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Reviews

Geochronological data of granitoids in the Bayankhongor area, central Mongolia

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Abstract: We reviewed the radiometric age data of the granitoids in the Bayankhongor area of central Mongolia. Age data are grouped into early Proterozoic, Riphean, early Paleozoic (Cambrian to Ordovician), late Paleozoic (mostly Permian), and Mesozoic (Jurassic).

The ages of diorite-granite stock-like small bodies, which were dated to be Carboniferous by previous work, were newly determined to be Permian. The Khangai Granite and Shar-us-gol Granite, which are representative batholithic bodies in Mongolia, show almost the same radiometric ages, latest Permian though it was previously stated that the former intruded in Carboniferous to Permian and the latter in Triassic. The Sr initial ratios in most late Paleozoic granitoids are around 0.7050.

1. Introduction

Mongolia is geologically situated between the Siberian Platform and Sino-Korean Block. The Bayankhongor area of central Mongolia exposes geologic units from Archean to Cenozoic. Therefore the geological investigation of this area will contribute to the construction of the history of assembly and dispersion of the continents.

Russian and German geologists were determining the radiometric ages of the granitoids in Mongolia, but some data are not shown in a printed publication but in open file reports of the Mongolian Geological Survey in Russian or Mongolian. We were engaged in a geological mapping project of the Bayankhongor area, central Mongolia, and have gathered some geochronological data. Some of our data are shown in a Mongolian domestic journal. Both Russian and German data, and our data should be reviewed because it is generally difficult to inspect the open files and domestic journals in Mongolia. In this paper, we summarize the radiometric age data of the granitoids in previous reports and our recent reports. We have used the geological description by Takahashi, Oyungerel and Naito, petrography by Oyungerel and Naito, and Rb–Sr age determination by Arakawa.

2. Geological Setting

The Bayankhongor area is located in central Mongolia about 600 km WSW of Ulaanbaatar. The investigated area ranges from 45°20′ to 47°20′N in latitude and from 98°to 102°E in longitude. The area is mostly located at the southern foot of the Khangai Mountains, and the southeastern part of the area is at Lake Vally. The highest part of the area is the northwest district with some peaks higher than 3000 m.

The Bayankhongor area has been geologically studied by many geologists (e.g., Kopteva *et al.*, 1984; Kepezhinskas and Zhirakovsky, 1987; Teraoka *et al.*, 1996; Tungalag, 1997). According to new geological maps of the Bayakhongor area (Geology Group of IGMR Project, 1999), the area is roughly divided into Baidrag and Bombogor Metamorphic Complexes, Burdgol Group, Bayankhongor Ophiolite Complex, Jiremnuruu Group, Dzag Group, and Khangai Group that are separated from each other by northwest-southeast trending faults. A simplified geologic map is shown in Fig. 1.

The Baidrag Metamorphic Complex consists of "gray" tonalitic gneisses which are Archean high-grade

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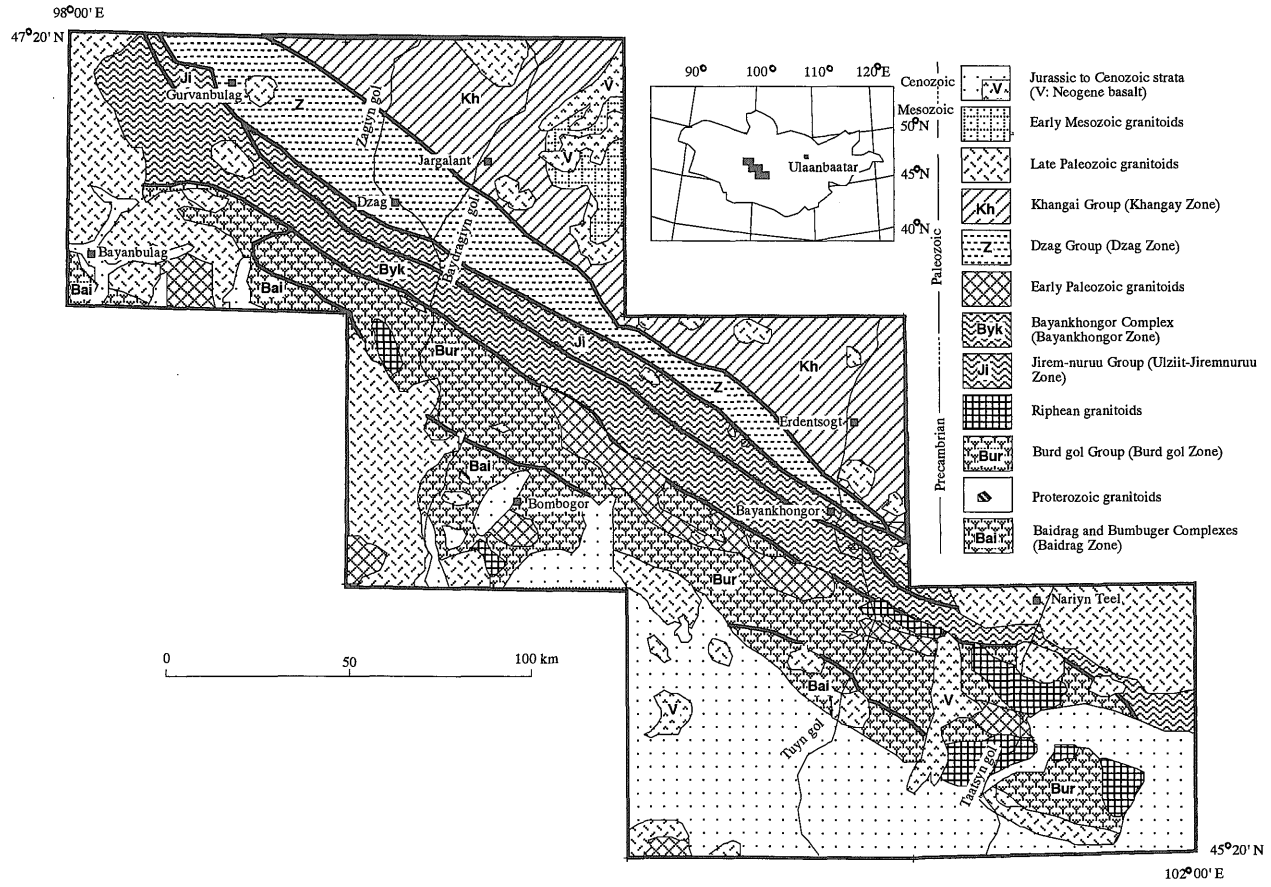

