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K-AR AGE BRACKET ON A LATE JURASSIC THRUST FAULT IN SOUTHEASTERN CALIFORNIA

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Emplacement of the Argus Sterling thrust fault in the Death Valley region of southeastern California is chronologically bracketed by the ages of granitic rocks that cut, and are cut by, the fault surface (Moore, 1974). The relations permit an excellent opportunity for delimiting by potassium-argon the time span during which thrust faulting took place. Seven hornblende and biotite separates were prepared from four samples collected from two pretectonic intrusive masses and two post-thrust plutons. The separates were prepared by magnetic, heavy liquid and mechanical methods and checked for purity by X-ray diffraction. Argon determinations were made in the isotope laboratory of the Department of Geophysics and Astronomy, University of British Columbia, using an AEI MS-10 mass spectrometer. Potassium was analyzed by atomic absorption on a Model 303 Perkin-Elmer spectrophotometer by R. L. Armstrong, Department of Geological Sciences, University of British Columbia. Uncertainties presented are at 1σ. Constants used are: $\lambda_\epsilon = 0.575 \times 10^{-10}$; $\lambda_\beta = 4.905 \times 10^{-10}$; $K^{40}/K = 1.18 \times 10^{-4}$.

GEOLOGIC DISCUSSION

The Argus Sterling thrust is exposed in the Argus Range, Inyo Co., where it dips 15 to 40 degrees SW (Fig. 1). It juxtaposes distinct quartz monzonitic complexes and is further intruded by several younger plutons. Rocks correlative with the Hunter Mountain Quartz Monzonite (McAllister, 1956), intruding roof pendants of Paleozoic sediments, are overlain along the thrust by porphyritic quartz monzonite of Maturango Peak, part of a granitic terrane that extends several miles westward to the Sierra Nevada. North and east of Maturango Peak, plutons of alaskite and younger quartz monzonite have come up along the thrust plane separating the two blocks and spreading apart zones of mylonitic quartz monzonite and tectonite marble that characterize the thrust exposures further south.

Six of the seven apparent ages determined cluster at two time points, defining two episodes of intrusion and cooling (Fig. 2). The Hunter Mountain Quartz Monzonite yielded concordant hornblende-biotite ages which agree well with previously published dates on this intrusive complex (Burchfiel and others, 1970; Ross, 1969). The hornblende age of Maturango Peak gives a 165 m.y. minimum age for this unit and suggests that it is roughly contemporaneous with the Hunter Mountain unit.

The younger plutons yield ages that indicate an intrusive event at about 140 m.y. This event is probably responsible for the discordance in the Maturango Peak sample which was collected within one kilometer of the younger plutons. A young apparent age for biotite of the quartz monzonite of Argus Sterling mine may reflect late alteration in this extensively chloritized pluton.

Significant conclusions from these data are: (1) The Argus Sterling thrust was emplaced between 140 and 165 m.y. (Late Jurassic); (2) Radiometric ages from granitic rocks in this area are comparable with those from areas in the Inyo Mountains (Ross, 1969; Armstrong and Suppe, 1973); (3) Thrusting in the Argus Range postdated the onset of batholithic intrusion in this area comprising a tectonic event later than and distinct from the early Mesozoic deformation belt described by Burchfiel and others (1970), which is characterized by pre-mid-Jurassic thrust faulting (Fig. 2).

