

Miscellaneous Map Series

Scale 1:200,000

L-47-IX

L-47-X

L-47-XVI

L-47-XVII

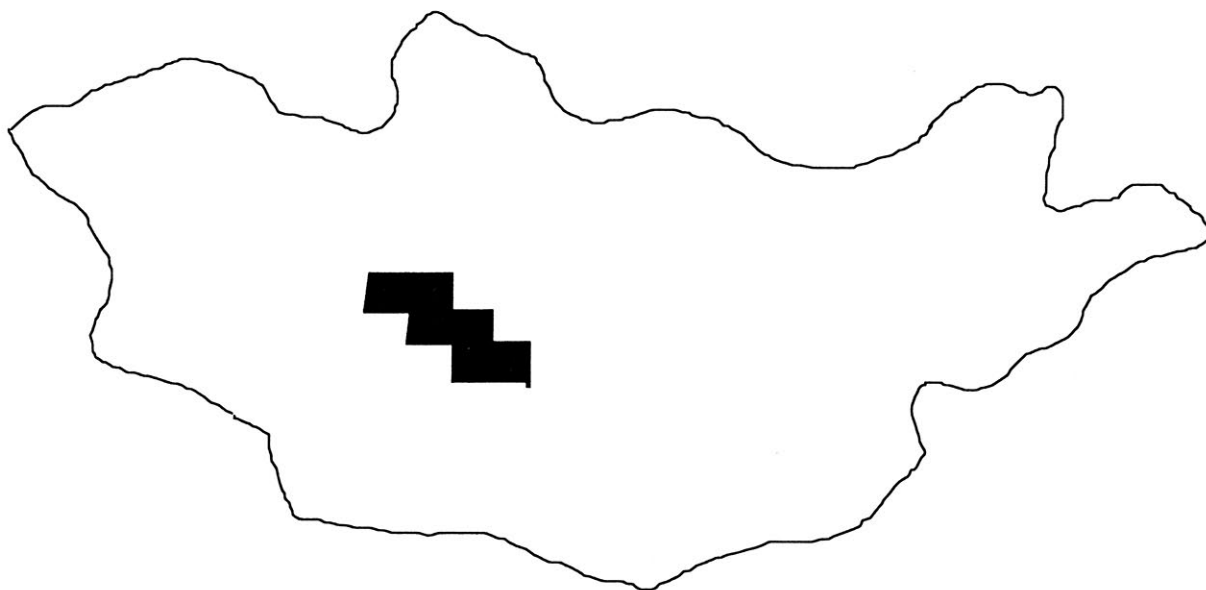
L-47-XXIII

L-47-XXIV

Geology of the Bayankhongor area

by

Geology Group of IGMR Project



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(Abstract of explanatory text of the geological map sheets
"L-47-IX, X, XVI, XVII, XXIII, and XXIV")

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(in alphabetical order)

1. Introduction

The "Bayankhongor metallogenic map project" has been performed as one of technical transfer programs of JICA "Institute of Geology and Mineral Resources" Project. The fieldwork was done at June to September in 1995, 1996, 1997 and 1998. Many samples were collected during fieldwork and they were analysed with uses of the instruments donated in JICA Project. As a result new geological informations were found.

This project has been done by four groups, i.e., Ore mineralogy group, Tectonics group, Stratigraphy group and Petrology group. Geological map and metallogenic map are now preparing in 1: 200,000 scale. These maps are prepared as digitalized sheets by computer-processing.

This article is brief introduction of general geology of the mapped area. This is based upon the open file reports of the Tectonics group, Stratigraphy group, and Petrology group of IGMR Project.

2. Geography

The investigated area is about 600 km WSW of Ulaanbaatar (Fig. 1). The area covers 6 sheets in 1/200,000 scale, L-47-IX, L-47-X, L-47-XVI, L-47-XVII, L-47-XXIII, and L-47-XXIV. The area ranges from 45° 20' to 47° 20' N in latitude and from 98° to 102° E in longitude. The investigated area is located mostly in Bayankhongor aimag. Northwestern part of the area belongs to Zavkhan aimag, northern part to Arkhangay aimag and southeastern part to Ovorkhangay aimag.

The investigated area is mostly located at southern foot of Khangai Mountains, and the southeastern part of the area is at Lake Valley. The highest part of the investigated area is northwest district, and some peaks are higher than 3000 m. These topographical characteristics

can be understood in the summit level map (Fig. 2). This mountaneous area is composed of forest and steppe zones. On the other hand, the Lake Valley in the investigated area is around 1500 m in altitude and composed of desert zone. The rivers are basically running southwards. Main rivers are Baydrag River and Tui River. The former flows in Boon Tsagaan Lake and the latter in Khoonvriyn bulag Lake. In the mountaneous area, the rivers cut broad and shallow valleys.