Fig. 1 Simplified geologic map Modified from Geology Group of IGMR Project (1999). The word "gol" in this figure means river in Mongolian.

metamorphic rocks ranging from amphibolite to granulite facies. The Bombogor Metamorphic Complex is composed of gneisses, crystalline schists, amphibolite, leptite, marble, and quartzite. The Burd-gol Group is composed of rocks of the middle to late Riphean age: conglomerate, quartzite, meta-sandstone, shale, limestone, and basaltic sill. The Jirem-nuruu Group consists of Riphean serpentinite, meta-gabbro, amphibolite, crystalline schist, stromatolite limestone, and quartzite, and Vendian to Cambrian shale, sandstone, limestone, quartzite, and basalt. The Bayankhongor Ophiolite Complex is a Vendian to Cambrian ophiolitic sequence such as ultrabasic rocks, gabbro, sheeted dykes, basalt, limestone, and tuffaceous sandstone. The Dzag Group consists mainly of Cambrian to Ordovician sandstone associated with conglomerate and shale. The Khangai Group consists of Devonian to Carboniferous turbidite sediments.

Various granitic bodies intruded into these geologic units. They are roughly divided into Proterozoic granitoids, Riphean granitoids, early Paleozoic granitoids, late Paleozoic granitoids and Mesozoic granitoids (discussed later).

3. Radiometric age data of the granitoids

Age data are shown in Table 1. Data are not re-calculated because the original analytical results and decay constants were not shown in many reports. We recently determined new K–Ar and Rb–Sr ages of the granitoids (see Table 2). Modal and chemical data (A/CNK vs. A/NK) of the Paleozoic granitoids are shown in Figs. 2 and 3, respectively.

3.1 Proterozoic granitoids

The Proterozoic granitoids outcrop around Bombogor. Early Proterozoic granitoids intrude the gneissose rocks of the Baidrag and Bombogor metamorphic complexes. The granitoids are composed of strongly deformed granodioritic stocks and concordant to discordant granitic dykes. Age data of the granitoids and related gneiss can be referred from Kotov *et al.* (1995). The U–Pb method of zircon was used for age determination of these rocks. Tonalitic gneiss was dated Archean, 2646 Ma. The granitoids were dated early Proterozoic, 2364 to 1825 Ma.

Table 1 Radiometric age data of the granitoids (part 1)