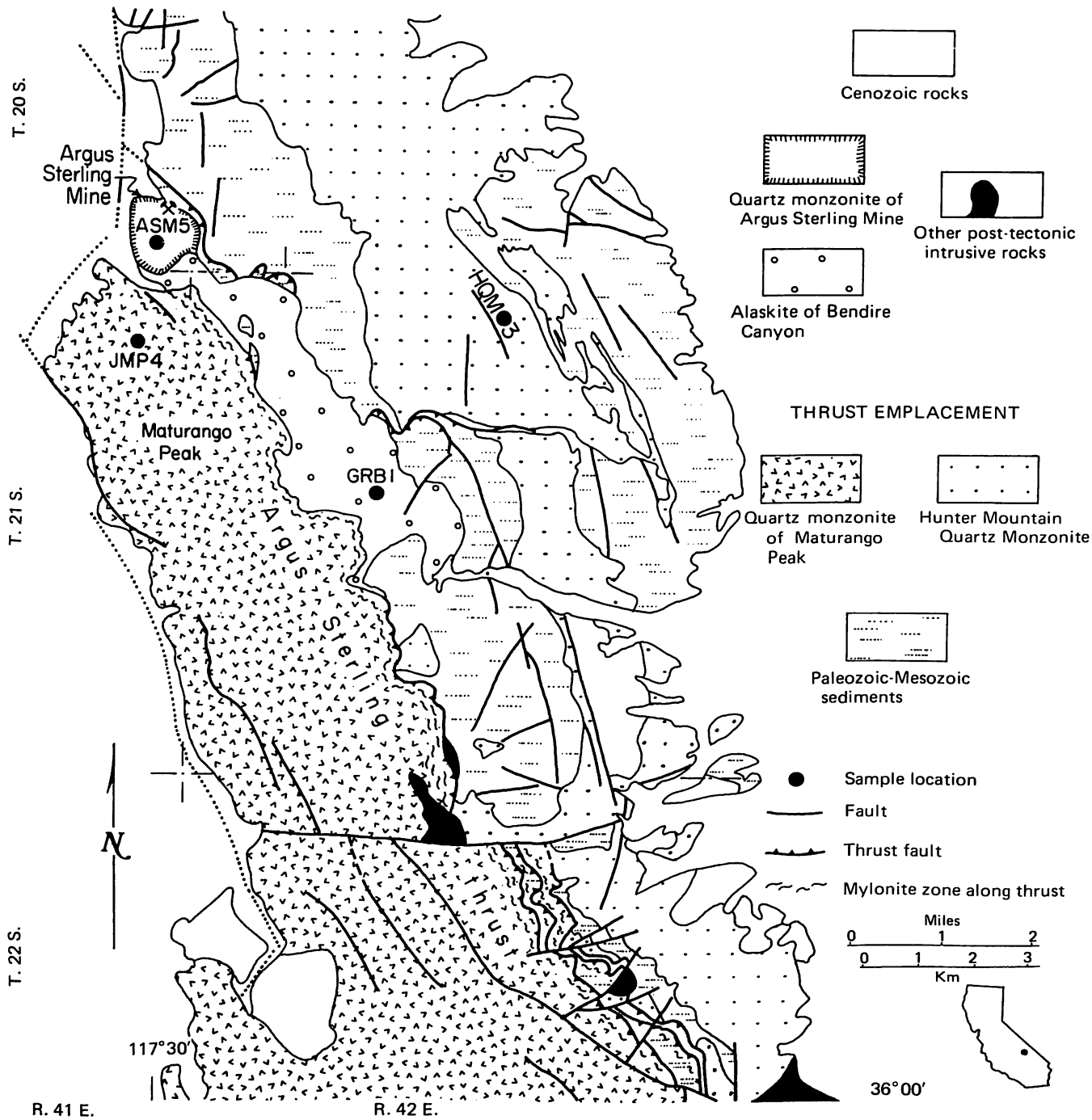

FIGURE 1. Geologic map of part of the Argus Range.