3. Historical review on geological mapping

Geological survey in the investigated area has been done by many geologists. In 200,000 scale, Davaa (1989) showed geologic map for L-47-IX district, Bayarsaihan and Henzii (1990) for L-47-X district, Tumurchudur et al. (1990) for L-47-XVII district, and Zabolkin (1988) for L-47-XXIII and XXIV. Thus, 5 sheets have been already published as 1:200,000 scale quadrangle geologic maps, but L-47-XVI district has not been represented in one report. Rauzer (1989) and Boguslavskii et al. (1963) showed 1:200,000 scale geologic map for western part of L-47-XVI district and northern part of the district, respectively.

In 1:50,000 scale, Iliev and Borisov (1984) showed geological map for northeastern part of L-47-XVI district. Andreas and Mihael (1969) reported results of 1:50,000 scale prospecting and geological mapping of southern Khangai plateau between Taats and Baidrag rivers in L-47-XVI and XXIII. And small areas around Bayankhongor City have been surveyed for prospecting metal deposits and prepared as 1:50,000 geologic map sheets (e.g., Togtoh et al., 1984). Recently JICA and MMAJ (1997, 1998) showed results of detailed geological mapping for Tsagaan tsahir uul deposit, which may be one of the biggest gold deposits in Mongolia, in L-47-XVI district.

In addition to these, Borzukovskii and Suprunov (1990) showed geologic and metallogenic maps of western Mongolia in 1:500,000 scale. Outline of metallogeny in the investigated area can be known by this work.

Scientific research works were also done in the investigated area and neighboring. The studies which inferred geological framework in English are reviewed in following.

Tumurtoogoo (1996) divided geological blocks of Mongolia into Northern, Middle and Southern Megablocks. Each Megablock is subdivided into a few terranes. The present investigated area belongs to Middle Megablock and consists of Lower Precambrian crystalline core of Khangai Superterrane, Ulziit-Orhon terrane, Bayankhongor terrane and Tsetserleg-Zuunmod terrane. Mossakovsky et al. (1994) considered evolution and history of Central Asian Belt, which is situated between Siberian Platform and Cathasia (northern China and Tarim platforms). They reconstructed paleo-Asian ocean from late Riphean to early Permian.

Zorin et al.(1993) showed geological and geophysical data from the Central Siberia-Mongolia transect along the 100° meridian where the present investigated area is included. They pointed out that the Phanerozoic Asian continent was formed by accretion tectonics. Dergunov et al. (1997) discussed structure and geological history of the present investigated area in late Proterozoic to Paleozoic. Mostly their discussion was focussed to the interaction between the central Mongolia Caledonides and the Archean - early Proterozoic basement (Dabkhan massif).

For the investigated area, Teraoka et al. (1996) geotectonically divided the area into the Baidrag, Burdgol, Bayankhongor, Dzag, and Khangay Zones. Tungalag (1997) reviewed previous works on tectonic framework and showed tectonical sketch map of the area. She divided the area into Baydrag uplift, Bayankhongor zone, Dzag zone and Khangai zone.

4. Explanation of geological units in the mapped area

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). Geotectonically, the area is roughly divided into Baidrag, Burd-gol, Bayankhongor, Ulziit-Jiremnuruu, Dzag, and Khangai Zones, which are separated from each other by northwest-southeast trending faults.

Various geologic units from Archean to Quaternary are well exposed in this area. Simplified geologic map is shown in Fig. 3. Geological succession is summarized in Fig. 4.

4.1 Precambrian (including a part of early Paleozoic)

The Baidrag Metamorphic Complex consists of "gray" tonalitic gneisses which are Archean high-grade metamorphic rocks ranging from amphibolite to granulite facies. The Bumbuger Metamorphic Complex is composed of gneisses, crystalline schists, amphibolite, leptite, marble, and quartzite. They are Proterozoic metamorphic rocks of amphibolite facies. These two complexes are distributed in the Baidrag Zone in Fig.3.

Early Proterozoic granite intrudes the gneiss of these metamorphic complexes with conformable contact. It is composed of strongly deformed tonalite, granodiorite, and granite.

