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K-Ar ages of white micas from pelitic schists of the Bayanhongor area, west Mongolia

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Chikao KURIMOTO, Floragiin TUNGALAG, Lkhamsuren BAYARMANDAL, and Niidengiin ICHINNOROV (1998) K-Ar ages of white micas from pelitic schists of the Bayanhongor area, west Mongolia. *Bull. Geol. Surv. Japan*, vol. 49 (1), p. 19-23, 6 figs., 1 table.

Abstract: The Bayanhongor area is about 500 km west of Ulaanbaatar, and is geotectonically divided into the Baidrag, Burdgol, Bayanhongor, Zag, and Hangai Zones from south to north. K-Ar age determination was made on white micas from two samples of pelitic schists which were collected at the northern extremity of the Bayanhongor Zone. The white micas gave K-Ar ages of 453.9±9.1 Ma and 447.4±9.0 Ma, indicative of the age of metamorphism.

1. Introduction

Mongolia belongs to the Middle Asian-Mongolian Mobile Belt, which is situated between the Siberian Platform and the Sino-Korean Block. The belt is composed of rocks with Precambrian micro-continent affinity and Proterozoic to Phanerozoic rocks.

The authors carried out a geological survey of the Bayanhongor area in 1996 as part of Institute of Geology and Mineral Resources Project of JICA (Japan International Cooperation Agency). The study area is situated in the western part of the Mongolian Steppes, and is about 500 km west of Ulaanbaatar (Fig. 1).

Two samples of pelitic schists were collected at the northern extremity of the Bayanhongor Zone for K-Ar age determination (Fig. 2). This report details the K-Ar ages obtained from white micas in the pelitic schist samples from the Bayanhongor Zone, and briefly describes the geology around the sample localities.

2. Geologic setting

Tomurtogoo (1997) divided Mongolia into the Northern and Southern superblocks, which are separated by the Mid-Mongolian Tectonic Line (Fig. 1). The Northern superblock corresponds to both the Northern and Middle Megablocks of Tomurtogoo (1996). The Bayanhongor area forms part of the Northern superblock.

The geology of Bayanhongor and the surrounding area is represented on geologic sheet maps at a scale of 1:500,000 (Barsbold and Dorjnamjaa, 1993; Borzakovskii, 1990), and 1:200,000 (Bayarsaikhan, 1990; Dzabotkin, 1988; Tumurchudur, 1990).

According to Teraoka *et al.* (1996), the Bayanhongor area is geotectonically divided into the Baidrag, Burdgol, Bayankhongor (Bayanhongor), Dzag (Zag), and Khangay (Hangai) Zones from south to north. The Baidrag Zone is occupied mainly by Archean to Early Proterozoic metamorphic rocks including gneiss, amphibolite, and charnockite. In the Burdgol Zone there is a widely distributed pelitic schist associated with a psammitic schist. The Bayanhongor Zone is characterized by ophiolitic and metamorphic rocks. The Zag Zone is occupied by pelitic and psammitic schists. The Hangai Zone is underlain by a non-metamorphosed sedimentary sequence called the Hangai Group, which is divided into the Erdenetsogt, Tsetserleg, Zhargalant, and Baidrag Formations in ascending order (Ufland and Filippova, 1967). Recently, Kurimoto *et al.* (1997) discovered Late Devonian (Famennian) conodonts from red cherts in the Erdenetsogt Formation.

3. Geology of the Bayanhongor Zone

The Bayanhongor Zone is occupied mainly by an ophiolite in the middle part and metamorphic rocks in the northern and southern parts. The ophiolite structurally overlies the metamorphic rocks, and is composed of serpentine melange, cumulate gabbro

