U.S. geological survey radiometric ages- compilation "C" part I; Mexico, and Wisconsin, Michigan, and North and South Carolina

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U.S. GEOLOGICAL SURVEY RADIOMETRIC AGES—COMPILATION "C"
Part one: Mexico, and Wisconsin, Michigan, and North and South Carolina

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This is part one of the third compilation of a planned series. The other compilations were by Marvin and Cole (1978). It contains both unpublished and published dates. However, the latter ages lacked either a specific sample location, petrologic information, or analytical data in their published form. Such specifics are often needed for evaluation and utilization of an isotopic age. That, we believe, is the value of this compilation—it supplies such information for most of the listed samples. Users are warned to use these ages with discretion as they constitute only a part of the total geologic picture in any particular area. For ease of reference, samples are grouped together by state. Two samples from northern Mexico are listed first.

Some of the listed ages are spurious due to the presence of xenocrystic material, excess radiogenic argon, mineral alteration, diffusion of radiogenic argon, etc. If the age is recognized as being spurious, this fact is mentioned. In a number of cases, we have insufficient information, geologic or otherwise, to accurately evaluate the listed age. The spurious mineral ages are of value in that they may indicate to future geochronologists and geologists that there are potential problems in dating certain rocks in that sampled locality.

All the ages were determined by U.S. Geological Survey personnel in Denver, Colorado, except for the North Carolina sample. Analysts are R. F. Marvin, H. H. Mehnert, and E. A. Brandt for K-Ar ages; and R. E. Zartman and M. D. Gallego or L. M. Kwak for U-Th-Pb ages. Analytical techniques are not described as these dating methods are fairly common knowledge to most geologists.

The following decay constants, recommended by the IUGS Subcommission on Geochronology (Steiger and Jager, 1977) were used.

Potassium-40: $\lambda\epsilon = 0.581 \times 10^{-10}$/yr, $\lambda\beta = 4.962 \times 10^{-10}$/yr; atomic abundance is 0.01167 atomic percent
Rubidium-87: $\lambda\beta = 1.42 \times 10^{-11}$/yr
Fission-track: $\lambda = 7.03 \times 10^{-17}$/yr for U^{238}

SAMPLE DESCRIPTIONS

MEXICO

1. *USGS(D)84J56* K-Ar
Dacite (31°41'57"N, 106°34'51"W; Chihuahua Departmento, Mexico). *Analytical data:* K_2O = 1.00, 0.98%; $*Ar^{40} = 0.6901 \times 10^{-10}$ mol/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 81%. *Submitted by:* H. Drewes. *Comments:* A dacite porphyry dike that is part of a dike swarm extending into the El Paso area, Texas.
hornblende 47.8 ± 2.2 Ma

2. *USGS(D)84D54* K-Ar
Rhyodacite (31°41'59"N, 106°34'52"W; at notch in the hill N of road, Chihuahua Departmento, Mexico). *Analytical data:* K_2O = 8.74, 8.72%; $*Ar^{40} = 6.139 \times 10^{-10}$ mol/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 81%. *Collected by:* H. Drewes. *Comments:* A rhyodacite porphyry dike that is part of a dike swarm extending into the El Paso area, Texas.
biotite 48.2 ± 1.7 Ma

WISCONSIN

3. *USGS(D)TT64-15* K-Ar
Limestone (42°31'15"N, 90°21'00"W; S26,T1N,R1E; wall sample from a mine drift in the Thompson Mine, New Diggings 7.5' quad., Lafayette Co., WI). *Analytical data:* K_2O = 9.74, 9.76%; $*Ar^{40} = 79.70 \times 10^{-10}$ mol/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 98%. *Collected by:* A. V. Heyl. *Comments:* Mixture of fine-grained K-feldspar and quartz was obtained as an insoluble residue of a limestone specimen taken from the basal limestone bed of the Quimbys Mill Member, Platteville Formation (Middle Ordovician). Calculated K-Ar age was obtained for reconnaissance geologic purposes.
K-feldspar 494 ± 18 Ma