The Burd-gol Group is divided into three formations of middle to late Riphean age; Gun-hudag, Khuh-bulag, and Bumbat Formations in younging order. In addition, Undivided Formation is set for the strata which is stratigraphically unclear. The Gun-hudag Formation is composed of conglomerate, quartzite, and stromatolite limestone. The Khuh-bulag Formation is made up of black shale. The Bumbat Formation consists of meta-sandstone, shale, limestone, quartzite, and sill of basic rocks.

Riphean Granite is distributed in southeastern part of the area. This Granite is

composed of leucocratic granite and minor of diorite. Some of them are deformed and foliated.

The Jirem-nuruu Group is divided into Riphean Jargalant-nuruu Formation and Vendian to Cambrian Ulziitgol Formation. The Jargalant-nuruu Formation is composed of serpentinite, meta-gabbro, amphibolite, crystalline schist, stromatolite limestone, and quartzite. The Ulziitgol Formation consists of shale, sandstone, limestone, quartzite, and basalt.

The Bayankhongor Ophiolite Complex is Vendian to Cambrian ophiolitic sequence such as ultrabasic rocks, gabbro, sheeted dykes, basalt, limestone, and tuffaceous sandstone.

4.2 Paleozoic

The Dzag Group is divided into Gurbanbulag, Khar-us-gol, and Dalay-hairhan Formations in ascending order. This group consists mainly of monotonous greenish sandstone and shale associated with conglomerate. This group does not contain any fauna but is stratigraphically considered as middle Cambrian to lower Ordovician. Mica from the group shows upper Ordovician age, which gives upper limit age of the group.

The early Paleozoic granitoids are divided into Cambrian to Ordovician batholithic bodies and "Ordovician" small granitic bodies. The batholithic bodies are divided into Togtochinshil, Telmen, and Tsahir-uul Complexes. They are composed of granitic facies and minor dioritic facies. "Ordovician" Granites are divided into Ugalz Granite and Bor-Khayrkhan Granite. They are mostly altered granite.

Munkhet-uul, Ulaansai, and Tsagaandel Formations are Ordovician strata. They are mostly red clastic rocks and expose in the restricted area. The Saran-uul Formation is composed of shale and sandstone and aged as Silurian. Naryn and Khurentolgoi Formations are Devonian strata; the former is composed of intermediate to acidic volcanic rocks and the latter is composed of siltstone, sandstone, and conglomerate. These Ordovician to Silurian strata are not shown in the simplified map (Fig. 3) because they are restricted in distribution.

The Khangai Group consists of Devonian to Carboniferous turbidite sediments. It is basically composed of thick and terrigenous sediments. This group is divided into Erdenetsogt, Tsetserleg, Jargalant, and Baidrag Formations in ascending order. Fossils are rare in these formations but Devonian conodonts are found in the Erdenetsogt Formation.

Carboniferous and Permian strata occur as post-orogenic sediments. They consist of sandstone, shale, conglomerate, and terrestrial volcanic rocks. These are divided into Orkhyn-hundey Formation, Buutsagaan Formation, Dush-Ovoo Formation, Shargyn-nuruu Formation, Khureemara Formation, Subvolcanics and Tuin-gol Formation in ascending order. These strata are not shown in Fig. 3.

Late Paleozoic granitoids are divided into granite-diorite complex and batholithic granitic

bodies. The former is composed of diorite, granodiorite, or diorite-granite complexes. It is divided into Tsogt Khayrkhan Complex, Daltyn-am Complex, Tsokh-huduc Granodiorite, Saran-uul Complex, and Ulaagchin Complex. The batholithic granitic bodies are divided into four granitic masses; Shar-sair Granite, Tarvagatai Granite, Khangay Granite, and Shar-us-gol Granite.

4.3 Mesozoic

Early Mesozoic granitoid, Egyn-davaa Granite, crops out northern part in the study area. It is composed of medium-grained granodiorite to granite.

Mesozoic deposits are divided into; Undivided, Bayan-teeg, Sharilin, and Tsagaan-tsav Formations in Jurassic, and Anday-hudag and Dovunt Formations in Cretaceous. They are continental basin sediments and composed of coal bearing mudstone, sandstone, conglomerate, and terrestrial volcanic rocks.

4.4 Cenozoic

Tertiary is mostly composed of lacustrine and fluvial sediments with flood basalt layers. It is divided into Tsagaan-oo Formation, Flood basalt, Shand-gol Formation, Luu Formation, Flood basalt, and Tuin Formation in younging order. Quaternary deposits are mainly distributed along rivers. These are divided into a few members based upon stratigraphical and genetical settings. Jurassic to Cenozoic strata are shown together in Fig. 3.