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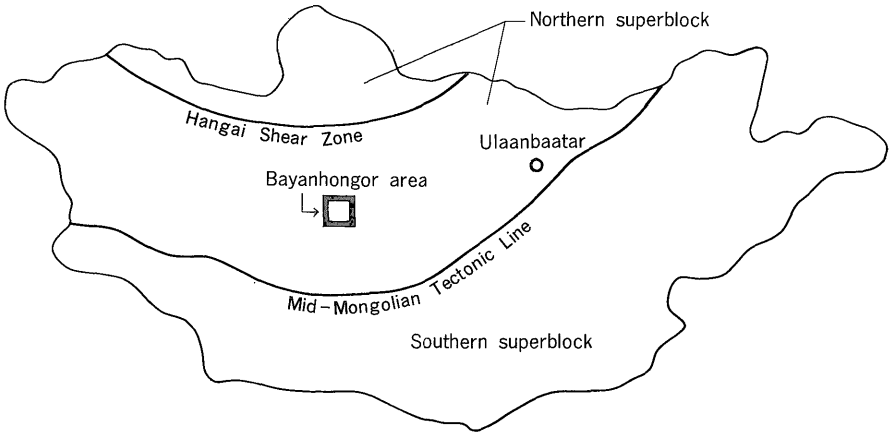

Fig. 1 Map showing the study area.
The tectonic division of Mongolia are after Tomurtogoo (1997).

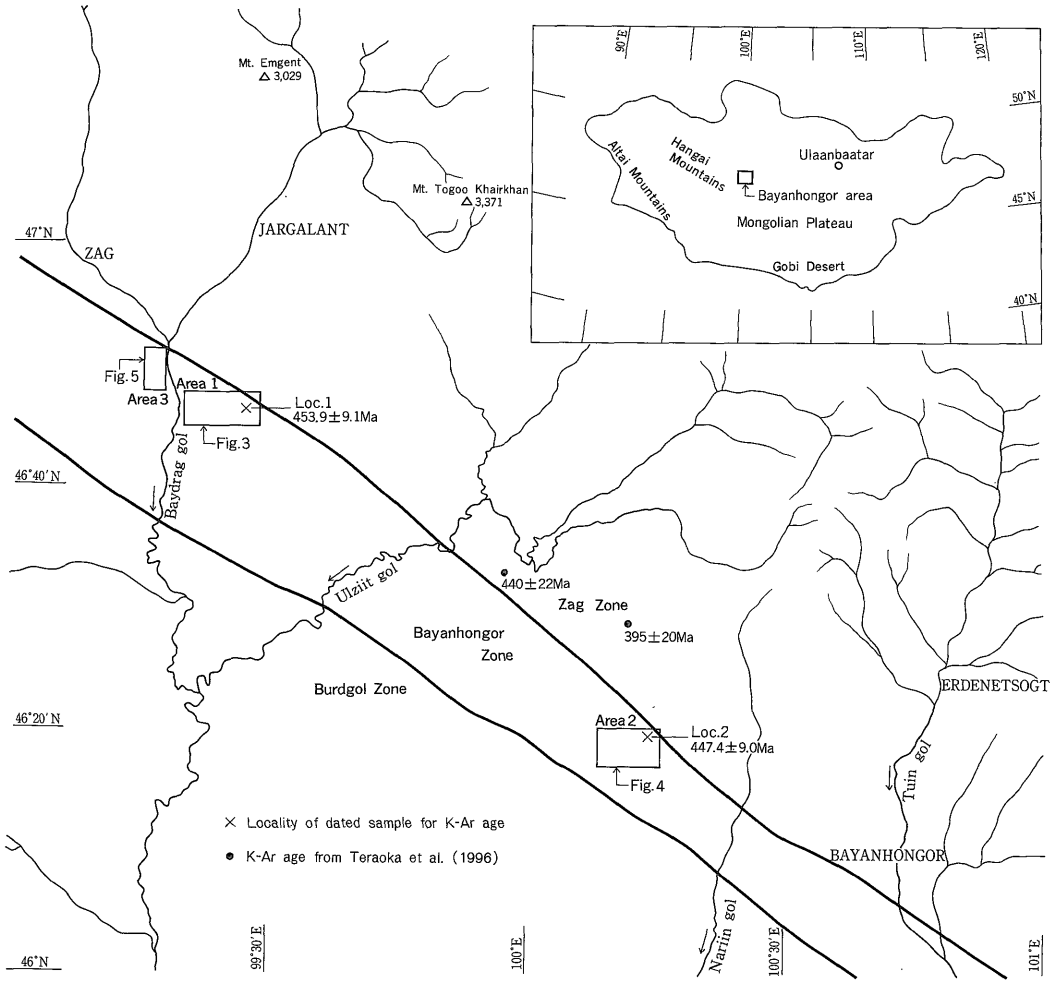

Fig. 2 Map showing the localities of the samples dated.
Locs. 1 and 2 correspond to those of Table 1. The map is based on 1 : 500,000-scale topographic map of Sheet L-47-Б published by the National Geodesic and Topographic Organization of Mongolia.