Name*	Locality**		Rock type	Method(material)	Age (Ma)	Reference
Egiin davaa Gr	99° 59'E	47° 12'N	Gr	K-Ar (Bt)	188	Fedoreva (1977)
Shar-us-gol Gr	99° 24'E	46° 04'N	Bt Gr	K-Ar (Bt)	216±7	Zabotkin (1988)
Khangai Gr	100° 14'E	46° 40'N	Grd	K-Ar (Bt)	223, 375	Tumorchudor (1990)
Khangai Gr	101° 25'E	45° 58'N	Gr	K-Ar (Bt)	215	Zabotkin (1988)
Khangai Gr	101° 27'E	45° 59'N	Gr	K-Ar (Bt)	336±6	Zabotkin (1988)
Khangai Gr	101° 30'E	45° 59'N	Gr	K-Ar (Bt)	193±3	Zabotkin (1988)
Khangai Gr	101° 32'E	45° 58'N	Gr	K-Ar (Bt)	320	Zabotkin (1988)
Tsogt hairhan Cm	100° 12'E	46° 07'N	Gb	K-Ar (WR)	341	Andreas et al. (1968)
Tsogt hairhan Cm	100° 12-13'E	46° 07'N	Dio	Rb-Sr (WR,3sp)	250.4±85.7	JICA and MMAJ(1997)
Tsogt hairhan Cm	99° 26'E	46° 12'N	Dio	K-Ar (Bt)	312	Izoh et al. (1990)
Tsahir uul Cm	100° 09'E	46° 08'N	Grd	K-Ar (WR)	268.1±5.6	JICA and MMAJ(1997)
Tsahir uul Cm	100° 13'E	46° 09'N	Adamellite	K-Ar (WR)	384.7±7.8	JICA and MMAJ(1997)
Tsahir uul Cm	99° 46'E	46° 27'N	Qtz Dio	K-Ar (Bt)	519	Andreas (1970)
Tsahir uul Cm	99° 55'E	46° 23'N	Grd	K-Ar (Bt)	551	Andreas (1970)
Tsahir uul Cm	101° 21'E	45° 40'N	Gr	K-Ar (Bt)	408±20	Zabotkin (1988)
Tsahir uul Cm	101° 21'E	45° 39'N	Gr	K-Ar (Bt)	405±2	Zabotkin (1988)
Riphean Gr	100° 06'E	46° 10'N	Leuco Gr	Pb-Pb	1000±46	Tumorchudor (1990)
Riphean Gr	100° 06'E	46° 10'N	Leuco Gr	Pb-Pb	1222±78	Tumorchudor (1990)
Riphean Gr	101° 38'E	45° 31'N	Leuco Gr	Pb-Pb	1100±75	Zabotkin (1988)
Proterozoic Gr	99° 24'E	46° 16'N	Gr	U-Pb (Zrn)	1825±5	Kotov et al. (1995)
Proterozoic Gr	99° 28'E	46° 16'N	Grd	U-Pb (Zrn)	1854±5	Kotov et al. (1995)
Proterozoic Gr	99° 30'E	46° 15'N	Gr	U-Pb (Zrn)	2308±4	Kotov et al. (1995)
Proterozoic Gr	99° 49'E	46° 10'N	Qtz Dio	U-Pb (Zrn)	2364±6	Kotov et al. (1995)
Proterozoic Gr	99° 21'E	46° 14'N	Tonalitic gneiss	U-Pb (Zrn)	2646±45	Kotov et al. (1995)

*Based upon Geology Group of IGMR Project (1999)
**Coordinates are roughly presumed on the basis of original description.
Abbreviation: Gr; Granite, Grd; Granodiorite, Dio; Diorite, Gb; Gabbro, Cm; Complex, WR; Whole rock
Mineral symbols are based on Kretz (1983).

Table 2 Radiometric age data of the granitoids (part 2)

(1) K-Ar age data of the granitoids

Name	Sp. no.	Locality	Material	Isotopic age (Ma)	40Ar* scc/gm x 10-5	%Ar*	%K
Shar-us-gol Gr	6023-1	98° 12'E 46° 52'N	Bt	235±12	6.73	88.9	7.03
					6.98	91.8	7.02
	6023-2	*ibid*	Bt	242±12	7.07	95.0	7.05
					7.11	95.1	7.04
Khangai Gr	P97-56	99° 35'E 47° 18'N	Bt	249±12	6.36	98.6	6.15
					6.41	98.3	6.18

Analyst: Teledyne Isotope

Name	Sp. no.	Locality	Material	Isotopic age	40Ar(radiogenic) nl/g	total	%K
Tsahir uul Cm	N95070201	99° 50'E 46° 24'N	Bt	469±9	28.4	85	1.40

Analyst: Geological & Nuclear Sciences

(2) Rb-Sr isotopic data of the granitoids

Name	Sp. no.	Locality	Material	Rb (ppm)	Sr (ppm)	87Rb/86Sr	87Sr/86Sr ±2σ
Shar-us-gol Gr	246	98° 06'E 46° 54'N	WR	241	139	5.016	0.723742 ±0.000011
	2146	98° 08'E 46° 55'N	WR	75	15	14.47	0.760941 ±0.000023
	6018	98° 12'E 46° 53'N	WR	124	37	9.696	0.736654 ±0.000011
Khangai Gr	P97-31	100° 49'E 46° 18'N	WR	103	406	0.737	0.707582 ±0.000008
	P97-32	100° 49'E 46° 17'N	WR	67	656	0.300	0.706088 ±0.000010
	P97-54	100° 01'E 46° 49'N	WR	159	422	1.090	0.708830 ±0.000010
	P97-56	99° 35'E 47° 18'N	WR	154	391	1.139	0.709138 ±0.000012
	P97-70	101° 30'E 45° 59'N	WR	11	307	0.104	0.705550 ±0.000012
Daltyn-am Cm	P97-62	100° 02'E 46° 29'N	WR	52	751	0.200	0.706239 ±0.000015
	P97-64	100° 02'E 46° 29'N	WR	35	743	0.136	0.705701 ±0.000013
	P97-65	100° 02'E 46° 29'N	WR	175	656	0.772	0.708133 ±0.000015
	P97-67	100° 02'E 46° 29'N	WR	133	696	0.553	0.707385 ±0.000013
	P97-68	100° 02'E 46° 29'N	WR	87	734	0.343	0.706597 ±0.000013