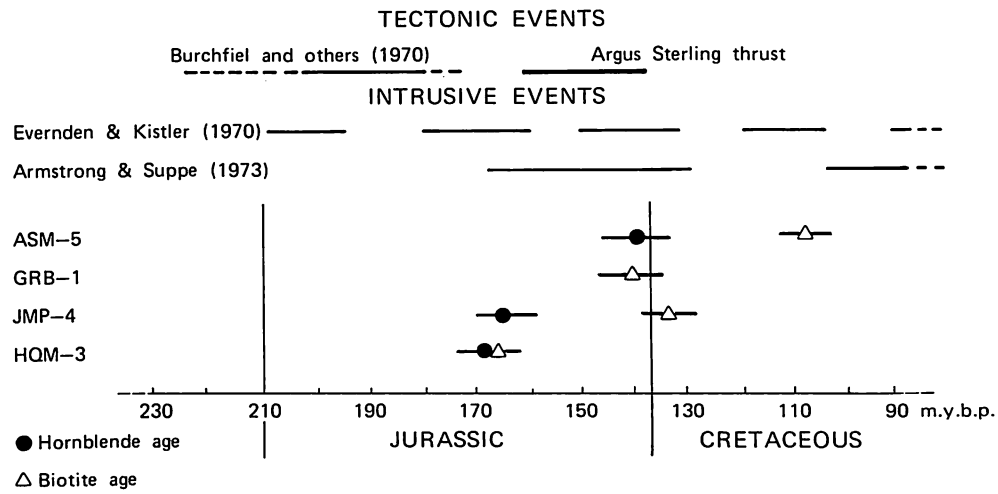

FIGURE 2. K-Ar ages of granitic rocks from the Argus Range compared with regional tectonic and intrusive events (period boundaries after Armstrong and Suppe, 1973).

SAMPLE DESCRIPTIONS

1. HQM-3 K-Ar (hornblende) 169 ± 6 m.y.
(biotite) 166 ± 6 m.y.

Medium-grained, equigranular quartz monzonite is correlative with the Hunter Mountain Quartz Monzonite (36°8′12″N, 117°26′15″W; upper Knight Canyon, Argus Range, Inyo Co., CA). Several samples from the Argus Range average 37% calcic oligoclase to calcic andesine; 22.5% quartz; 29% potassium feldspar; 7% hornblende; and 4% biotite. Analytical data: (hornblende) K = 0.394%; $*Ar^{40}$ = 1.209 x 10^{-10} moles/g, $*Ar^{40}$/total Ar^{40} = 72.2%; (biotite) K = 6.74%, $*Ar^{40}$ = 2.033 x 10^{-9} moles/g, $*Ar^{40}$/total Ar^{40} = 80.9%.

2. JMP-4 K-Ar (hornblende) 165 ± 5 m.y.
(biotite) 132 ± 5 m.y.

Quartz monzonite of Maturango Peak (36°8′14″N; 117°30′15″W; 2 km NW of Maturango Peak; Inyo Co., CA). Medium-grained, porphyritic quartz monzonite with potassium feldspar phenocrysts to 2 cm. Several samples average 41.5% sodic andesine, 16% quartz, 24% potassium feldspar, and 18.5% hornblende plus biotite. Analytical data: (hornblende) K = 0.997% $*Ar^{40}$ = 2.989 x 10^{-10} moles/g, $*Ar^{40}$/total Ar^{40} = 86.3%; (biotite) K = 7.01% $*Ar^{40}$ = 1.661 x 10^{-9} moles/g, $*Ar^{40}$/total Ar^{40} = 85.6%.

3. GRB-1 K-Ar (biotite) 140 ± 6 m.y.

Alaskite of Bendire Canyon (36°6′32″N, 117°27′17″W; near upper Bendire Canyon; Inyo Co., CA). Biotite alaskite containing roughly equal proportions of coarse-grained sodic plagioclase, quartz, and perthitic potassium feldspar; biotite averages 3%. Analytical data: (biotite) K = 6.89%; $*Ar^{40}$ = 1.739 x 10^{-9} moles/g; $*Ar^{40}$/total Ar^{40} = 87.7%.

4. ASM-5 K-Ar (hornblende) 139 ± 5 m.y.
(biotite) 108 ± 4 m.y.

Quartz monzonite of Argus Sterling Mine (36°8′56″N, 117°29′51″W; Inyo Co., CA). Fine- to medium-grained quartz monzonite in a small pluton north of Maturango Peak. Analytical data: (hornblende) K = 0.872%; $*Ar^{40}$ = 2.179 x 10^{-10} moles/g; $*Ar^{40}$/total Ar^{40} = 76.2%; (biotite) K = 6.68%; $*Ar^{40}$ = 1.291 x 10^{-9} moles/g; $*Ar^{40}$/total Ar^{40} = 81.5%.

All samples collected by S. C. Moore, 1974.

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