complex, sheeted dikes, pillow breccia, and pillow lava in ascending order. The pillow lava intercalates carbonate rocks and includes a basalt breccia. Ryazantsev (1994) reported Cambrian fossils (sponges) from the carbonate rocks. In contrast, the metamorphic rocks of the zone consist of pelitic and mafic schists with crystalline limestone and psammitic schist.

The study area (Area 1, 2 and 3) is occupied by the metamorphic rocks of the Bayanhongor Zone (Fig. 2). The rocks are lithologically divided into Units A and B. The lithology of the units is shown in Figs. 3 to 5. The total thickness is more than 2,000 m (Fig. 6).

Unit A consists mainly of pelitic schists with a small amount of mafic schist and crystalline limestone. The pelitic schist is black to grayish black in color, and sometimes includes quartz segregation veins. The mafic schist and crystalline limestone are contained in the pelitic schists as blocks which are several meters in diameter.

Unit B consists mainly of mafic schists and crystalline limestone associated with pelitic and psammitic schists. The original rocks of the mafic schists were basalt lava and volcaniclastic rocks. The crys-

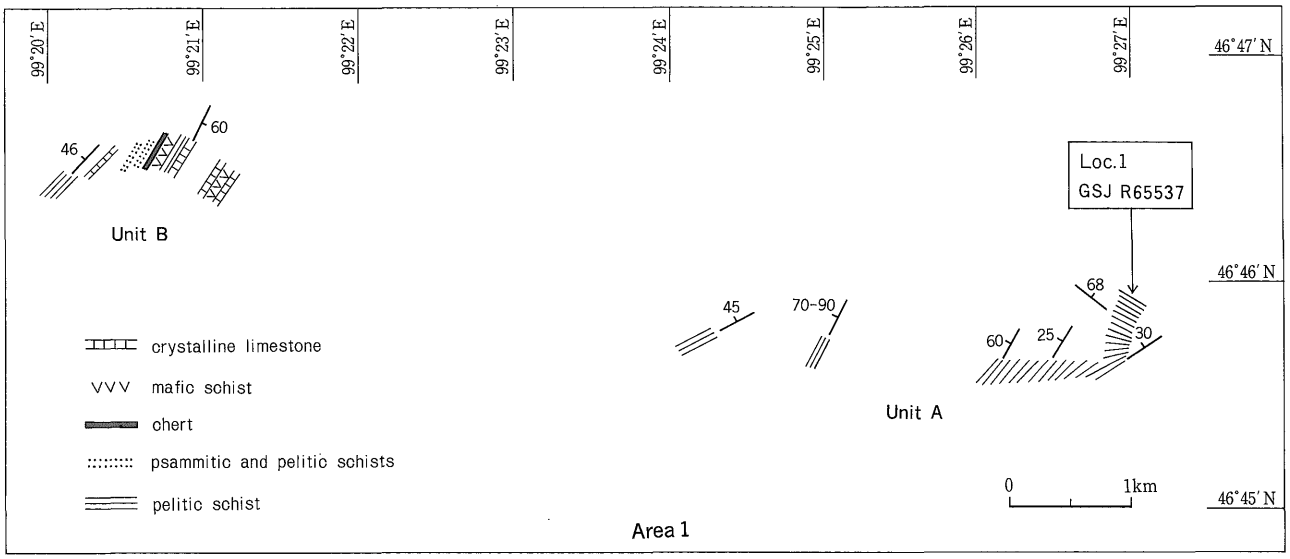

Fig. 3 Route map of Units A and B in Area 1, showing the locality of the dated sample. Mapped area is shown in Fig. 2.