3.2 Riphean granitoids

Riphean granitoids are distributed in the southeastern part of the area. The granitoids are composed of leucocratic granite and a minor amount of diorite. Some granitoids are deformed and foliated. Three samples of leucocratic granite were dated 1222, 1100, and 1000 Ma using the Pb–Pb method (Zabotkin, 1988; Tumurchudur *et al.*, 1990).

3.3 Early Paleozoic granitoids

The early Paleozoic granitoids are divided into Cambrian to Ordovician batholithic bodies and "Ordovician" small granitic bodies. The batholithic bodies are subdivided into Togtokhynshil, Telmen, and Tsahir-uul

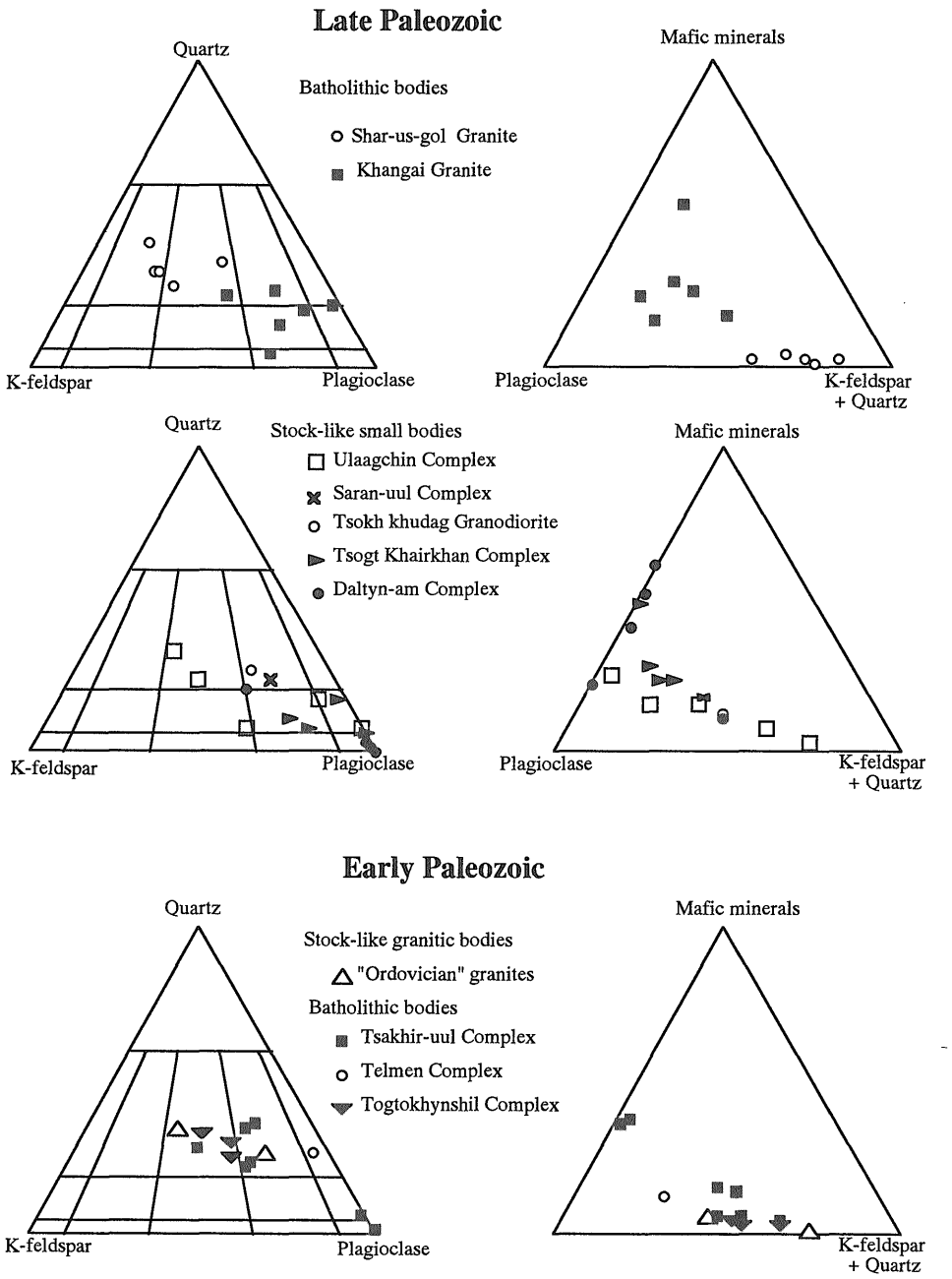

Fig. 2 Modal compositions of the granitoids

Complexes. They are composed of granitic facies and a minor amount of dioritic facies. The "Ordovician" small granitic bodies are often altered.