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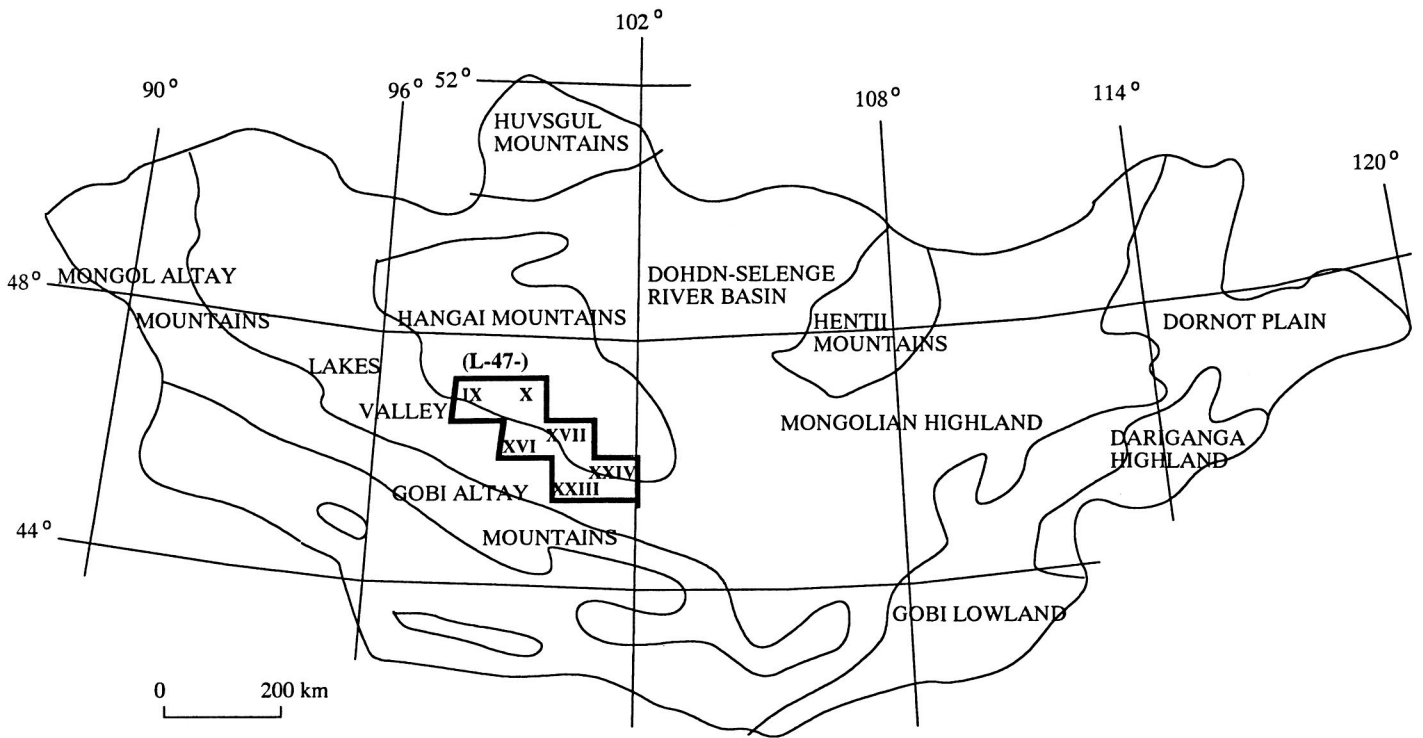


