

K-Ar Ages of Yakujima* Granite, Kyushu, Japan

By

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Abstract

K-Ar ages of three biotites of adamellite and granodiorite of Yakujima are 13 ± 2 , 14 ± 1 and 14 ± 1 m.y. respectively. They are correlated to late Miocene.

Geological setting

The island Yakujima is located to the south of Kyushu and is on the Ryukyu arc. It is expected that Yakujima is the probable extension of the Outer Zone of Southwest Japan.

The island Yakujima is composed of granite and fringing sediments. The sediments are not fossiliferous and, however, its rock facies is quite similar to some members of the Shimanto group, lower Paleogene. Yakujima granite is intruded into the sediments giving contact metamorphism and is famous for large potassium feldspar phenocryst.

Description of the determined samples

(1) Biotite adamellite (TN 66031003)

Kosugidani, Yaku-cho, Kumage-gun, Kagoshima pref.

It is a light-colored, porphyritic adamellite and is homogeneous despite of abundant inclusions.

Under the microscope, phenocryst is potassium feldspar. 5 ~ 10 cm across, with perthite veinlets. Matrix is composed of mainly biotite, plagioclase and quartz. Biotite is fresh, 2~4 mm across, with pleochroism, X : nearly colorless, Y, Z : reddish brown. Plagioclase is fresh, hypidiomorphic, 3~5 mm across with conspicuous zoning and twinning and is about oligoclase in composition. Quartz is allotriomorphic, 3~5 mm across, with abundant cracks. Zircon, apatite and iron ore are contained in small amount. Zircon gives strong halo to biotite in contact.

(2) Biotite granodiorite (TN 66031011)

Ambo, Yaku-cho, Kumage-gun, Kagoshima pref.

It is quite similar to the sample TN66031003, except that plagioclase is more

* "Yakujima" may be written as "Yakujima" after another pronunciation.

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abundant and larger, 3~9 mm across, and phenocrystic potassium feldspar is also a little larger, 15~20 mm across.

(3) Biotite adamellite (TN 66031101)

Isso, Kamiyaku-cho, Kumage-gun, Kagoshima pref.

It is also similar to the sample TN66031003. However, potassium feldspar gets larger up to 30 mm and increases in amount.

Experimental procedure

Biotite was isolated with an isodynamic separator after crushing and sieving of the rock sample.

Argon was extracted and purified in the pyrex high vacuum system. Each sample was fused in a molybdenum crucible at about 1300°C for 30 minutes with an induction heater. The Ar³⁸ spike was added during fusion, and argon was purified from other gases with hot titanium sponge. Isotopic ratios of argon were measured by the static operation on the Mitsubishi MS-315G mass spectrometer, which is Reynolds-type with 15 cm-radius 60°-sector analyzer.

Potassium was determined by flame photometry. Each sample was digested with hydrofluoric acid and hydrochloric acid, and then, the residue was dissolved in hydrochloric acid, diluted to a standard volume, and the potassium content of the solution was measured with the Hitachi EPU-2 flame photometer.

The constants used in the calculations are : $\lambda_{\beta} = 4.72 \times 10^{-10} \text{ yr}^{-1}$, $\lambda_{\alpha} = 0.584 \times 10^{-10} \text{ yr}^{-1}$, and $K^{40}/K = 0.0119\%$.

The results of the determination are given in the following table.

Table K-Ar ages of Yakujima granite

Sample No.	Mineral	K ₂ O	Atmospheric contamination	Age and error
(1) TN 66031003	biotite	8.57%	29.4%	14±1
(2) TN 66031011	biotite	8.56	30.2	14±1
(3) TN 66031101	biotite	8.28	75.2	13±2

Geological meaning of the results

The three determinations give nearly one age, 14 m.y., which is correlated to late Miocene. These results are not inconsistent to any geological evidences.

Granites in the Outer Zone in Southwest Japan is divided into two, from isotopic age, one nearly 20 m.y., the other nearly 14 m.y. The Yakujima granite belongs to the younger group.