The Tsahir-uul Complex is a representative early Paleozoic granitic body, and was previously called Baidrag Complex (Takahashi *et al.*, 1998). The Tsahir-uul Complex consists mainly of granitic facies (granodiorite to granite) with minor of diorite facies (Fig. 2) and shows I- and S-types of chemical characteristics (Fig. 3). This body was dated 519 and 551 Ma by Andreas (1970) and 405 and 408 Ma by Zabotkin (1988) using K–Ar method. We determined an age of 469 Ma for this body (Takahashi and Delgertsogt, 1997). Younger age data, 384 and 268 Ma, have been also reported from this body (JICA and MMAJ, 1997). We interpreted these results as being young due to the thermal effect of the late Paleozoic Tsogt Khairkhan Complex.

3.4 Late Paleozoic granitoids

Late Paleozoic granitoids are divided into granite-diorite complexes and monotonous batholithic granitic bodies. The former occurs as stock-like small bodies and consists of gabbro, diorite, quartz monzodiorite,

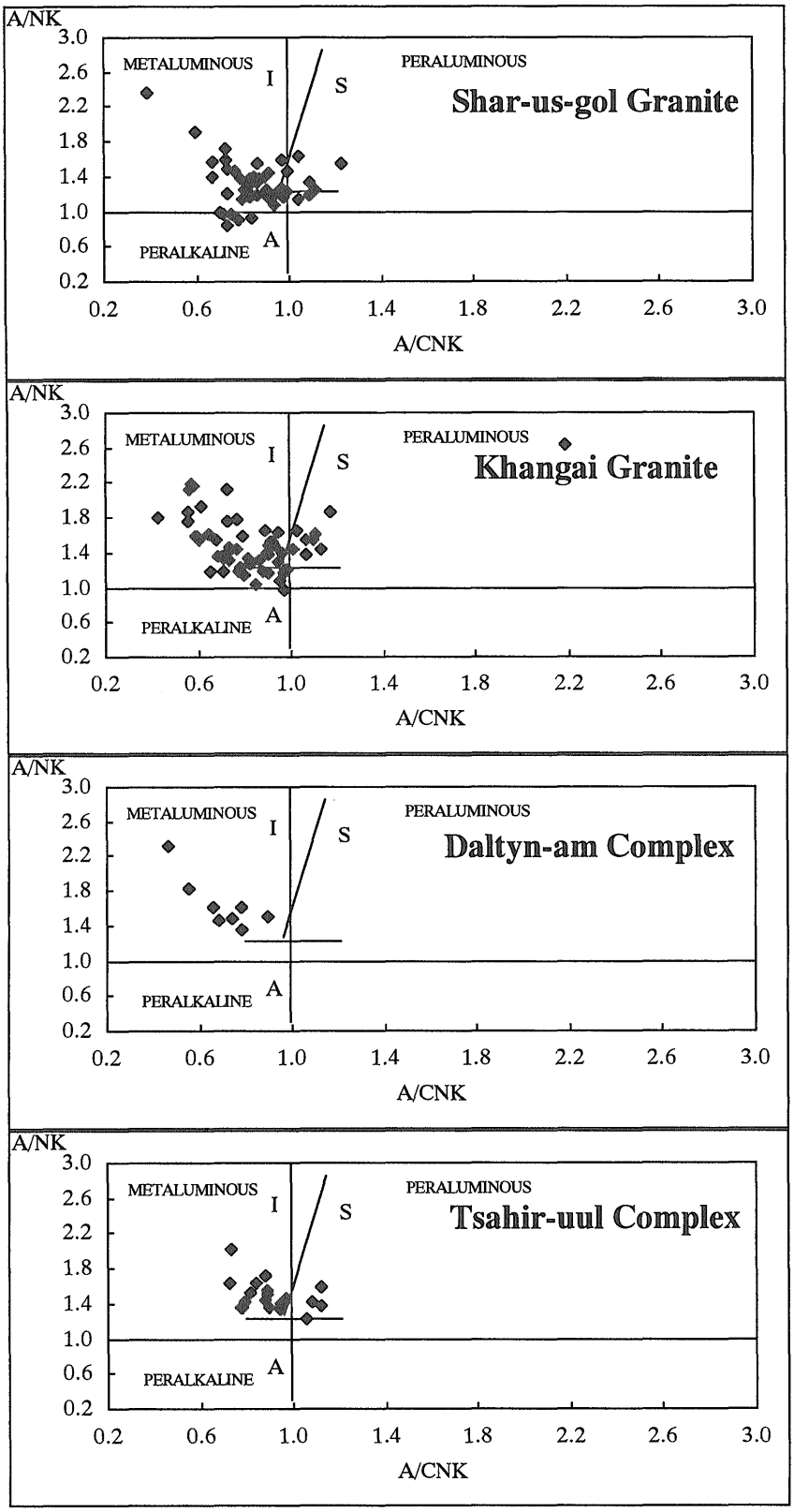

Fig. 3 A/NK vs. A/CNK diagram A/NK: $Al_2O_3/(Na_2O+K_2O)$, A/CNK: $Al_2O_3/(CaO+Na_2O+K_2O)$ in molecule. I, S, and A are fields of I-, S-, and A-type granitoids (Chappel and White, 1977; Collins *et al.*, 1982). Boundaries are modified on the basis of Maeda *et al.* (1986). Chemical data are based upon data in the texts of previous geological maps (e.g., Tumurchudor, 1990; Davaa *et al.*, 1989; Bayarsaihan *et al.*, 1990) and our unpublished data.

granodiorite, and granite (Fig. 2). They are named Tsogt Khairkhan Complex, Daltyn-am Complex, Tsokhkhudag Granodiorite, Saran-uul Complex, and Ulaagchin Complex. The Shar burd diorite and Tsogt Khairkhan-north diorite in the previous report (Takahashi *et al.*, 1998) are included in the Tsogt Khairkhan Complex. These stock-like bodies are generally magnetite-series granitoids (Takahashi *et al.*, 1997). The Daltyn-am Complex shows chemical characteristics of I-type (Fig. 3).

The batholithic granitic bodies are divided into Khangai Granite and Shar-us-gol Granite. The Khangai Granite mostly intrudes into Devonian to Carboniferous sedimentary rocks of the Khangai Group. The Shar-us-gol Granite intrudes into the Baidrag and Bombogor Metamorphic Complexes. The Khangai Granite is composed of quartz monzodiorite with a minor amount of diorite and mostly shows ilmenite-series characteristics (Takahashi *et al.*, 1997). The Shar-us-gol Granite is composed of granite (both of syeno- and monzo-granites) and shows magnetite-series characteristics. Chemical characteristics of these Granites are not clearly defined into the I-, S-, and A-type classification (Fig. 3).

