Introduction

These maps, and the tables that accompany them, are a compilation of isotopic age determinations of rocks and minerals in four 1:100,000-scale quadrangles in the northern and central Front Range, Colorado. Phanerozoic (primarily Tertiary and Cretaceous) age data are shown on one map; Proterozoic data are on the other (sheet 1). A sample location map (sheet 2) is included for ease of matching specific localities and data in the tables to the maps. Several records in the tables were not included in the maps because either there were ambiguous dates or lack of location precluded accurate plotting.

To illustrate the geological setting for the samples, the plutonic rocks are shown on the maps. The boundaries of the plutons are from the Geologic Map of Colorado (Tweto, 1979; digital version by Green, 1992) with a few modifications (Gable, 1984; A.B. Wilson, 2004, unpub. data). For ease of reference, we labeled each of the larger (and some of the smaller) plutons with a generally accepted name from the literature. As a convenience in using the data, we have informally named some plutons based on geographic features on or near those plutons. Those names are shown in parentheses.

The maps show the type of age determination by symbol and age subdivisions by color. Seven different methods, each shown with a different symbol, were used to determine Phanerozoic ages: $^{40}Ar/^{39}Ar$ (circles), Rb/Sr (crosses), K-Ar (stars), U/Pb (squares), zircon fission track (diamonds), sphene fission track (inverted triangles), and apatite fission track (triangles). Four different methods were used to determine Proterozoic ages: $^{40}Ar/^{39}Ar$ (circles), Rb/Sr (crosses), K-Ar (stars), and U/Pb (squares).

Many age determinations have been made on samples which were not located precisely on published maps, although some were located on small-scale geologic sketch maps. We located those samples as best we could on published 1:24,000-scale geologic maps and determined a latitude and longitude for that location. These uncertain or imprecise locations are indicated in the tables by a footnote and on the maps they are shown with open, or unfilled, symbols in the same shapes as explained previously.

Many ages in these tables were determined before the use of the currently accepted values for the decay and abundance constants recommended by the IUGS Subcommission on Geochronology (Steiger and Jäger, 1977). We have corrected the K-Ar ages that used the older decay constant ($^{40}K/K=1.19\times10^{-4}$ mol/mol) and abundance constants generally used in the Western World to ones based on the currently accepted decay constant ($^{40}K/K=1.167\times10^{-4}$ mol/mol) by using the tables of Dalrymple (1979). We have corrected the Rb/Sr ages that used the older decay constant ($^{87}Rb\lambda=1.39\times10^{-11}$/yr) to ones based on the currently accepted constant ($^{87}Rb\lambda=1.42\times10^{-11}$/yr) by multiplying the age by 0.9788.

On the two maps intrusions of similar ages are highlighted in color, and the dated samples of each age group are shown in the same color. On the map showing Proterozoic ages, samples are divided into mostly Early Proterozoic (1,900–1,500 Ma; green) and Middle and Late Proterozoic (1,500–540 Ma, but mostly Middle Proterozoic; purple). On the map showing Phanerozoic ages samples are divided into six groups: Paleozoic and Mesozoic (540–80 Ma; yellow); Late Cretaceous to early Eocene ("Laramide"; 80–50 Ma; blue), early and middle Eocene (50–40 Ma; pale blue); middle Eocene to early Oligocene (40–30 Ma; pink), early Oligocene to early Miocene (30–20 Ma; magenta); and early Miocene and younger (20–0 Ma, but mostly Miocene; red).

Additional isotopic age data were intentionally not included in this compilation because the data are unreliable. This includes early attempts to date rocks based on chemical determinations of total uranium and lead in pitchblende in some samples from the Central City district. For the older isotopic age determinations on these uranium-bearing minerals see Marvin and others (1974). Phair (1979) discussed and corrected some of these data and concluded that there were two groups of ages at 58 Ma and 72.5 Ma.

References Cited

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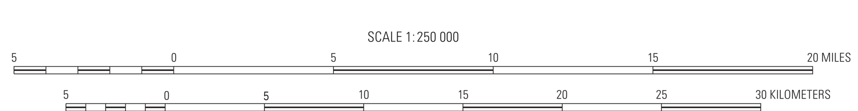

ISOTOPIC AGES OF ROCKS IN THE NORTHERN FRONT RANGE, COLORADO

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SAMPLE LOCATIONS