PRELIMINARY REPORT ON INITIAL LEAD AND STRONTIUM ISOTOPES FROM OPHIOLITIC AND BATHOLITHIC ROCKS SOUTHWESTERN FOOTHILLS SIERRA NEVADA CALIFORNIA

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Initial lead and strontium isotopic ratios have been determined for three suites of gabbros from the mafic-ultramafic belt of the Kings and Kaweah Rivers in the southwest Sierra Nevada foothills. Geochronological control is derived from zircon studies on the same suites (Saleeby and Sharp, 1978). The oldest suite of gabbro is from the metamorphosed Kings-Kaweah ophiolite belt whose petrogenetic age is 250 to 300 m.y. The second suite is a 169 m.y. (Middle Jurassic) syntectonic gabbrodiorite complex which intrudes the ophiolite. The third suite is a posttectonic suite of voluminous olivine-hornblende gabbros, which are intimately related to norites, pyroxene diorites, and quartz diorites, all yielding ages from 115 to 125 m.y. (Early Cretaceous). The Jurassic and Cretaceous gabbros constitute the mafic members of the composite Sierra Nevada batholith. The ophiolitic gabbros are part of an allocthonous terrane, which forms part of the western metamorphic wall of the batholith.

The isotopic compositions of lead from the ophiolitic suite range from 17.90 to 17.95 for $^{206}Pb/^{204}Pb$, and from 15.45 to 15.52 for $^{207}Pb/^{204}Pb$. The Jurassic suite yields a more radiogenic lead of 18.47 for $^{206}Pb/^{204}Pb$ and 15.60 for $^{207}Pb/^{204}Pb$. The Cretaceous olivine gabbros yield ratios similar to the ophiolitic gabbros. In a $^{206}Pb/^{204}Pb$ - $^{207}Pb/^{204}Pb$ diagram, the ophiolitic and Cretaceous gabbros plot within the ocean ridge basalt field. The Jurassic gabbro lies within the field of Sierran granitoids (Chen and Tilton, 1978).

Initial $^{87}Sr/^{86}Sr$ value on a gabbro from the ophiolitic suite is 0.7026. Initial $^{87}Sr/^{86}Sr$ values determined on the Cretaceous suite range from 0.7031 to 0.7039, and for the Jurassic suite a value of 0.7032 was determined. These data are in agreement with the values measured on other batholithic rocks of the western Sierra by Kistler and Peterman (1973). Lead and strontium isotopic studies on other fractions of the Kings-Kaweah mafic-ultramafic belt are in progress.

Several significant conclusions can be drawn from this study.

1. The ophiolitic and Cretaceous suites bear some of the least radiogenic leads on the west coast. They are less radiogenic than the oceanic-affinity volcanic rocks of the Franciscan assemblage to the west (Sinha and Davis, 1971), and they are comparable to leads measured on the eastern Taiwan ophiolite (Chen, unpub. data) and on Mid-Atlantic ridge basalts (Tatsumoto, 1978).

2. The ophiolitic and Cretaceous suites were derived from a source that had the characteristics of oceanic upper mantle. Geologic relations indicate that in the case of the ophiolitic suite petrogenesis was in the oceanic realm far removed from the Sierran region, whereas the Cretaceous suite was generated beneath its present position.

3. When compared with the more radiogenic initial lead and strontium values measured on batholithic rocks to the east (Kistler and Peterman, 1973; Chen and Tilton, 1978), these data support the notion that ophiolitic rocks of the Kings-Kaweah belt mark a fossil suture between oceanic and continental lithospheric plates (Saleeby, 1977). The fundamental nature of this suture has been masked by the Sierra Nevada batholith.

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PRELIMINARY REPORT ON THE BEHAVIOR OF U-Pb ZIRCON AND K-Ar SYSTEMS IN POLYMETAMORPHOSED OPHIOLITIC ROCKS AND BATHOLITHIC ROCKS, SOUTHWESTERN SIERRA NEVADA FOOTHILLS, CALIFORNIA

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Ophiolitic rocks of the southwest Sierra Nevada foothills form part of the western metamorphic wall of the Sierra Nevada batholith (fig. 1). Geochronological studies were undertaken to determine: (1) The igneous petrogenetic age of the ophiolite; (2) The age of a prebatholith dynamic greenschist to amphibolite facies metamorphic event experienced by the ophiolite; and (3) The emplacement ages of the batholithic rocks. Geochronological work was interfaced with detailed structural and petrologic studies. A summary of the geochronological data is given in figure 2.

Zircon from four widely spaced leucocratic dikes within the ophiolite yield suites of internally consistent discordant U-Pb ages. Each zircon sample was split into size and magnetic fractions, which were analyzed separately. Each sample showed the same pattern of greater discordance with increase in U concentration and decrease in grain size. Zircon discordance is attributed to regional thermal metamorphism related to emplacement of the Sierra Nevada batholith. Metamorphism affected the hornblende hornfels facies, but one of the main factors which is believed to have affected the zircon is the intense metasomatic system, which was set up between the batholithic rocks and serpentinite that enclosed the ophiolitic blocks containing the sampled dikes.

Numerous concordant zircon ages measured on the cross-cutting batholithic rocks of gabbroic to granodioritic composition range from 100 to 125 m.y. Mafic metaigneous rocks of the ophiolite, which enclose the leucocratic-dike rocks, were sampled for K-Ar age determinations. The K-Ar ages were reset to ages which fall within the range of concordant batholithic-zircon ages. Concordia plots made for each of the discordant ophiolitic zircon populations yielded lower intercept ages, which are in agreement with the concordant batholithic-zircon ages and the reset ophiolitic K-Ar ages.

The intercept age ranges for each ophiolitic-zircon population are derived by fitting a family of lines through the error brackets of the discordant U-Pb points on a concordia plot, and noting the ranges over which these lines intercept concordia. The upper intercept falls around 300 m.y. and may represent an initial crystallization age for the ophiolitic-dike rocks. The oldest $^{206}Pb/^{238}U$ age obtained from the discordant populations is 247 m.y. $^{206}Pb/^{207}Pb$ ages for the discordant populations range back to 275 m.y. These data together suggest that the igneous ages of the ophiolitic-dike rocks are between 250 and 300 m.y. The dike rocks are an integral part of the ophiolite assemblage and thus this petrogenetic age range is assigned to the entire igneous assemblage of the ophiolite. The petrogenetic age is considered an oceanic spreading center age.

Mafic metamorphic tectonites of amphibolite facies were sampled from the ophiolite in domains of lowest textural and mineralogic contact metamorphic grade. K-Ar ages on amphibole represent a minimum age on the dynamic metamorphic event that was related to tectonic disruption of the ophiolite. The minimum ages range from 179 m.y. to 190 m.y. Where sampled adjacent to the batholith a similar mafic tectonite sample (not shown on fig. 2) had its K-Ar system reset to the batholithic-zircon age. Geological relations suggest that the dynamic metamorphic age should be close to the petrogenetic age of the ophiolite, and that this metamorphism occurred