$^{40}Ar/^{39}Ar$ age determinations of sanidine from ash-flow tuffs of the Ryan Spring and Ripgut Springs formation in east-central Nevada

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$^{40}Ar/^{39}Ar$ AGE DETERMINATIONS OF SANIDINE FROM ASH-FLOW TUFFS OF THE RYAN SPRING AND RIPGUT SPRINGS FORMATIONS IN EAST-CENTRAL NEVADA

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Rhyolite tuffs of the Ryan Spring and Ripgut Springs Formations were some of the ash-flows erupted in the Oligocene volcanic activity that formed the Indian Peak Caldera Complex (fig. 1) in east-central Nevada and western Utah (Best and Grant, 1987a; Best and others, 1989, 1993). Sanidine was separated from each of these units using conventional magnetic, heavy liquid, and hand-picking separation techniques. Each sample was sealed in a quartz tube and placed in the core of Oregon State University's TRIGA (Training, Research, and Isotope production General Atomic) reactor for 10 to 15 hours, receiving a neutron dose of 1.0 - 1.5 × 10^{18} nvt. The efficiency of conversion of K^{39} to Ar^{39} was monitored by a hornblende standard (MMhb-1, 520 Ma; Samson and Alexander, 1987). Gases were analyzed by a Mass Analyzer Products MAP 215-50 mass spectrometer at Dr. Robert Duncan's laboratory at Oregon State University's College of Oceanography and Atmospheric Sciences.

Dates were calculated using the following formula:

