K-Ar ages of volcanic and plutonic rocks in the northern Wassuck Range, central-western Nevada

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K-AR AGES OF VOLCANIC AND PLUTONIC ROCKS IN THE NORTHERN WASSUCK RANGE, CENTRAL-WESTERN NEVADA

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Age determinations reported here were completed as part of a U.S. Geological Survey–Nevada Bureau of Mines and Geology cooperative program designed to provide critical geochronologic data to augment a geologic mapping program in the northern Wassuck Range. All samples were collected by E. C. Bingler from within the Schurz 15-minute quadrangle; determinations were run by M. L. Silberman and E. H. McKee. Sample preparation and analytical procedures were similar to those described in Morton, and others (1977, p. 19), with the exception that the constants used in calculation of the ages are:

$\lambda_e = 0.585 \times 10^{-10}$ yr^{-1}
$\lambda_\beta = 4.72 \times 10^{-10}$ yr^{-1}
^{40}K/K(total) = 1.22×10^{-4} g/g

New decay constants for $\lambda\beta$ and λe and for ^{40}K/K(total) are now (1979) in use (Morton and others, 1977), but the data for the Wassuck samples were completed before these constants became generally established. The difference in calculated age using the new constants is small, being on the order of 2 percent of the reported age. We report the Wassuck ages using both the old and new constants (indicated by a *) in order to simplify comparisons with ages reported from nearby areas, for example, Yerington (Proffett and Proffett, 1976) and other areas of western Nevada (Silberman and others, 1975), which were published using the old constants, and reports in which ages were calculated using the new constants (Morton and others, 1977).

Samples are listed here under the following headings:

1. Ash-flow tuffs
2. Flow rocks
3. Plutonic rocks

The distribution and stratigraphic relations of these rocks are described in detail in the text portion of the Geologic Map of the Schurz Quadrangle (Bingler, 1978).

SAMPLE DESCRIPTIONS

(* indicates new constants)

ASH-FLOW TUFFS

1. *SQ17* K-Ar

Rhyolite ash-flow tuff (C, NE¼ S18,T12N,R27E; 38°54.4'N, 119°00'W; Mineral County, NV). *Analytical data*: K_2O = 4.39%, $*Ar^{40}$ = 1.403×10^{-10} moles/gm, $*Ar^{40}/\Sigma*Ar^{40}$ = 58%. *Collected by*: E. C. Bingler; *dated by:* M. L. Silberman. *Comment*: Sample collected from non-welded, devitrified ash-flow tuff correlative with the lower part of the Bluestone Mine Tuff of Proffett and Proffett (1976) and believed to be correlative with the Nine Hill Tuff (Bingler, 1978a) and part of the tuff of Gabbs Valley (Ekren and others, in press). Age appears to be about 10% too young. Alkali feldspars of this composition frequently give anomalously low ages (Evernden and James, 1964).

(sanidine) 21.5 ± 0.6 m.y.
22.1 ± 0.6 m.y.*

2. *SQ19* K-Ar

Quartz latite ash-flow tuff (C, S21,T13N,R27E; 38°58.5'N, 118°58'W; Mineral County, NV). *Analytical data:* K_2O = 7.25%, $*Ar^{40}$ = 2.108×10^{-10}, 2.221×10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 29%, and 28%. *Collected by*: E. C. Bingler; *dated by:* M. L. Silberman. *Comment*: Sample of moderately welded, hornblende-bearing, crystal-rich tuff from the youngest of a sequence of rhyolitic ash-flow tuffs correlative with the Blue Sphinx Tuff in the Gillis and Gabbs Valley Ranges (Ekren and others, in press). Dated biotite is oxidized and is 2 to 3 million years too young on the basis of position of tuff beneath the Poinsettia Tuff Member of the Hu-Pwi Rhyodacite, which has been dated at 22.1 ± 0.7 (plag), 23.1 ± 0.7 (bio) from the Gabbs Valley Range to the east (Ekren and others, in press; Morton and others, 1977; # 23, p. 23).