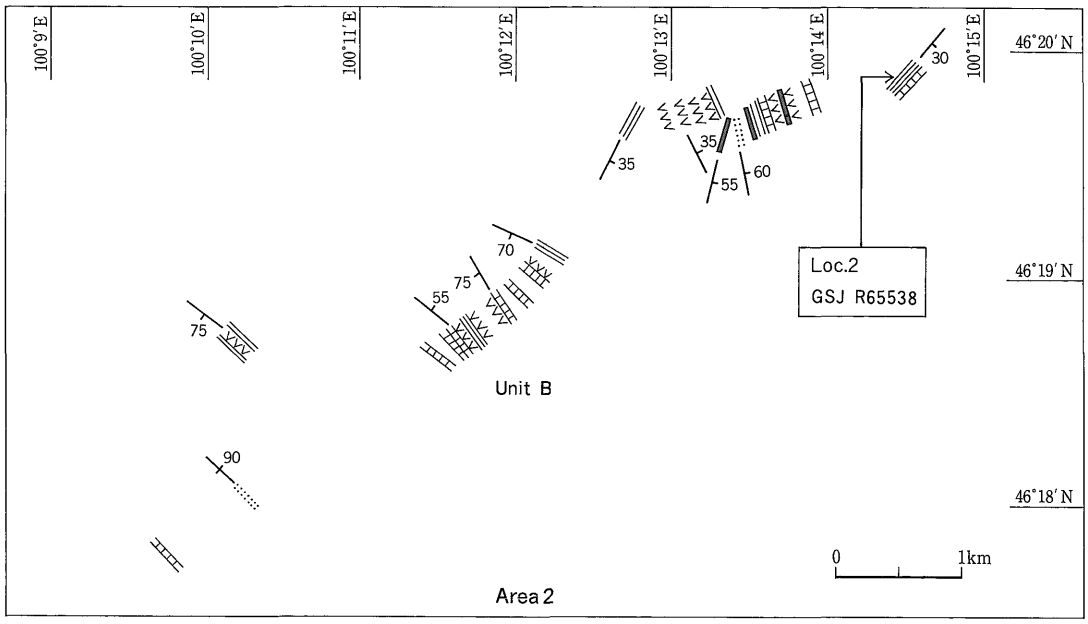

Fig. 4 Route map of Unit B in Area 2, showing the locality of the dated sample. Mapped area is shown in Fig. 2. Legend is the same as in Fig. 3.

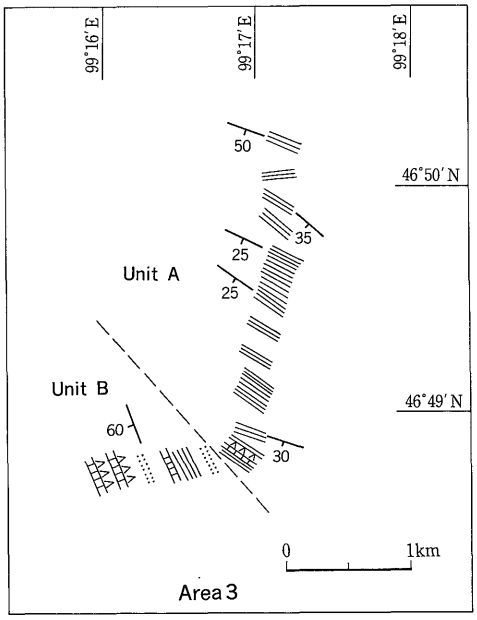

Fig. 5 Route map of Units A and B in Area 3. Mapped area is shown in Fig. 2. Legend is the same as in Fig. 3.