In previous reports, the age of the Tsogt Khairkhan Complex, one of the granite-diorite stock-like complexes, is Carboniferous, i.e., 341 Ma (Andreas *et al.*, 1968) and 312 Ma (Izoh *et al.*, 1990). Recently JICA and MMAJ (1997) presented a Rb–Sr whole rock isochron age of 250 Ma for the gabbronorite body that was dated 341 Ma by Andreas *et al.* We surveyed the Daltyn-am Complex in detail and dated using the Rb–Sr whole rock isochron method (Arakawa *et al.*, 1998). When we checked the geology and petrography of this Complex after Arakawa *et al.* (1998), it was made clear that one of the samples that Arakawa *et al.* (1998) analyzed should be excluded for the age calculation. As a result, we adopt the age of 275±12 (2σ) Ma from specimen nos. P97–64, 65, 67, and 68 (Table 2) though the age value of Arakawa *et al.* (1998), 287 Ma, is near to the newly calculated value of 275 Ma.

For the Khangai Granite, much age data were reported and its range is wide, Carboniferous to Triassic, as shown in Table 1 (Zabotkin, 1988; Tumurchudur *et al.*, 1990). We determined its age as 249 Ma using the K–Ar biotite method (Arakawa *et al.*, 1999). The Rb–Sr age concordant with this K–Ar age was also reported but it should not be used for the discussion because the analyzed samples were collected in a wide area.

The K–Ar biotite age of the Shar-us-gol Granite, 216 Ma, was reported by Zabotkin (1988). We obtained new data, 235–242 Ma using the K–Ar biotite method.

3.5 Mesozoic granitoid

Mesozoic granitoid, Egiin-davaa Granite, outcrops in the northern part of the study area. The Granite intrudes into the latest Permian Khangai Granite with a discordant boundary in the area. It is composed of medium-grained granodiorite to granite. The Granite was determined to be 127 to 220 Ma (Koval *et al.*, 1982; Fedorova, 1977) but only the K–Ar biotite age of Fedorova (1977), 188 Ma, is listed in Table 2 because the locations of the other samples were not clear. Older data (375 and 289 Ma) were also reported by Fedorova (1977), but these samples were taken outside of our study area and described as partly contaminated. Though the geological setting of the rocks having an age of 375 and 289 Ma is unclear, at least, the Egiin-davaa