$$t_c = \tau \bullet \log \{R \bullet F \bullet J_u + 1\}$$

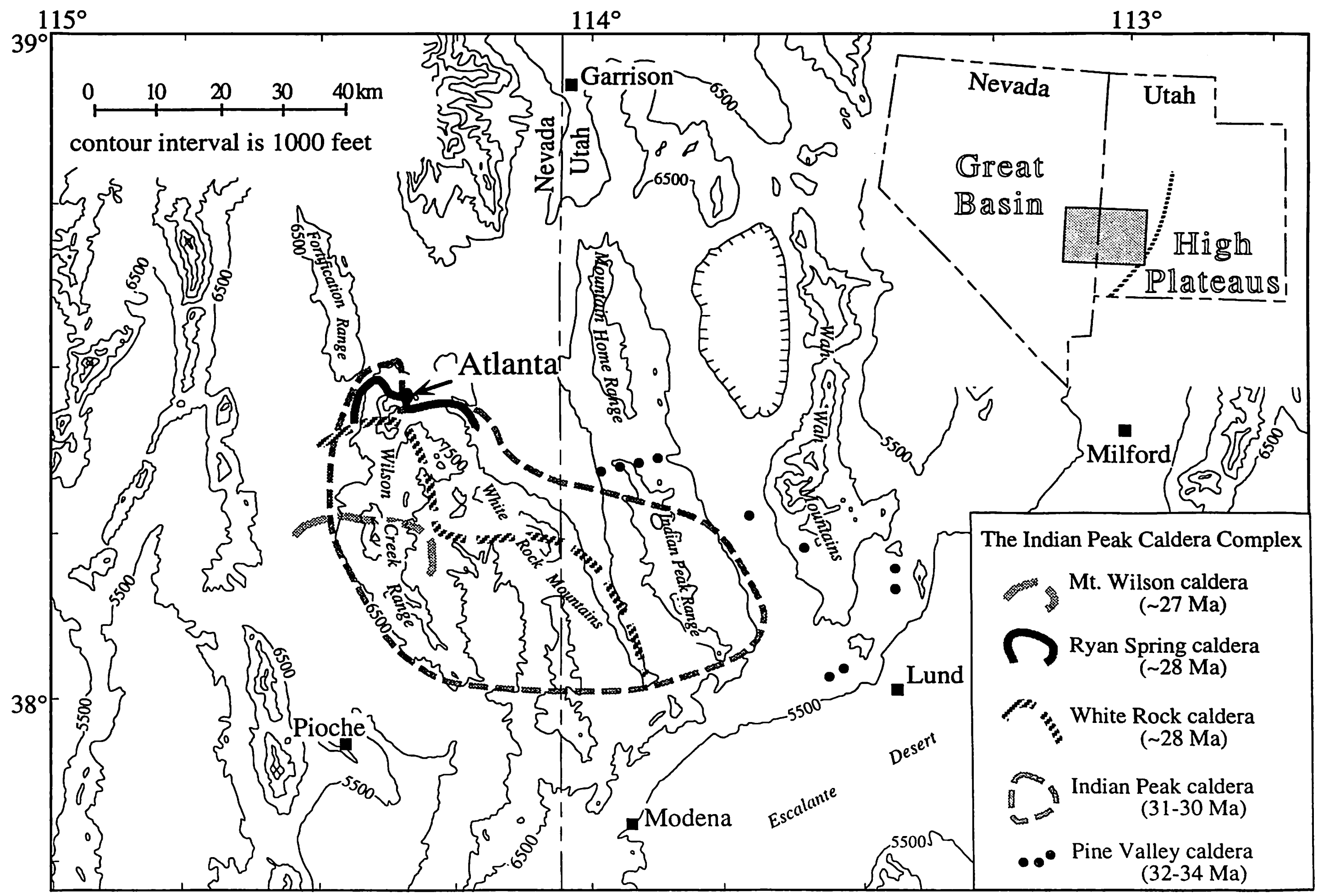

FIGURE 1. Location of study area with respect to the Indian Peak Caldera Complex in east-central Nevada. (Best and Grant, 1987; Best, Christiansen, and Blank, 1989; LaBerge, 1994).

where: t_c = corrected age (years)
τ = inverse of decay constant (1.80375E+09 years)
R = ratio calculated from measured $^{40}Ar^{*}/^{39}Ar$ values†
F = flux correction factor
J_u = neutron flux factor (uncorrected), determined by comparison with known hornblende standards in sample vial

$$^{\dagger}R = (10^{\{T_u/\tau\}} - 1) / J_u$$

where T_u = 'uncorrected age,' calculated from measured $^{40}Ar^{*}/^{39}Ar$ value for each heating step, corrected for atmospheric ^{40}Ar and Ar isotopes produced by decay of Ca (^{36}Ar, ^{39}Ar, ^{40}Ar). R value was not corrected for flux variation from standard. (This correction is incorporated into the calculation.)

The interpreted age is taken as the weighted mean plateau age, represented by two or more contiguous temperature steps containing >60% of the total ^{39}Ar released and within analytical error of each other. The weighted mean plateau age was calculated using $1/r^2$ as the weighting factor, and errors reported are one standard deviation of the mean (1σ).

Plateau age =

$$\frac{[(1/r1^2 \bullet T_{c1}) + (1/r2^2 \bullet T_{c2}) + (1/r3^2 \bullet T_{c3}) + \ldots]}{[(1/r1^2) + (1/r2^2) + (1/r3^2) + \ldots]}$$

where: $T_{c1}, T_{c2}, T_{c3}\ldots$ = corrected ages for temperature steps 1, 2, 3, etc. in plateau
r1, r2, r3... = uncorrected error (measured analytical error) for steps 1, 2, 3...

SAMPLE DESCRIPTIONS

1. *RY-0001* $^{40}Ar/^{39}Ar$

Densely welded, devitrified rhyolite tuff (38°27′20″N, 114°19′49″W, Atlanta 7.5′ quad., Lincoln County, NV). Sample RY-0001 from the Ryan Spring Formation yielded a two-step plateau, containing 68% of the ^{39}Ar gas (fig. 2). *Comments:* Sample was collected from the northern upper bench in the Atlanta mine. In other areas, two nearly identical ash-flow tuffs separated by a cooling break make up this formation (Best, Christiansen, and Blank, 1989), but no cooling break was distinguishable in the limited exposures of this unit in the mine area. This sample may represent the upper, lower, or both ash-flow tuffs of this formation (LaBerge, 1994). This age is within error of the overlying Ripgut Springs Formation (sample RP-4420, below).

