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MIOCENE K-Ar AGE DETERMINED FOR METAMORPHIC MUSCOVITE FROM PRECAMBRIAN QUARTZITE IN EXTREME NORTHWEST UTAH

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Metamorphic muscovite recovered from a sample of quartzite of the upper(?) Precambrian Harrison Formation gave a K-Ar radiometric age of 18.5 ± 0.8 m.y., from the extreme northwest corner of Utah.

Chemically and mineralogically the sample is very similar to the late Precambrian and early Cambrian calcium-poor quartzites of eastern White Pine County, Nevada, described by Lee and others (1980). Sample 446 was originally an argillaceous quartz sand, mineralogically mature, but texturally immature. The sand may have been derived from a deeply weathered crystalline terrane. It has been metamorphosed to a quartzite with the following chemical composition (weight %): $\text{SiO}_2 = 90.7$; $\text{Al}_2\text{O}_3 = 4.9$; $\text{Fe}_2\text{O}_3 = 0.78$; $\text{FeO} = 0.16$; $\text{MgO} = 0.20$; $\text{CaO} = 0.00$; $\text{Na}_2\text{O} = 0.06$; $\text{K}_2\text{O} = 2.0$; $\text{H}_2\text{O}^+ = 0.63$; $\text{H}_2\text{O}^- = 0.01$; $\text{TiO}_2 = 0.20$; $\text{P}_2\text{O}_5 = 0.02$; $\text{MnO} = 0.04$; and total = 99.7. Like the quartzites of eastern White Pine County, Nevada, this rock is remarkable for its dearth of CaO relative to other major elements present, and for its very high $\text{K}_2\text{O}/\text{Na}_2\text{O}$ ratio (> 30). Sample 446 is 81 % quartz and 19 % white mica. Chemical analysis of this mica shows it to be phengitic and very similar in composition to the metamorphic white micas present in the Lower Cambrian Prospect Mountain Quartzite of the Snake Range, eastern Nevada (Lee and Van Loenen, 1969).

The map compiled by Stokes (1963) shows Mississippian Chainman Shale and Tertiary porphyritic intrusive rocks thrust over the upper(?) Precambrian Harrison Formation in the area of sample site 446. Under the microscope the quartz grains in sample 446 show evidence of pronounced strain and recrystallization, with sutured contacts except where shielded by mica. The quartz grains are drawn out to express a pronounced planar element approximately parallel to the present surface and presumably parallel also to the overlying thrust fault. The micas are aligned in the same plane.

The 18.5 m.y. date determined for mica 446 may indicate the time of most recent movement on the overlying thrust fault. Studies in White Pine County, Nevada, some 280–340 km south of sample site 446, have shown that metamorphic micas occurring in field settings practically identical to that just described for sample 446 apparently were degassed by thermal stresses related to late movement on the Snake Range decollement or some other thrust fault (Lee and others, 1970; Lee, Marvin, and Mehnert, 1980). However, similar relationships in the Ruby Mountains, about 220 km southwest of sample site 446, were interpreted by Kistler and O'Neil (1975) to indicate cooling during uplift.

Further work is necessary in order to determine the areal extent and geologic significance of such young age dates in extreme northwest Utah.

SAMPLE DESCRIPTION

1. 446 K-Ar
Quartzite ($41^\circ 58' 50''\text{N}$, $113^\circ 51' 40''\text{W}$; in Box Elder Co., extreme northwest UT). *Analytical data:* $\text{K}_2\text{O} = 10.93\%$; $^* \text{Ar}^{40} = 2.921 \times 10^{-10}$ moles/gm; $^* \text{Ar}^{40} = 56\%$; analyzed by R. F. Marvin, H. H. Mehnert, E. L. Munson (K determinations made by gravimetric analysis. Constants used: $\text{K}^{40}\lambda_{\epsilon} = 0.581 \times 10^{-10}/\text{yr}$; $\lambda_{\beta} = 4.962 \times 10^{-10}/\text{yr}$. Atomic abundance $\text{K}^{40} = 1.167 \times 10^{-4}$). *Comment:* Date may indicate time of most recent movement on overlying thrust or time of cooling during uplift.
(muscovite) 18.5 ± 0.8 m.y.

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