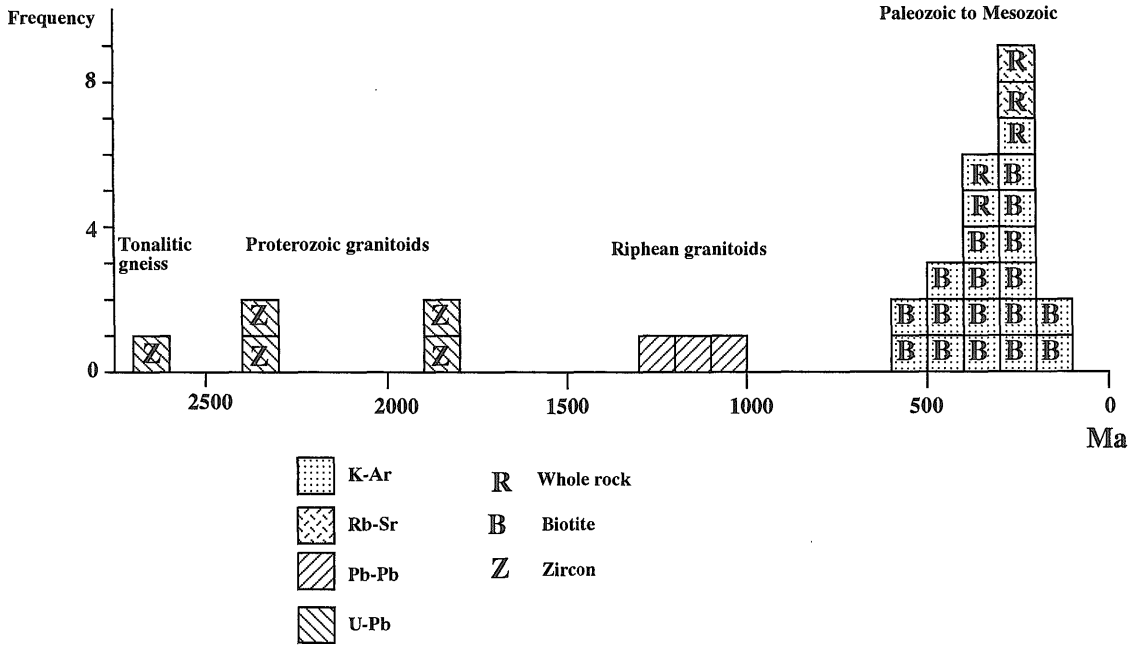

Fig. 4 Histogram of age data

Granite in our study area should be inferred to be Mesozoic from the field relationship that the Egiin-davaa Granite intrudes into the Khangai Granite.

4. Summary and discussion

We reviewed the radiometric age data of the granitoids in the Bayankhongor area. All data are shown in a histogram, Fig. 4. The first peak is early Proterozoic, 2500 to 1800 Ma, and second peak is Riphean, 1200 to 1000 Ma. Much age data are concentrated in Paleozoic to Mesozoic. On closer examination, Paleozoic to Mesozoic age data are grouped into early Paleozoic (Cambrian to Ordovician), late Paleozoic (mostly Permian), and Mesozoic (Jurassic).

In the comparison of our data with previous reports, it is suggested that the age of late Paleozoic diorite-granite stock-like small bodies may be changed to Permian from Carboniferous age (e.g., Tumurchudur *et al.*, 1990). For the batholithic bodies, both the Khangai Granite and Shar-us-gol Granite show almost the same radiometric age, latest Permian, though it was previously reported that the Khangai Granite is older than the Shar-us-gol Granite (e.g., Davaa, 1989).

When the Sr initial ratios are calculated by assuming an age of 250 Ma for the Khangai and Shar-us-gol Granites and 280 Ma for the Daltyn-am Complex, the ratios are mostly concentrated at 0.7045–0.7052.

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References

Andreas, D. (1970) Geological sheet map (L–47–55E, 56, 67E, 68), 1:100,000. Open file report in Geological Funds of Mongolia no. 1895. (in Russian)

Arakawa, Y., Naito, K., Takahashi, Y., Oyungerel, S. and Amakawa, H. (1998) Rb–Sr whole rock isochron age of Daltyn-am Complex in Bayankhongor area, central Mongolia. *Mongolian Geoscientist*, no. 8, 16–19.

Arakawa, Y., Naito, K., Takahashi, Y., Oyungerel, S. and Amakawa, H. (1999) New K–Ar and Rb–Sr ages of Khangay Granite, central Mongolia. *Mongolian Geoscientist*, no. 12, 32–35.

Bayarsaihan, Ts. (1990) Geological sheet map (L–47–X), 1:200,000. Open file report in Geological Funds of Mongolia no. 4421, Ulaanbaatar, Mongolia. (in Mongolian)

Chappell, B. W. and White, A. J. R. (1974) Two contrasting granite types. *Pacific Geology*, **8**, 173–174.

Collins, W. J., Beams, S. D., White, A. J. R. and Chappel, B. W. (1982) Nature and origin of A-type granites with particular reference to southeastern Australia. *Contrib. Mineral. Petrol.*, **80**, 189–200.

Davaa, O. (1989) Geological sheet map (L–47–IX), 1:200,000. Open file report in Geological Funds of Mongolia no. 4313, Ulaanbaatar, Mongolia. (in Mongolian)

Fedorova, M. E. (1977) *Geological position and petrology of granitoids in Khangai upland (Central Mongolia)*. Nauka, Moscow, 149p. (in Russian)

Geology Group of IGMR Project (1999) *Geology of the Bayankhongor area.* With Geological Sheet Maps at 1:200,000, Bureau of Geological Investigation, 9p, Ulaanbaatar, Mongolia.