(biotite) 20.1 ± 0.5 m.y.
20.6 ± 0.6 m.y.*

3. *SQ13* K-Ar

Augite rhyodacite vitrophyre agglomerate (SE¼ SW¼ S16,T13N,R27E; 38°59.1'N, 118°58.2'W; Mineral County, NV). *Analytical data*: K_2O = 8.75%, 8.47%, 8.46%, $*Ar^{40}$ = 2.796×10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 68%. *Collected by*: E. C. Bingler; *dated by*: M. L. Silberman. *Comment*: From distinctive agglomeratic glassy flow near the base of a thick succession of aguite rhyodacite ash flows. Correlative to the Ghost Dance Lava Member of the Hu-Pwi Rhyodacite (Ekren and others, in press).

(biotite) 22.0 ± 0.7 m.y.
22.6 ± 0.7 m.y.*

4. *SQ29* K-Ar

Augite rhyodacite vitrophyre agglomerate (NW¼ SE¼ NE¼ S13,T13N,R27E; 38°59.5'N, 118°54.2'W; Mineral County, NV). *Analytical data*: K_2O = 8.34%, $*Ar^{40}$ = 3.144×10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ =

64%. *Collected by*: E. C. Bingler; *dated by*: E. H. McKee. *Comment*: See SQ13. Age is distinctly discordant with SQ13.

(biotite) 26.0 ± 0.5 m.y.
26.7 ± 0.8 m.y.*

5. *SQ21* K-Ar

Quartz latite ash-flow tuff. Singatse Tuff (C, SW¼ SW¼ SE¼ S33,T12N,R28E; 38°51.2'W, 118°51.3'W; Mineral County, NV). *Analytical data*: (hornblende) K_2O = 0.953%, $*Ar^{40}$ = 0.363 x 10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 47%; (biotite) K_2O = 6.88%, $*Ar^{40}$ = 2.652 x 10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 75%. *Collected by*: E. C. Bingler; *dated by*: M. L. Silberman. *Comment*: Sample of hornblende-biotite quartz latite, moderately welded, devitrified, crystal tuff. Both biotite and hornblende are oxidized and partially replaced by fine-grained, opaque, non-titanium oxide and chlorite. These concordant ages agree within analytical uncertainty with a date of 27.2 ± 1.1 m.y. on biotite reported by Proffett and Proffett (1976) from the type area of the Singatse Tuff. Previously reported ages of 28.5 ± 1.1 m.y. by Bingler (1972) on biotite and 31.7 ± 1.8 m.y. by Proffett and Proffett (1976) on hornblende are equal to (or greater than) most dates from the underlying Mickey Pass Tuff and are almost certainly too old.

(hornblende) 25.6 ± 0.8 m.y.
26.3 ± 0.8 m.y.*
(biotite) 25.9 ± 0.8 m.y.
26.6 ± 0.8 m.y.*

6. *SQ18* K-Ar

Weed Heights Member of the Mickey Pass Tuff (C of E border, NE¼ S1,T12N,R27E; 38°56.1'N, 119° 00.9'W; Lyon–Mineral County border, NV). *Analytical data*: K_2O = 8.18%, $*Ar^{40}$ = 3.156 x 10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 71%. *Collected by*: E. C. Bingler; *dated by*: M. L. Silberman. *Comment*: Glassy moderately to strongly welded biotite quartz latite crystal-vitric ash-flow tuff containing trace amounts of pale-green pyroxene and green-brown hornblende, and abundant fresh biotite. Age agrees well with a sanidine date of 26.1 ± 0.9 m.y. reported by Proffett and Proffett (1976) from the type section.

(biotite) 25.9 ± 0.8 m.y.
26.6 ± 0.8 m.y.*

7. *SQ15* K-Ar

Guild Mine Member of the Mickey Pass Tuff (C SW¼ SW¼ S26,T13N,R27E; 38°57.3'N, 118°55.6'W; Mineral County, NV). *Analytical data*: (biotite) K_2O = 7.05%, $*Ar^{40}$ = 2.803 x 10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 80%; (plagioclase) K_2O = 0.652%, $*Ar^{40}$ = 2.422 x 10^{-11} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 68%. *Collected by*: E. C. Bingler; *dated by*: M. L. Silberman. *Comment*: Black crystal-rich rhyodacite vitrophyre characteristic of the base of the Guild Mine Member. Ages are discordant. Biotite age is within analytical uncertainty of the 27 to 28 million year ages reported for the base of the Mickey Pass Tuff (Proffett and Proffett, 1976; Bingler, 1978a; Ekren and others, in press).