Fig. 1 Index map

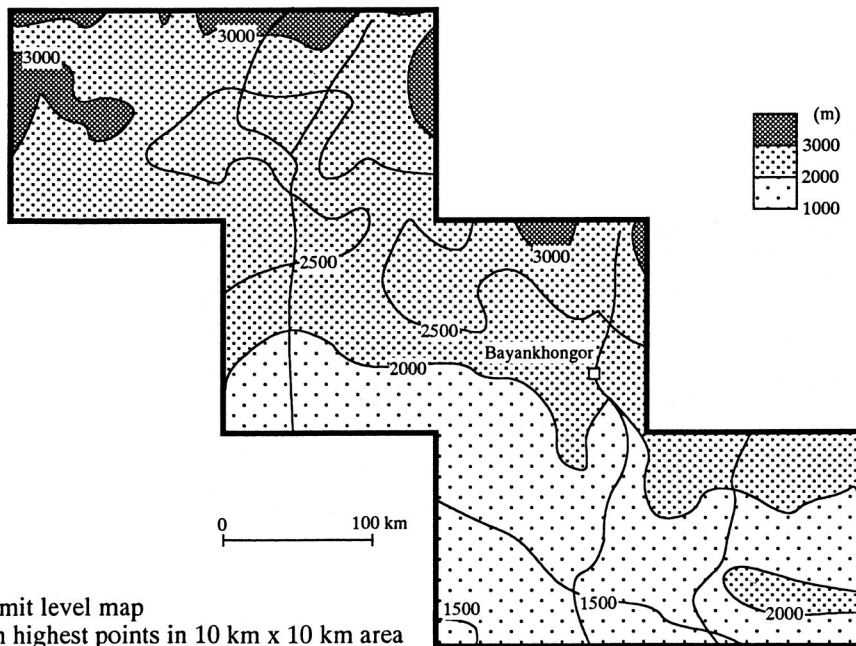
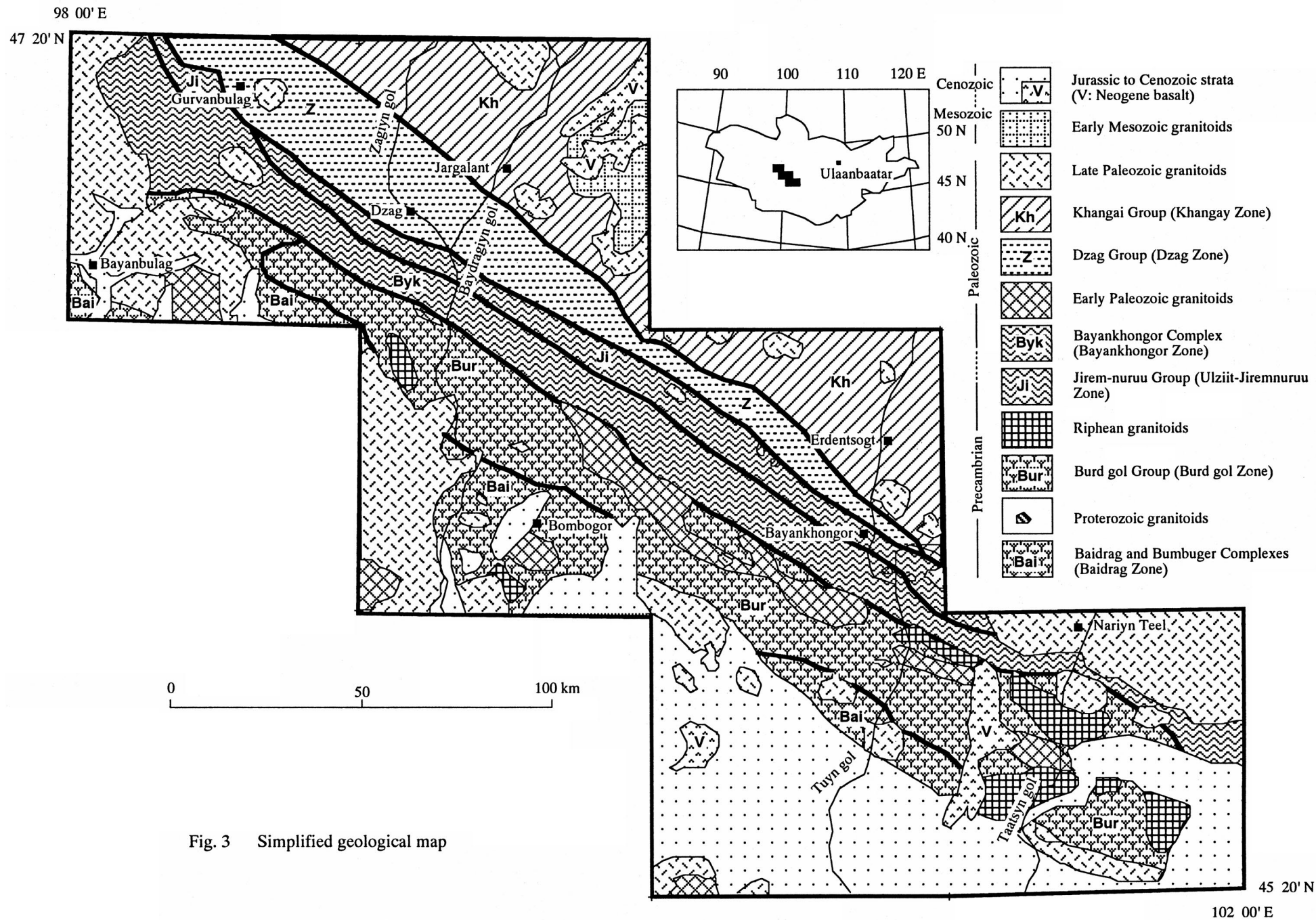