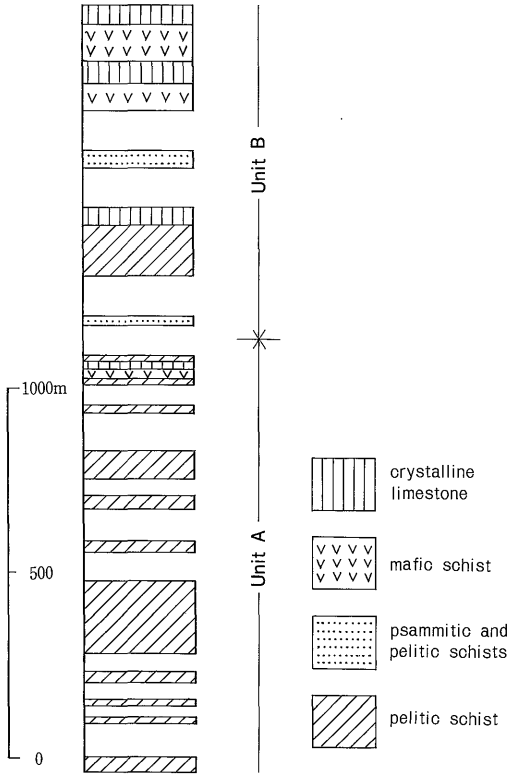

Fig. 6 Schematic section showing the geological sequence based on the route map of Fig. 5. Legend is the same as in Fig. 3.

talline limestone still preserves a well-bedded structure. The pelitic schists often includes blocks of chert and mafic schist, and represents a chaotic fabric.

4. K-Ar age

Two samples of the pelitic schists were collected for K-Ar dating from the Bayanhongor Zone, and their localities are shown in Fig. 2. The pelitic schist sample from Loc. 1 (46° 45.93′ N, 99° 26.98′ E) shows a foliated structure, and contains quartz, albite, white mica, chlorite, and epidote as metamorphic minerals. Quartz-rich layers and white mica-chlorite-rich layers are interbedded with thicknesses of 1 to 2 mm. The sample from Loc. 2 (46° 19.88′ N, 100° 14.50′ E) is also a pelitic schist, which has the same characteristics as the sample collected from Loc. 1. The sample from Loc. 1 was dated at 453.9±9.1 Ma, and that from Loc. 2 at 447.4±9.0 Ma (Table 1).

In this report, the authors regard the dates obtained for the samples to represent the metamorphic rocks of the Bayanhongor Zone. As shown in Fig. 2, the routes mapped are situated at the northern extremity of the Bayanhongor Zone. Teraoka et al. (1996) reported K-Ar ages of 395±20 Ma and 440±22 Ma for pelitic schists in the Zag Zone (Fig. 2), with one of these being very close to the K-Ar ages obtained in this study. As the Southern Belt of the Zag Zone is occupied mostly by pelitic schists (Teraoka *et al.*, 1996), it is possible that the metamorphic rocks from the sample localities may belong to the Zag Zone. However, the authors consider the rocks dated belong to the Bayanhongor Zone because they are accompanied by the mafic schists and crystalline limestone, which are characteristic of the Bayanhongor Zone. However, the boundary and relationship between the Bayanhongor and Zag Zones must be investigated in detail.

5. Conclusion

K-Ar ages of 453.9±9.1 Ma and 447.4±9.0 Ma were determined from white micas in two samples of pelitic schists from the Bayanhongor Zone, west Mongolia, indicating that regional metamorphism took place during the Ordovician.

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Table 1 K-Ar ages of white micas from pelitic schists of the Bayanhongor area, west Mongolia. Measured by the Institute of Geological and Nuclear Sciences Ltd. New Zealand.

Locality number	Sample number	K (wt.%)	Rad. ^{40}Ar (total %)	K-Ar age (Me)
Loc. 1	GSJ R 65537	4.09	98.6	453.9±9.1
Loc. 2	GSJ R 65538	4.81	98.4	447.4±9.0

$\lambda_\varepsilon = 0.581 \times 10^{-10}$/yr, $\lambda_\beta = 4.962 \times 10^{-10}$/yr, $^{40}K/K = 0.0001167$

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モンゴル西部，バヤンホンゴル地域に分布する泥質片岩の白雲母 K-Ar 年代

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要　旨

モンゴル西部のバヤンホンゴル地域は南から北にむかって，バイドラッグ帯，ブルドゴル帯，バヤンホンゴル帯，ザッグ帯及びハンガイ帯に区分される．これらのうち，バヤンホンゴル帯はオフィオライトと変成岩類から構成されている．

今回，バヤンホンゴル帯に属する泥質片岩を採取し，白雲母 K-Ar 年代を測定した．結果は 453.9±9.1 Ma と 447.4±9.0 Ma であった．これらの放射年代は変成作用の年代を示し，バヤンホンゴル地域のテクトニクスを考察する上で重要な資料となる．