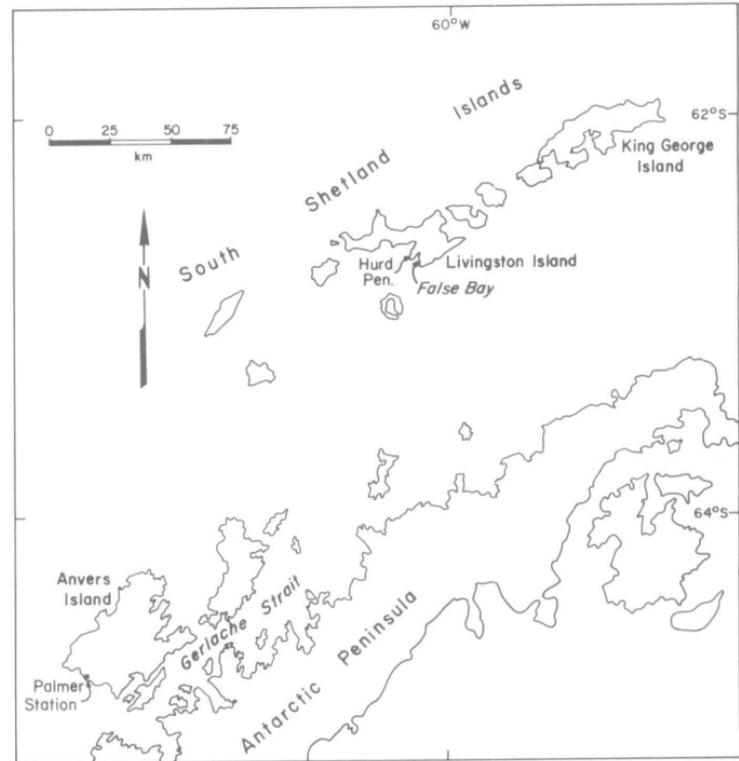
area. In fact, molybdenite is more conspicuous in outcrop than are the copper sulfides that typify porphyry copper mineralization. Molybdenum may dominate the porphyry mineralization, if such mineralization exists in this part of the peninsula.

Anomalous tungsten is also present in samples from the Palmer Station and northeast False Bay areas (table). Fluorine exhibits no distinctly positive correlation either with molybdenum or with tungsten.

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References

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Location map for the northern Antarctic Peninsula.