Fig. 2 Summit level map
Based upon highest points in 10 km x 10 km area



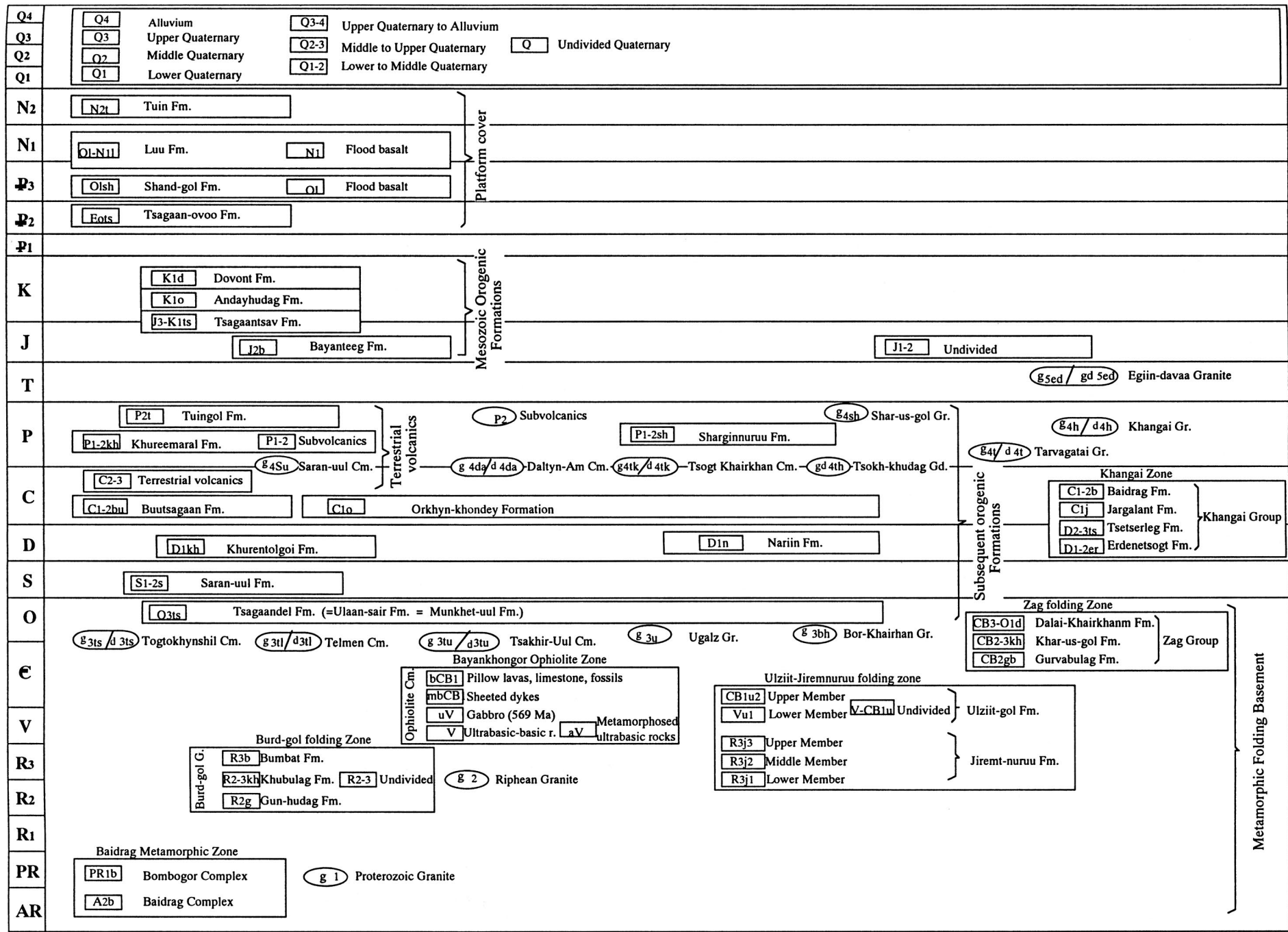


Fig. 4 Summary of geological units in Bayankhongor area