

## K-Ar Age of the Shimonohara Quartzdiorite, Hida Mountains, Japan

By

Ken SHIBATA & Tamotsu NOZAWA

### Abstract

K-Ar age measurement was carried out on a biotite separated from the quartzdiorite at Shimonohara, Nyukawa-mura, Gifu pref. The age of 86 m.y. is correlated to middle Cretaceous and consistent with the geological evidence.

### Geological setting

Along the Japanese Alps in the Hida mountains, a vast volume of granitic rocks is exposed. They are mainly of granodiorite with subordinate volume of quartzdiorite and diorite. They are intruded into basement rocks such as the Hida metamorphic rocks, the Funatsu granitic rocks and Paleozoic formations.

The Shimonohara quartzdiorite is one of these granitic rocks and is a small stock of round shape about 500 m across. It is intruded into the phyllitic shale of Permian age with sharp and steep contact plane. Its contact effect is weak but conspicuous. It is fine-grained, porphyritic, light-colored, non-gneissose, nearly homogeneous and poor in inclusions (ISOMI, H. and NOZAWA, T., 1957).

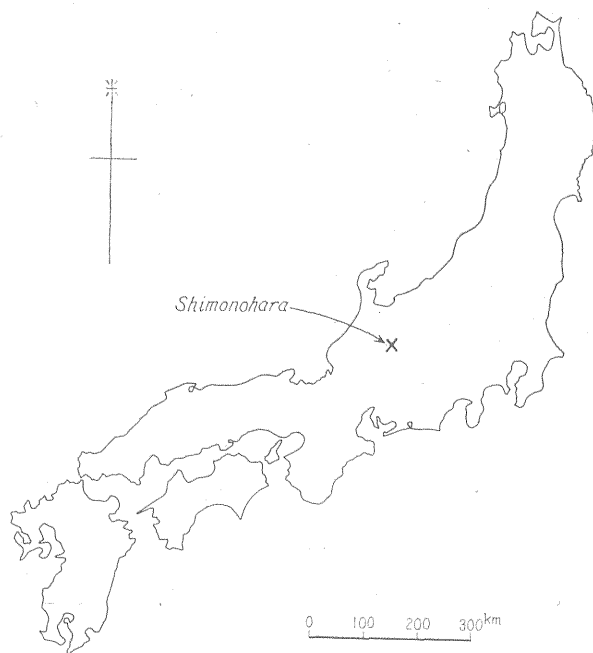


Fig. 1 Index to the Shimonohara area



Fig. 2 Distribution of the younger granitic rocks in the Hida mountains  
(Figures are previous data on their isotopic ages in million years, after H. Nagasawa et al. 1962, unpublished, cited here by their courtesy.)

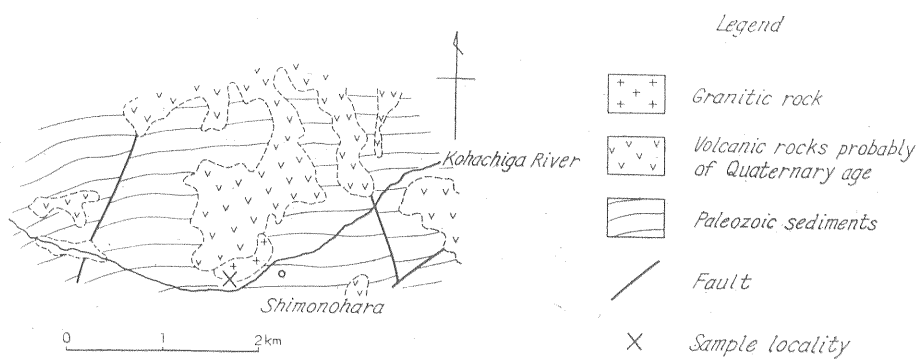


Fig. 3 Geologic map of the Shimonohara district

### Description of the determined sample

Quartzdiorite (TN61091301)

Shimonohara, Nyukawa-mura, Ōno-gun, Gifu pref.

It was taken on the roadside along the Kohachiga river, about 100 m apart from the

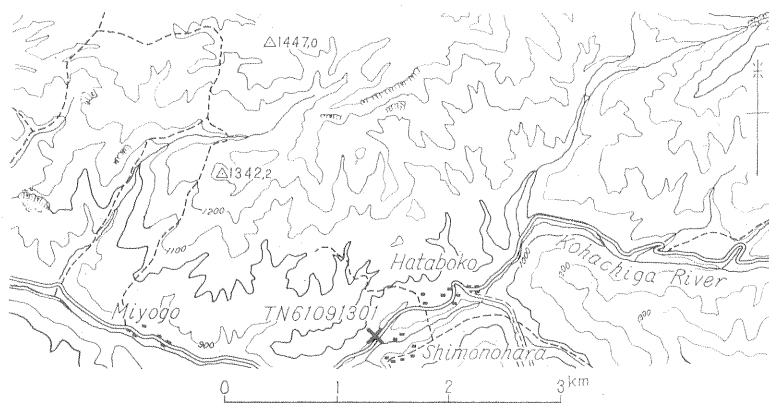


Fig. 4 Sample locality on the 1/50,000 topographic map, Funatsu

contact. It seems to represent the main facies of the quartzdiorite with features mentioned above.