4. *USGS(D)TT64-17* K-Ar
Limestone (42°31'15"N, 90°21'00"W; S26,T1N,R1E; wall sample from a mine drift in the Thompson Mine, New Diggings 7.5' quad., Lafayette Co., WI). *Analytical data:* K_2O = 10.34, 10.28%; $*Ar^{40} = 79.46 \times 10^{-10}$ mol/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 99%. *Collected by:* A. V. Heyl. *Comments:* Mixture of fine-grained K-feldspar and quartz was obtained as an insoluble residue of a limestone specimen taken from the basal limestone bed of the Quimbys Mill Member, Platteville Formation (Middle Ordovician). Calculated K-Ar age was obtained for reconnaissance geologic purposes.
K-feldspar 469 ± 11 Ma

5. *USGS(D)TT64-3A* K-Ar
Limestone (42°31'15"N, 90°21'00"; S26,T1N,R1E; wall sample from a mine drift in the Thompson Mine, New Diggings 7.5' quad., Lafayette Co., WI). *Analytical data:* K_2O = 6.64, 6.38%; $*Ar^{40} = 53.41 \times 10^{-10}$ mol/gm, $*Ar^{40}/\Sigma Ar^{40}$ = 98%. *Collected by:* A. V. Heyl. *Comments:* Mixture of fine-grained K-feldspar and quartz was obtained as an insoluble residue of a limestone specimen taken from the basal limestone bed of the Quimbys Mill Member, Platteville Formation (Middle Ordovician). Calculated K-Ar age was obtained for reconnaissance geologic purposes.
K-feldspar 501 ± 18 Ma

MICHIGAN

6. *USGS(D)HRP-1* U-Pb
Carbonate-apatite bed in an iron-formation near the base of the Baraga Group, Marquette Range Supergroup (46°51'50"N, 88°05'00"W; NW¼, S35,T52N,R30W; bed of the Huron River, Big Eric's Bridge, Baraga Co., MI). *Analytical data:* Whole-rock (split 1): U = 192.3 ppm, Pb = 79.2 ppm; isotopic composition of lead (atomic percent): ^{204}Pb = 0.2531, ^{206}Pb = 76.43, ^{207}Pb = 12.44, ^{208}Pb = 10.88. Whole-rock (split 2): U = 191.2 ppm, Pb =

80.8 ppm; isotopic composition of lead (atomic percent): ^{204}Pb = 0.2614, ^{206}Pb = 75.99, ^{207}Pb = 12.53, ^{208}Pb = 11.22. Isotopic composition of common lead assumed to be ^{204}Pb:^{206}Pb:^{207}Pb:^{208}Pb = 1:15.5:15.3:35.4. *Collected by:* W. F. Cannon. *Comments:* This uraniferous cherty phosphorite is presumed to be derived from organic material (Mancuso and others, 1975); it occurs within an iron-formation near the base of the Baraga Group, Marquette Range Supergroup. The iron-formation unconformably overlies an Archean granitic basement complex; the iron-formation grades upward into black slate of the Michigamme Formation. Essentially concordant U-Pb ages appear to be geologically reasonable for the time of sedimentation or early diagenesis of the Baraga Group. Attempts to determine thorium content of sample were unsuccessful, presumably because of chemical interference from graphite in the phosphorite.

whole-rock (split 1) $^{206}Pb/^{238}U$ = 1920 ± 10 Ma
$^{207}Pb/^{235}U$ = 1924 ± 14 Ma
$^{207}Pb/^{206}Pb$ = 1928 ± 24 Ma
whole-rock (split 2) $^{206}Pb/^{238}U$ = 1950 ± 10 Ma
$^{207}Pb/^{235}U$ = 1942 ± 14 Ma
$^{207}Pb/^{206}Pb$ = 1934 ± 24 Ma

7. *USGS(D)77-B-30* U-Pb

Phosphorite pebble (46°49'35"N, 88°18'55"W; SW¼,S12,T51N,R32W; Forsythe property, Abbaye Peninsula, Baraga Co., MI). *Analytical data:* Whole-rock (pebble): U = 702.9 ppm, Pb = 185.3 ppm; isotopic composition of lead (atomic percent): ^{204}Pb = 0.0594, ^{206}Pb = 87.36, ^{207}Pb = 10.22, ^{208}Pb = 1.353. Isotopic composition of common lead assumed to be ^{204}Pb:^{206}Pb:^{207}Pb:^{208}Pb = 1:15.5:15.3:35.4. *Collected by:* M. R. Brock. *Comments:* A phosphorite pebble conglomerate, which may represent shallow water reworking of carbonate-apatite beds lower in the section, forms a basal phosphatic zone of the Michigamme Formation, Baraga Group, Marquette Range Supergroup. Individual pebbles are somewhat flattened and range widely in uranium content; matrix also consists of cherty phosphorite and has a uranium content equal to about the average value of the pebbles. One of the more radioactive pebbles measuring 1.8 cm in long dimension was chosen for analysis.