Izokh, A. E., Polyakov, G. V., Krivenko, A. P., Bognibov, V. I. and Bayarbileg (1990) *The gabbro formations of Western Mongolia.* Nauka, 269p. (in Russian)

JICA (Japan International Corporation Agency) and MMAJ (Metal Mining Agency of Japan) (1997) *Report on the mineral exploration in the Tsagaan Tsakhir Uul area, Mongolia (phase I).* 223p.

Kepezhinskas, K. P. and Zhirakovsky, V. Zu. (1987) Mineralogical criteria for structure and metamorphic evolution of the earth's crust of the Bayankhongorskaja zone. *J. Geoloiyai Geophizica*, **8**, 63–70. (in Russian)

Kopteva, V., Kuzumin, M. I. and Tomurtogoo, O. (1984) Structure of the upper part of Bayankhongor ophiolite zone, Mongolia. *Geotektonika*, **18**, 481–490. (in Russian)

Kotov, A. B., Kozakov, I. K., Bibikova, E. V., Salnikova, E. B., Kirnozova, T. I. and Kovach, V. P. (1995) Duration of the episodes of regional metamorphism in the area of polycyclic endogenic processes: Evidence from U–Pb geochronological data. *Petrologiya*, **3**, 622–631. (in Russian)

Kozakov, I. K., Kotov, A. B., Kovach, V. P. and Salnikova, E. B. (1997) Crustal growth in the geologic evolution of the Baidarik Block, central Mongolia: Evidence from Sm–Nd isotopic systematics. *Petrology*, **5**, 201–207.

Koval, P. V., Yakimov, V. M., Naigebauer, V. A. and Goreglyad, A. V. (1982) *Regional petrochemistry of Mesozoic intrusions of Mongolia.* Nauka, Moscow, 207p. (in Russian)

Kretz, R. (1983) Symbols for rock-forming minerals. *American Mineralogist*, **68**, 277–279.

Maeda, J., Suetake, S., Ikeda, Y., Tomura, S., Motoyoshi, Y. and Okamoto, Y. (1986) Tertiary plutonic rocks in the axial zone of Hokkaido-distribution, age, major element chemistry, and tectonics–. *Monograph Assoc. Geol. Collab.*

Japan, no. 31, 223–246. (in Japanese with English abstract)

Takahashi, Y. and Delgertsogt, B. (1997) New K–Ar age for the Baydrag complex. *Mongolian Geoscientist*, no. 3, 35.

Takahashi, Y., Oyungerel, S. and Delgertsogt, B. (1997) Petrography of some dioritic bodies in the Bayankhongor area, central Mongolia with special reference to relationship between twinning laws and geological setting. *Mongolian Geoscientist*, no. 5, 6–17.

Takahashi, Y., Oyungerel, S., Naito, K. and Delgertsogt, B. (1998) The granitoid series in Bayankhongor area, central Mongolia. *Bull. Geological Survey of Japan*, **49**, 25–32.

Teraoka, Y., Suzuki, M., Tungalag, F., Ichinnorov, N. and Sakamaki, Y. (1996) Tectonic framework of the Bayankhongor area, west Mongolia. *Bull. Geological Survey of Japan*, **47**, 447–455.

Tumurchudur, Ch., Ganbat, D. and Noosoi, Z. (1990) Geological sheet map (L–47–XVI and XVII), 1:200,000. Open file report in Geological Funds of Mongolia no. 4415, Ulaanbaatar, Mongolia. (in Mongolian)

Tungalag, F. (1997) Stratigraphy and structural geology of Precambrian and Paleozoic strata in Bayankhongor area. *Mongolian Geoscientist*, no. 3, 4–11.

Zabotkin, L. B. (1988) Geological sheet map (L–47–XXIII and XXIV), 1:200,000. Open file report in Geological Funds of Mongolia no. 4276, Ulaanbaatar, Mongolia. (in Russian)

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モンゴル中央部，バヤンホンゴル地域の花崗岩類の年代

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要　旨

モンゴル中央部，バヤンホンゴル地域の花崗岩類の放射年代値を総括した．年代値は大きく原生代前期，リフェアン，古生代前期（カンブリア紀–オルドビス紀），古生代後期（主に二畳紀），中生代（ジュラ紀）に分けられる．

岩株状閃緑岩–花崗岩質複合岩体は，従来石炭紀とされていたが，二畳紀とすべきである．モンゴルの代表的な底盤状花崗岩体であるハンガイ花崗岩とシャルウスゴル花崗岩は，これまで前者が石炭紀から二畳紀，後者が三畳紀とされていたが，両者はほぼ同じ年代の二畳紀最後期である．これらの古生代後期花崗岩類の Sr 同位体初生値は 0.7050 付近に集中する．