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MAP SHOWING PRELIMINARY RESULTS OF K-Ar STUDIES IN THE CHIGNIK AND SUTWIK ISLAND QUADRANGLES, ALASKA

by

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As part of the Chignik and Sutwik Island Alaska Mineral Resources Assessment Program (AMRAP) a potassium-argon age study of intrusive rocks and related mineral deposits in the two quadrangles was begun. The purpose of this study is twofold, first, in a general way to attempt to shed some light on the tectonic history of the area and second, to attempt to measure the timing of alteration with respect to intrusion and emplacement. This report includes analytical and sample data from samples completed so far. Approximately 40 potential dating samples have been collected and further results will be forthcoming.

Work to date had concentrated on mineralized areas, while that in progress concentrates on unmineralized intrusives. Three major prospects have been studied to date, Bee (Dry) Creek, Warner Bay and Mallard Duck Bay. The Bee Creek prospect is centered around a quartz diorite porphyry which intrudes sediments of the Upper Jurassic Naknek Formation (Burk, 1965). Disseminated copper-sulfide mineralization is in both the sedimentary and intrusive rocks. Present results indicate a mineralization age of 3.65 ± .20 my and an apparent emplacement of the quartz diorite age near 8 my based on a preliminary hornblende date from the porphyry at Bee Creek. Further work is in progress to more clearly define the emplacement event(s). An age of 3.3 ± .4 my on sericite was reported by Armstrong and others, (1976) for this prospect. Of particular interest with respect to this prospect is that the upper part of the alteration halo is cut off by a low angle northwestward dipping thrust fault, indicating fairly recent movement along this fault.

The Warner Bay Prospect occurs in the northeastern portion of the exposed Devils Batholith, a large quartz-diorite body intruding sediments of late Cretaceous and early Tertiary age (Burk, 1965). The prospect was apparently discovered in the early part of this century and has two adits driven into it (Atwood, 1911, p. 124). The mineralization occurs generally along fracture surfaces in the closely jointed plutonic rock and disseminated in the small breccia zone on the north edge of the exposure. K-Ar ages on biotite and potassium feldspar may indicate a mineralization age near 7 my, while preliminary results on hornblende indicate an original emplacement age of the batholith of 10 my. Discordance between biotite and hornblende ages (sample 77AWs 100, Table 1) suggests a post-crystallization thermal event (mineralization?) that resulted in argon loss from the biotite.

The Mallard Duck Bay prospect, originally located as a gold prospect near the turn of the century (Atwood, 1911, p. 128) was examined by Bear Creek Mining Company in 1975-76 as a potential porphyry copper deposit (Bristol Bay Native Corp., 1977, written communication). Host rocks at this prospect a generally andesitic volcanic unit, possibly the Meshik volcanics (Burk, 1965). The volcanics are intruded by a small number of propylitically altered quartz diorite plutons. Presently available data (samples 77AWs 137, 183; Table 1) suggest an alteration age near 21 my from quartz-sericite whole rock and chloritized biotite dates in what is thought to be an early Oligocene to Eocene propylitically altered andesitic volcanic pile. No reasonably fresh samples of the plutonic rocks associated with this prospect were found though they may be considered comagmatic with the volcanic pile. The dike dated (sample 77AMs 001, Table 1) intrudes the volcanic pile, is propylitically altered and predates alteration.

Cape Kumlik is a highly mineralized peninsula with at least two apparently distinct mineralized zones on the peninsula and another possibly distinct zone on Kumlik Island. Initial K-Ar results indicate an apparent emplacement age of about 36 my (samples 77AWs 30, 40, 46; Table 1) for the hypabyssal hornblende andesite plutons on the peninsula. This peninsula and nearby Kumlik Island show evidence of intense igneous activity, with a number of small hypapyssal intrusives and associated (?) volcanics. These intrusion ages are quite similar to that obtained on biotite from a biotite dacite located on Sutwik Island, 20 km away, indicating a major igneous event in the early Oligocene. [M. L. Silberman has dated a mineralized intrusion in the Ugashik quadrangle and obtained a similar age.] Additional work in progress includes potassium-argon on a number of other prospects, intrusive rocks and the Meshik Volcanics.

Potassium was determined by flame photometry using a lithium metaborate fusion technique (Engels and Ingamells, 1970). The potassium analyst was P. R. Klock. Argon extraction and measurement was accomplished with the standard techniques of dilution mass spectrometry as described by Dalrymple and Lamphere (1969). Sample preparation and data reduction was by the author, while argon extraction and measurement were by the author with assistance from W. C. Gaum, M. L. Silberman and C. L. Connor. All samples were collected during the 1977 field season by the author and with assistance from M. L. Silberman at the three prospects.

The analytical error assigned to each age (table 1) is an estimate of the standard deviation of analytical precision using the method of Cox and Dalrymple (1967) together with the authors calculated estimates of uncertainties in the concentration of 38-Ar tracer and the potassium measurements.