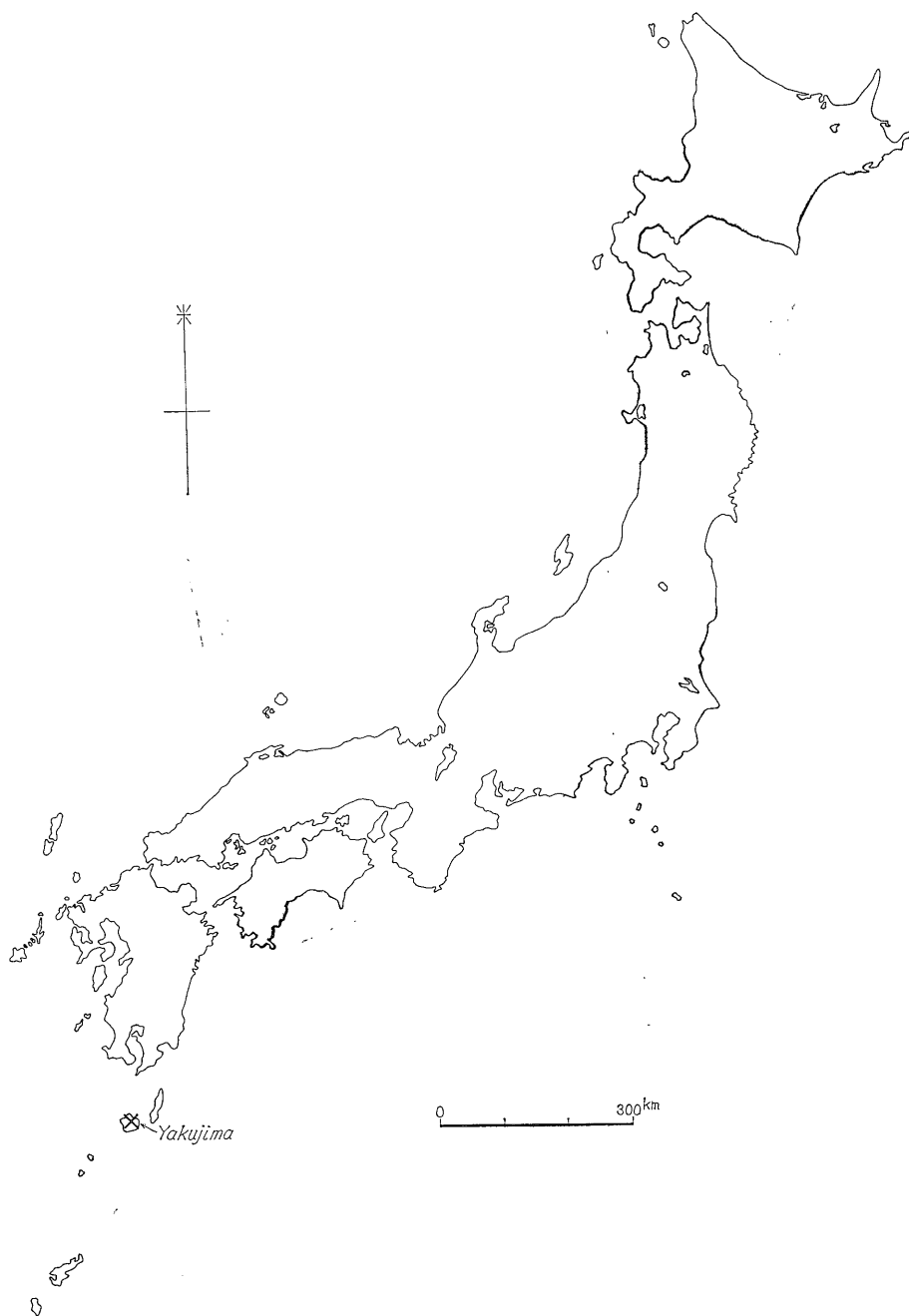


Figure 1 Index to Yakujima area

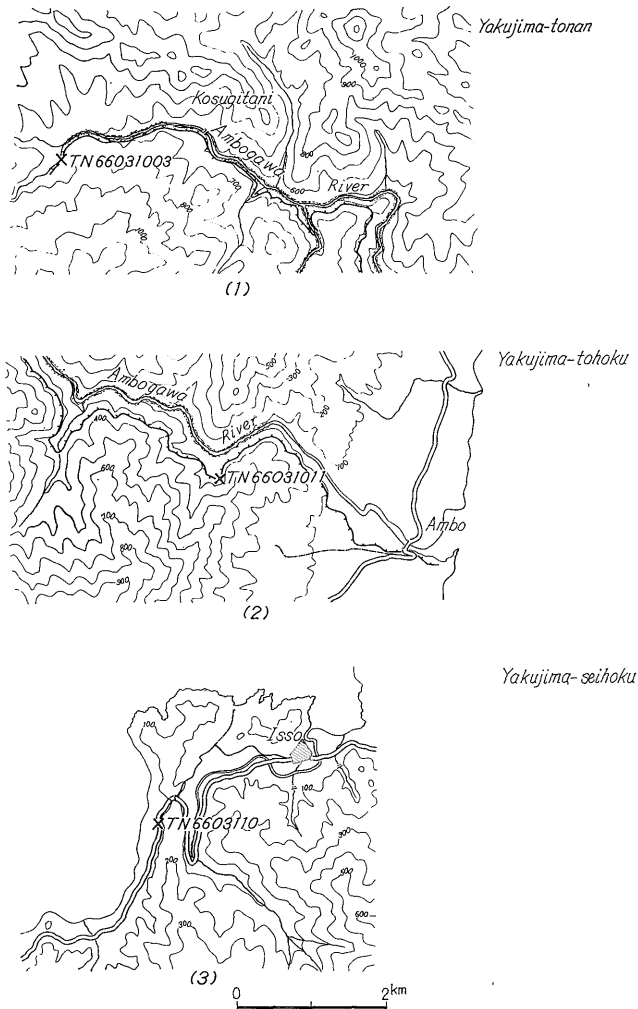


Figure 2 Sample localities on the 1/50,000 topographic map

- (1) Yakujima-tōnan
- (2) Yakujima-tōhoku
- (3) Yakujima-seihoku

Literature

Kagoshima-chishitsuchōsa-kenkyūkai (1961) : *Geology of the Kagoshima prefecture*.