U-Pb ages are significantly discordant and probably reflect secondary uranium and/or lead mobility at some time after sedimentation. Apparently, the heterogeneous distribution of uranium in this conglomerate was conducive to chemical migration whereas the uniform distribution of uranium in the carbonate-apatite bed represented by sample HRP-1 (entry #163) encountered no net movement of uranium and lead.

whole-rock (pebble) $^{206}Pb/^{238}U$ = 1516 ± 8 Ma
$^{207}Pb/^{235}U$ = 1620 ± 10 Ma
$^{207}Pb/^{206}Pb$ = 1762 ± 16 Ma

NORTH CAROLINA

8. *CC-3* K-Ar

Gabbro (35°20'02"N, 80°40'04"W; outcrop on S side of country road no. 1300, adjacent to Millard Branch; Harrisburg 7.5' quad., Cabarrus Co., NC). *Analytical data:* K_2O = 6.61%, $^*Ar^{40}$ = 41.52 × 10^{-10} mol/gm, $^*Ar^{40}/\Sigma Ar^{40}$ = 97%. *Collected and analyzed by:* S. A. Kish while a graduate student at University of North Carolina. *Comments:* The Concord Gabbro or the Concord Syenite which has been dated by Rb-Sr whole-rock method to be 404 ± 21 Ma.

biotite 391 ± 16 Ma

SOUTH CAROLINA

9. *USGS(D)CCC-1* (Gohn and others, 1977) K-Ar

Basalt (32°53'15"N, 80°21'25"W; Clubhouse Corners drill hole no. 1 at 785-m depth, Clubhouse Corners Road, Cottageville 15' quad., Dorchester Co., SC). *Analytical data:* K_2O = 1.37, 1.43%; $^*Ar^{40}$ = 2.309 × 10^{-10} mol/gm, $^*Ar^{40}/\Sigma Ar^{40}$ = 85%. *Submitted by:* J. P. Owens. *Comments:* The amygdaloidal basalt core has been somewhat altered as indicated by the chloritized femic minerals. The published age of 109 Ma has been recalculated with revised potassium-40 decay constants (Steiger and Jager, 1977).

whole-rock 111 ± 4 Ma

10. *USGS(D)CCC-1* (Gohn and others, 1977) K-Ar

Basalt (32°53'15", 80°21'25"; Clubhouse Corners drill hole no. 1 at 771-m depth, Clubhouse Corners Road, Cottageville 15' quad., Dorchester Co., SC). *Analytical data:* K_2O = 0.63, 0.62%; $^*Ar^{40}$ = 0.8968 × 10^{-10} mol/gm, $^*Ar^{40}/\Sigma Ar^{40}$ = 83%. *Submitted by:* J. P. Owens. *Comments:* Basalt core appears fresh; calculated age is a minimum age for the basalt body. Published age of 94.8 Ma has been recalculated with revised potassium-40 decay constants (Steiger and Jager, 1977).

whole-rock 97.0 ± 4.3 Ma

REFERENCES

Gohn, G. S., Higgins, B. B., Smith, C. C., and Owens, J. P. (1977) Lithostratigraphy of the deep corehole (Clubhouse Crossroads corehole 1) near Charlestown, South Carolina: U.S. Geological Survey Professional Paper 1028-E, p. 59.

Mancuso, J. J., Lougheed, M., and Shaw, R. (1975) Carbonate-apatite in Precambrian cherty iron-formation, Baraga County, Michigan: Economic Geology, v. 70, p. 583–586.

Marvin, R. F., and Cole, J. C. (1978) Radiometric ages—compilation A, U.S. Geological Survey: Isochron/West, no. 22, p. 3.

Steiger, R. H., and Jager, E. (1977) Subcommission on Geochronology—Convention on the use of decay constants in geo- and cosmochronology: Earth Planetary Science Letters, v. 36, p. 359.