Sample and analytical data are listed in table 1 and sample locations are plotted on the map.

References

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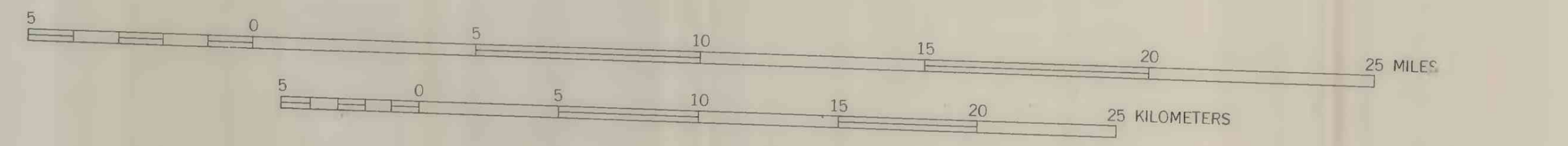

Sample number	Rock type	Mineral (mesh size)	%K$_2$O		moles/gm x10^{-11} $^{40}Ar_{rad}$	%$^{40}Ar_{rad}$	AGE m.y.	ANAL. ERROR	Comments
Bee Creek Prospect									
77AWs 152	Altered quartz diorite	Biotite 60-100	8.53	8.46	4.449 4.434	11.88 34.85 Average=	3.67 3.62 3.65	.09 .07 .11	
77AWs 251	Altered diorite?	Biotite 60-100	8.15	8.16	4.378 4.229	24.11 18.25 Average=	3.73 3.60 3.67	.08 .08 .10	
Warner Bay Prospect									
77AWs 96B	Pegmatite	Potassium feldspar 60-100	14.06	14.07	13.37 13.09	44.10 51.59 Average=	6.59 6.46 6.53	.11 .10 .15	
77AWs 180	Pegmatite	Biotite 60-100	9.00 9.16	9.07 9.04	9.220 10.08	20.81 17.14 Average=	7.04 7.70 7.37	.17 .24 .29	
77AWs 100	Quartz diorite	Hornblende 100-200	.551 .530	.531 .532	.7702 .7406	21.32 27.22 Average=	10.1 9.66 9.86	.18 .15 .23	Unaltered(?) quartz diorite sample.
		Biotite 100-200	9.10	9.11	10.366 10.089	37.90 43.1 Average=	7.88 7.67 7.78	.13 .12 .18	
77AWs 125	Quartz diorite	Biotite 60-100	8.97 8.97		7.95 7.63	62.28 48.67 Average=	6.15 5.90 6.03	.09 .09 .13	
77AWs 179	Altered quartz diorite	Biotite 60-100?	9.00 9.01	9.01	10.20 9.674	4.55 31.31 Average=	7.85 7.45 7.65	.53 .27 .59	First determination suspect at 4.55% $^{40}Ar_{rad}$.
Mallard Duck Bay									
77AWs 137	Chloritized, altered quartz diorite	Biotite/chl 60-120	5.54, 5.56,	5.55 5.57	16.84 17.42	19.98 42.36 Average=	20.93 21.65 21.29	.39 .38 .55	Small pluton intruding volcanic pile.
77AWs 183	*	Qtz-ser WR 150-200	2.498, 2.607,	2.487 2.462	7.938 7.475	56.32 75.93 Average=	21.81 20.54 21.18	.68 .63 .93	*Quartz-sercite altered volcanic.
77AMs 001	Epidotized hornblende andesite	Hornblende 80-150	.344,	.342	1.301 1.389	29.56 15.31 Average=	26.2 27.9 27.1	.57 .85 .99	Dike intruding sericitized volcanics, contains abundant epidote.
Cape Kumlik									
77AWs 30	Hornblende diorite porphyry	Hornblende 100-170	.317,	3.21	1.666 1.700	29.09 35.16 Average=	35.9 36.7 36.3	1.03 .79 1.30	From altered zone.
77AWs 40	Hornblende andesite porphyry	Hornblende 100-200	.465, .467,	.466 .468	2.287 2.456	24.23 36.73	33.7 36.2	.60 .56	From altered zone. Brecciated rock, partly altered with epidote, sericite and chlorite.
77AWs 46	Quartz diorite/andesite porphyry	Hornblende 100-200	.310, .311,	.311 .313	1.711	19.81	37.8	1.58	From altered zone. Altered rock, chlorite and calcite.
Sutwik Island									
77AWs 74	Biotite dacite	Biotite 60-100	8.46,	8.50	43.81 41.26	43.65 73.95	35.5 33.5	.64 .59	No associated mineralization known.
Nakchamik Island									
77AWs 134	Hornblende plagioclase porphyry	Hornblende 100-200	.388,	.389	.5575 .5756	4.08 12.91 Average=	9.94 10.36 10.10	.87 .21 .89	Unmineralized, unaltered sample on highly mineralized island. Brecciated rock.

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