(biotite) 26.7 ± 0.8 m.y.
27.4 ± 0.8 m.y.*
(plagioclase) 25.0 ± 0.8 m.y.
25.7 ± 0.8 m.y.*

FLOW ROCKS

8. *SQ16* K-Ar

Basaltic andesite; resorbed phenocrysts of hornblende set in a fine-grained matrix of plagioclase, aguite and glass. (NE¼ NW¼ SW¼ S4,T12N,R27E; 38°55.9'N, 118°58.4'W; Mineral County, NV). *Analytical data*: K_2O = 1.290%, $*Ar^{40}$ = 1.397 x 10^{-11} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 26%. *Collected by*: E. C. Bingler; *dated by*: M. L. Silberman. *Comment*: From near the base of a sequence of flows overlying sedimentary deposits correlative with part of the Coal Valley Formation.

(whole rock) 7.3 ± 0.4 m.y.
7.5 ± 0.4 m.y.*

9. *SQ24* K-Ar

Basaltic andesite (C N½ S1,T11N,R28E; 38°50.9'N, 118°48'W; Mineral County, NV). *Analytical data*: K_2O = 0.310%, $*Ar^{40}$ = 4.339 x 10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 1.3%. *Collected by*: E. C. Bingler; *dated by*: E. H. McKee. *Comment*: Same stratigraphic interval as SQ16 above. Although the age agrees well with young basalts in the Singatse Range (Proffett and Proffett, 1976) and SQ16 above, the high atmospheric argon and low kp content result in a very low precision.

(plagioclase) 9.7 ± 7.5 m.y.
10.0 ± 7.5 m.y.*

10. *SQ34* K-Ar

Porphyritic olivine basalt. Interbedded with fine- to medium-grained volcanic litharenite of the Coal Valley Formation (C S½ NE¼ S24,T11N,R27E; 38°48.2'N, 118°54.3'W; Mineral County, NV). *Analytical data*: K_2O = 0.771%, $*Ar^{40}$ = 1.5243 x 10^{-11} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 7.2%. *Collected by*: E. C. Bingler; *dated by*: E. H. McKee.

(plagioclase) 13.7 ± 2.2 m.y.
14.1 ± 2.3 m.y.*

11. *SQ10* K-Ar

Hornblende latite plug (NW¼ SW¼ SE¼ S13,T13N, R27E; 38°59.1'N, 118°54.5'W; Mineral County, NV). *Analytical data*: K_2O = 0.793%, $*Ar^{40}$ = 1.637 x 10^{-11} mole/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 58%. *Collected by*: E. C. Bingler; *dated by*: M. L. Silberman. *Comment*:

From a feeder dike related to widespread fine-grained latite flows unconformably overlying the Oligocene and Miocene ash-flow tuff sequence and overlain by coarse clastic beds of the Coal Valley Formation.

(hornblende) 13.9 ± 0.4 m.y.
14.3 ± 0.4 m.y.*

12. *SQ14* K-Ar

Hornblende latite flow rock. Contains numerous medium-grained phenocrysts of euhedral green-brown hornblende set in a very fine-grained trachytic matrix of plagioclase microlite and devitrified glass (C S15, T13N,R27E; 38°59.3'N, 118°56.8'W; Mineral County, NV). *Analytical data*: K_2O = 0.835%, $*Ar^{40}$ = 1.689 x 10^{-11} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 55%. *Collected by*: E. C. Bingler; *dated by*: M. L. Silberman. *Comment*: Extrusive equivalent of SQ10. Ages are concordant.