(sanidine) 27.91 ± 0.29 Ma

2. *RP-4420* $^{40}Ar/^{39}Ar$

Densely welded, devitrified rhyolite tuff (38°27′36″N, 114°20′04″W, Atlanta quad., Lincoln County, NV). Sample RP-4420 from the Ripgut Springs Formation gave a three-step plateau, containing 84% of the ^{39}Ar gas (fig. 3). *Comments:* Sample was collected from the central portion of the upper pumice-rich ash flow of the Ripgut Springs Formation (Best, Christiansen, and Blank, 1989) exposed on the top of the low hills just southwest of the Atlanta mine. This age is within error of the underlying Ryan Spring Formation (sample RY-0001, above).

(sanidine) 28.36 ± 0.24 Ma

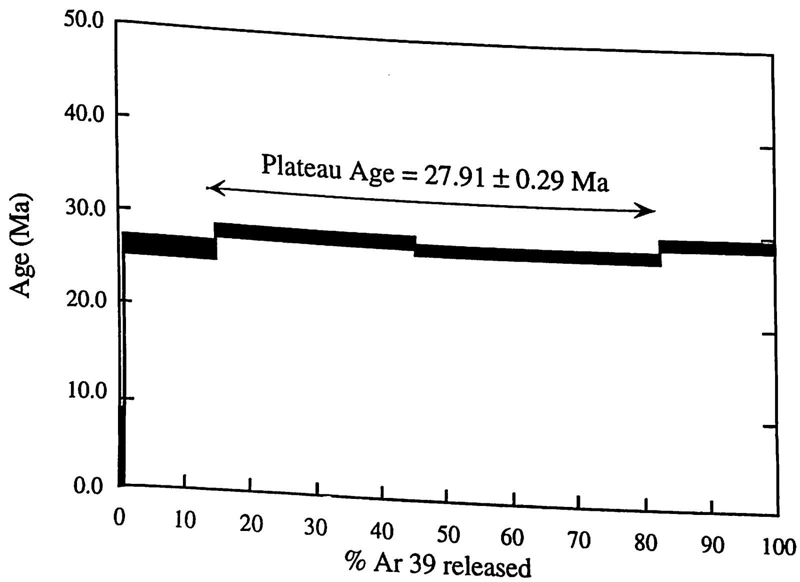

FIGURE 2. Age spectrum for sample RY-0001 from the Ryan Spring Formation at the northern end of the Atlanta mine. See text for discussion.

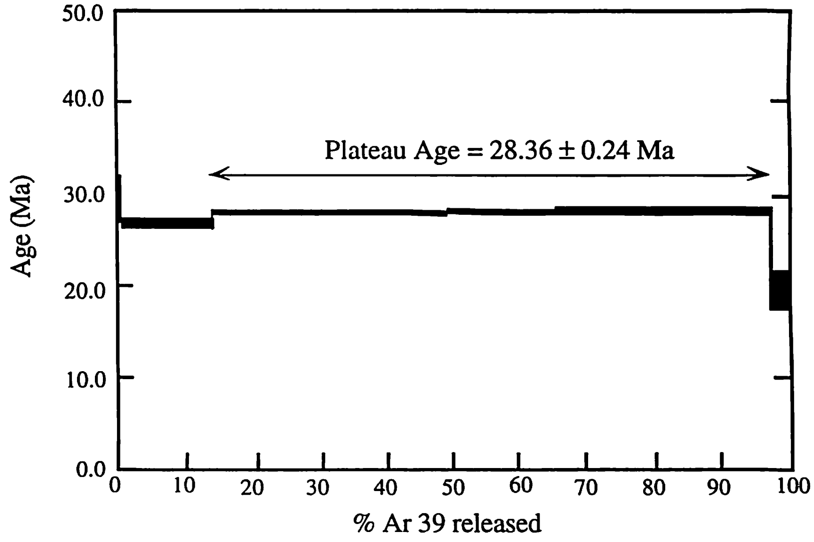

FIGURE 3. Age spectrum for sample RP-4420 from the upper ash-flow tuff of the Ripgut Springs Formation approximately 1 km southwest of the Atlanta mine. See text for discussion.

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