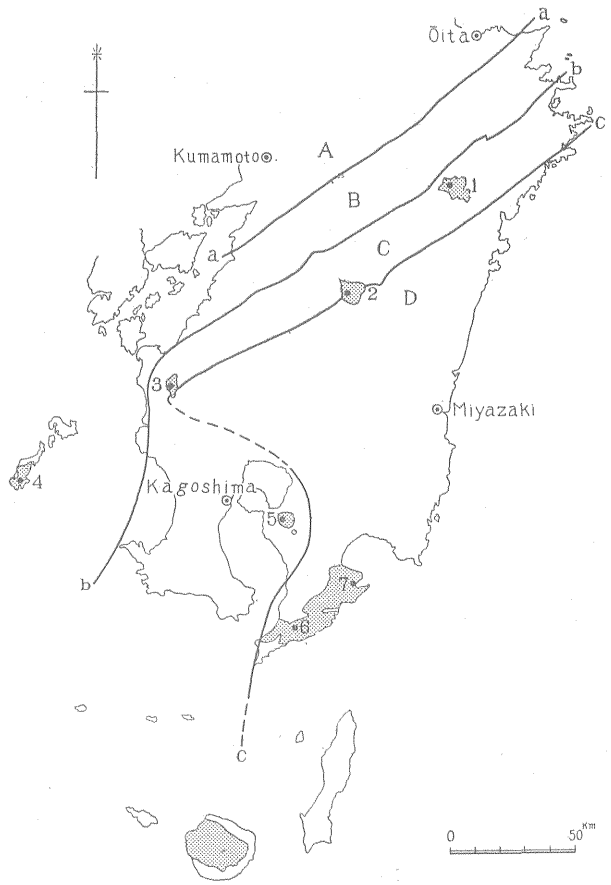
552.3(522): 550.93

Potassium-Argon Ages of Granitic Rocks from the Outer Zone of Kyushu, Japan

by

John A. Miller*, Ken Shibata** & Yosuke Kawachi***

Granitic masses distributed in the Outer Zone of Kyushu have been considered to be of similar ages. They resemble one another in petrographic character, chemical composition,



1. Okuéyama 2. Ichibusayama 3. Shibisan 4. Koshikijima 5. Takakumayama
6. Kunimi mountains (K 16) 7. Kunimi mountains (K 34)

A: Ryoke Zone — Inner Zone
B: Paleozoic and Sambagawa Metamorphic Zone
C: Weakly metamorphosed } Shimanto Zone — Outer Zone
D: Non-metamorphosed }
a: Usuki-Yatsushiro Tectonic Line
b: Butsuzo Tectonic Line
c: Nobéoka-Shibisan Tectonic Line

Fig. 1 Map showing sample localities and distribution of granitic rocks

* Department of Geodesy and Geophysics, Cambridge University
** Technological Department
*** Geology Department

mineralization associated with igneous activity, and in their structural relationships to the country rocks[2].

In view of the fact that all the granites, except the Koshiki-jima granite, outcrop in the vicinity of the phyllite zone in the formations of unknown age, and are found to have intruded that zone discordantly, Kawachi[3] suggested that the intrusion took place after the formation of the phyllite and probably during the period of movement now represented by the unconformity at the base of the Miyazaki group, which is late Miocene to Pliocene in age.

Age determinations were carried out using the potassium-argon method on biotites separated from seven granites from the Outer Zone of Kyushu. Localities are shown in Fig. 1. Sample No. 1 was given by Drs. T. Nozawa and K. Takahashi of the Geological Survey of Japan, and all others were supplied by Mr. S. Ishihara and one of the authors (Y. K.). Separation of biotites was carried out at the Geological Survey of Japan and potassium-argon measurements were made at the Department of Geodesy and Geophysics, Cambridge, using the isotope dilution technique. Details of the procedure are given elsewhere.

The results given in Table 1, show all the intrusions to be Miocene in age[1] (11～25 m. y.). The Okuéyama and Kunimi mountains (K 16) masses gave ages of 21 million years which would place them in the early Miocene, while the remainder yielded late Miocene dates between 13 and 16 million years. In all probability this difference is due to experimental error and in the absence of further geological or geochronological evidence it is not considered that they represent two separate periods of intrusion.

Table 1 Results of Potassium-Argon Dating

No.	Sample	Atmospheric contamination (%)	K_2O (%)	Age and estimated error (million years)
1	Okuéyama	20.7	7.95	21±1
2	Ichibusayama	35.8	6.72	14±1
3	Shibisan	7.7	7.13	15±4
4	Koshikijima	35.7	7.03	13±4
5	Takakumayama	18.2	7.29	16±1
6	Kunimi mountains K 16	18.6	7.68	21±1
7	Kunimi mountains K 34	28.8	8.11	14±1

Decay constants: $\lambda_\beta = 4.72 \times 10^{-10}$ yr.$^{-1}$, $\lambda_e = 0.584 \times 10^{-10}$ yr^{-}.

1. Biotite granodiorite, outcrop on the floor of a stream, north of Shishigawa, Hinokage-cho
2. Biotite granodiorite, quarry by the road leading to Yuyama pass, Mizukami-mura
3. Porphyritic orthoclase-hornblende-biotite granodiorite, outcrop by the road between Kusubaé and Horikiri, Miyanojo-cho
4. Hornblende-biotite granodiorite, outcrop by the road leading to Sebi, north of Teuchi, Shimokoshiki-mura
5. Garnet bearing tourmaline-biotite adamellite, and biotite adamellite～biotite granodiorite, composite of 17 samples along the river Honjo. Tarumizu city
6. Hornblende-biotite granodiorite～biotite adamellite, outcrop by the road between Setoguchi, Tashiro-mura and Nakamura, Sata-cho
7. Biotite granodiorite, outcrop by the road at the east end of Mizushiri village, Uchinoura-cho

Acknowledgements: The authors wish to thank Dr. T. Nozawa, Dr. K. Takahashi, and Mr. S. Ishihara for supplying the samples, and Dr. K. Takahashi, Mr. H. Kurasawa, and Mr. S. Ito of the Geological Survey for separating biotite from the rocks.

References

1) Holmes, A.: A revised geological time-scale, Trans. Edin. Geol. Soc., Vol. 17, p. 183～216, 1959

2) Kawachi, Y.: Granitic rocks and related uraniferous metallic ore deposits in southern Kyushu, Natural occurrence of uranium in Japan, Part 1, Rept. Geol. Surv. J., No. 190, p. 93～104, 1961 (in Japanese)

3) Kawachi, Y.: On the low grade regional metamorphic zone developed in Takakuma-yama, Osumi Peninsula, Southern Kyushu (Preliminary report), Earth Science, No. 58, p. 18～25, 1962 (in Japanese)