(hornblende) 13.6 ± 0.4 m.y.
14.0 ± 0.4 m.y.*

PLUTONIC ROCKS

13. *SQ11* K-Ar

Hornblende-biotite granodiorite porphyry (SW¼ SW¼ SE¼ S14,T13N,R27E; 38°59'N, 118°55.5'W; Mineral County, NV). *Analytical data*: (hornblende) K_2O = 1.14%, $*Ar^{40}$ = 1.969 x 10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 76%; (biotite) K_2O = 5.70%, $*Ar^{40}$ = 6.793 x 10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 86%. *Collected by*: E. C. Bingler; *dated by*: M. L. Silberman. *Comment*: Sample of distinctive rock type largely restricted to an E-W zone of faulting and intrusive activity (Bingler, 1978b). These discordant ages are younger than earlier determinations of 143 ± 8 m.y. (hornblende) (Bingler, 1972) and 146 ± 8 m.y. (hornblende) (Castor, 1972) on similar granodiorite porphyry. Almost all biotite-hornblende mineral pair ages from this region of western Nevada are discordant; the hornblende generally are significantly older than co-existing biotite (Bingler, 1972; Evernden and Kistler, 1970). These relations indicate a complex post-emplacement thermal history of the region. K-Ar ages should be considered minimum figures in this terrane.

(hornblende) 114 ± 3.0 m.y.
117 ± 4.0 m.y.*
(biotite) 79.0 ± 2.4 m.y.
81.0 ± 2.4 m.y.*

14. *SQ22* K-Ar

Hornblende-biotite quartz monzonite (SE¼ SE¼ S8, T11N, R25E; 38°49.5'N, 119°57'W; Wilson Canyon, Singatse Range, Lyon County, NV). *Analytical data*: (hornblende) K_2O = 0.661%, $*Ar^{40}$ = 1.566 x 10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 83%; (biotite) K_2O = 8.31%, $*Ar^{40}$ = 12.62 x 10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 92%. *Collected by*: E. C. Bingler; *dated by*: M. L. Silberman.

(hornblende) 154 ± 5 m.y.
158 ± 5 m.y.*
(biotite) 100 ± 3 m.y.
103 ± 3 m.y.*

15. *SQ38* K-Ar

Hornblende-biotite quartz monzonite (C S4,T11N, R26E; 39°50.6'N, 119°4.6'W, Lyon County, NV). *Analytical data*: K_2O = 8.28%, $*Ar^{40}$ = 17.71 x 10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 94%. *Collected by*: E. C. Bingler; *dated by*: M. L. Silberman. *Comment*: This sample and SQ22 above are taken from a large pluton exposed in the Gray Hills and the southern Singatse Range. The considerable range of these dates is probably due to partial argon loss from the heating effects of Cretaceous plutons in the southern Wassuck Range and Gray Hills.

(biotite) 140 ± 4 m.y.
143 ± 4 m.y.*

16. *AD44* K-Ar

Medium-grained granodiorite (NE¼ NE¼ S30,T13N, R28E; 38°57.9'N, 118°53.2'W; Mineral County, NV). *Analytical data*: K_2O = 0.673%, $*Ar^{40}$ = 1.492 x 10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 92%. *Collected by*: E. C. Bingler; *dated by*: M. L. Silberman. *Comment*: Extensive exposures of this granodiorite mark the E-W zone of intrusion and mineralization (Bingler, 1972) that approximately bisects the Yerington district. Rock is extensively epidotized.

(hornblende) 144 ± 4 m.y.
148 ± 4 m.y.*

17. *AD47* K-Ar

Coarse-grained hornblende-quartz diorite (C SW¼ S3,T12N,R28E; 38°55.6'N, 118°50.6'W; Mineral County, NV). *Analytical data*: (hornblende) K_2O = 0.956%, 1.980 x 10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 91%; (biotite) K_2O = 7.87%, $*Ar^{40}$ = 9.485 x 10^{-10} moles/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 87%. *Collected by*: E. C. Bingler; *dated by*: M. L. Silberman. *Comment*: Field relations indicate that this is the oldest intrusive phase in the Wassuck Range, thus these discordant dates appear to reflect reheating effects of subsequent Jurassic and Cretaceous intrusions.

(hornblende) 135 ± 4.0 m.y.
138 ± 4.0 m.y.*
(biotite) 79.9 ± 2.4 m.y.
81.9 ± 2.5 m.y.*

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