Under the microscope, phenocryst is mainly plagioclase with subordinate volume of quartz and biotite. Matrix is composed mainly of plagioclase, quartz and potash feldspar with a small quantity of hornblende. Apatite, sphene and iron ore are contained, too, in small quantities. Phenocrystic plagioclase is of idiomorphic prism, 3–5 mm long, with repeated zoning and its composition is nearly oligoclase on the periphery of zoned crystal. Phenocrystic plagioclase often takes partly irregular outline like corroded form. Biotite is idiomorphic or hypidiomorphic, 2–3 mm across, with pleochroism, X: pale yellowish brown, Y, Z: brown, and is a little altered to chlorite and partly replaced by nearly colorless hornblende. Quartz is granular, 2–3 mm across. Besides these phenocrysts, there are rarely large phenocrysts of perthite with oligoclase rim, just like Rapakivi structure (NOZAWA, T. et al., 1957). Quartz and feldspar in the matrix are nearly equigranular, 0.2–0.5 mm across. Hornblende is rare and commonly appears replacing the biotite but rarely as single crystal which is idiomorphic long prism, 1–2 mm long, often showing sieve structure.

#### Experimental procedures

K-Ar age determination was made on the biotite separated from the rock sample, using the isotope dilution technique.

Separation of the biotite was carried out with an isodynamic separator after crushing and sieving.

Argon extraction and purification were made in the pyrex high vacuum system. The biotite in a molybdenum crucible was fused at about 1300°C for 30 minutes with an induction heater. The Ar<sup>38</sup> spike was added during fusion, and evolved gases were purified by hot titanium sponge and CuO. The isotopic ratios of argon were measured with the Hitachi RMU-5B mass spectrometer by the flow method.

Potassium determination was made by flame photometry. The biotite was digested with HF and HCl, the residue was dissolved in HCl and diluted to a standard volume, and potassium content was measured with the Hitachi EPU-2 flame photometer.

The results of K-Ar age determination are given in Table 1.

Table 1 K-Ar age of the Shimonohara quartzdiorite

Sample No.	Mineral	K <sub>2</sub> O (%)	Atmospheric contamination (%)	Age and error (million years)
TN 61091301	biotite	6.78	5.6	86±6

$$\lambda_{\beta}=4.72 \times 10^{-10} \text{ yr.}^{-1}, \lambda_{e}=0.584 \times 10^{-10} \text{ yr.}^{-1}$$

### Geological meaning of the result

The result, 86 million years of the Shimonohara quartzdiorite is correlated nearly to middle Cretaceous age. After unpublished data by H. NAGASAWA et al\*, K-Ar age of the granodiorite in the neighborhood of Unazuki, nearly the northern end of the Japanese Alps region, is 88 million years on biotite and 69 million years on the rest whole rock from which biotite was taken away. Thus biotite ages of both granitic rocks are quite similar. There is no geological evidence disharmonious with these results.

By the way, in the southern region out of the Hida mountains, such as Naégi or north of the Ryoike metamorphic belt, there are exposed widely granitic and rhyolitic rocks. These granitic rocks are mostly late Cretaceous or early Tertiary according to isotopic age.

### Acknowledgements

The authors wish to thank Dr. H. NAGASAWA of Gakushuin University for the kind assistance in preparing Ar<sup>38</sup> spike.

Thanks are also due to Dr. H. NAGASAWA and his colleagues for their permission to cite their unpublished data.

### References

- ISOMI, H. & NOZAWA, T. (1957): Geological map, 1/50,000. "Funatsu" and its explanatory text. (in Japanese)
- NOZAWA, T. et al. (1957): Rapakivi structure found in some granites in Hida Mountainland, Japan. *Jour. Geol. Soc. Japan*, vol. 63, no. 737, p. 154-155. (in Japanese)

### 飛驒山地下ノ原石英閃緑岩の K-Ar 年代

柴田 賢 野沢 保

#### 要 旨

岐阜県大野郡丹生川村下ノ原で採取した石英閃緑岩の黒雲母について、K-Ar 法による年代測定を行なった。求められた年代  $86 \times 10^6$  年は白堊紀中期を示し、地質学的事実と矛盾しない。

\* - Cited here by their courtesy.