Kagoshima prefecture (in Japanese).

九州, 屋久島花崗岩の K-Ar 年令

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要 旨

屋久島のアダメロ岩および花崗閃緑岩の3コの黒雲母は、K-Ar 法によるとそれぞれ 13 ± 2 ,
 14 ± 1 および 14 ± 1 m.y. である。これは、すべて、中新世末期に相当する。

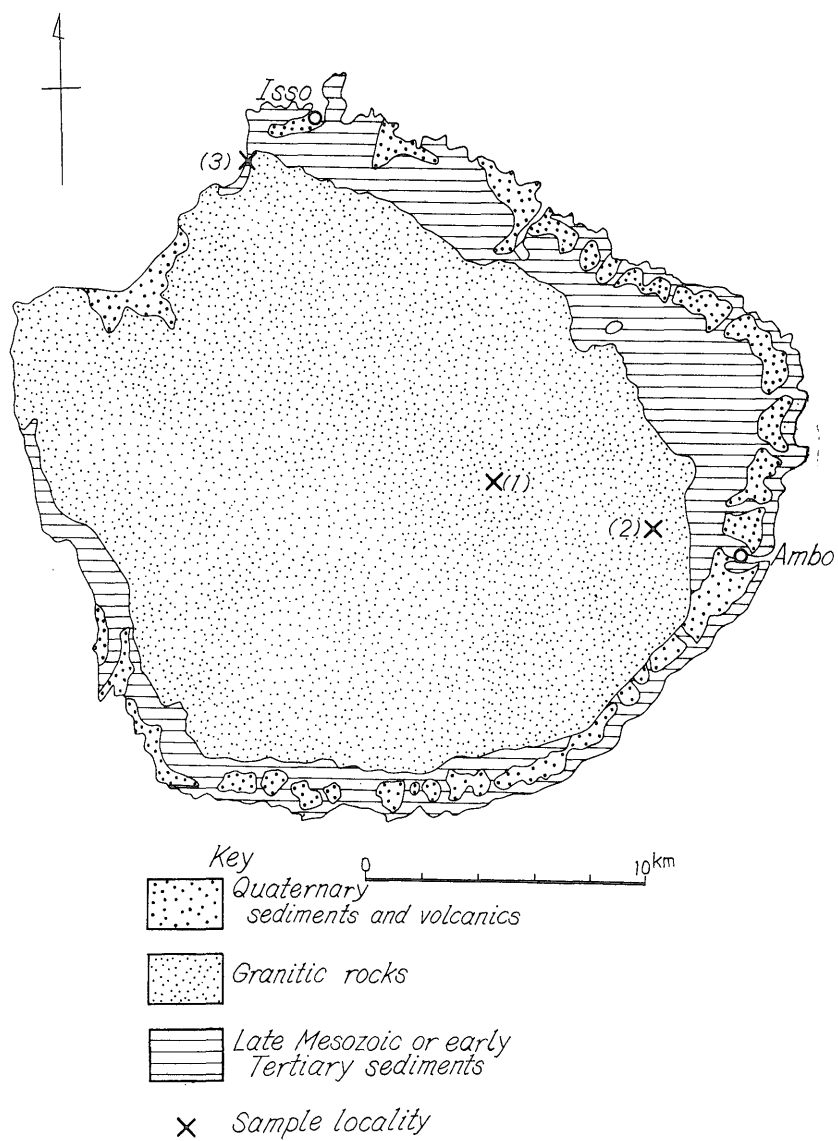


Figure 3 Geological map of the Yakujima area
(after Kagoshima-chishitsuchōsa-kenkyūkai, 1961)