

Two types of mineralization in the North Khentei gold tend

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Abstract The North Khentei tectonic belt is located in the Northern part of Mongolia and comprises North Khentei gold trend. The North Khentei tectonic belt is bounded on the north by the Bayangol fault system and on the south by the Yeroogol fault system. Our major geologic events appear to have defined the North Khentei belt.

Four major geologic events appear to have defined the North Khentei belt, including: development of a subduction zone along the Bayangol fault system; extension along the Yeroogol fault system with the formation of the Yeroogol graben; compression and the emplacement of the Triassic-Jurassic Khazaar complex; inter-continental extension and the filling of Jurassic-Cretaceous basins.

Examination of gold occurrences along the North Khentei gold belt suggests three significant gold mineralization zones, and its potential is determined by low-sulfide and moderate-sulfide mesothermal and epithermal gold mineralization.

Keywords: geology, fault zone, gold trend, potential, mesothermal, epithermal.

1. Introduction

The North Khentei tectonic belt is located in the Northern part of Mongolia (Fig. 1) and comprises North Khentei gold trend, which includes well known gold reserves occurred at both placers and bedrock deposits. Reserves of Zamar and Sharingol gold placer districts is totally about 145 tones showing and Bumbat (16 tones) and Boroo group (45 tones) gold deposits are confined to the structure.

The North Khentei tectonic belt is bounded on the north by the Bayangol fault system and on the south by the Yeroogol fault system. Both faults have a similar southwest-northeast orientation and define the similarly trending North Khentei belt. Four major geologic events appear to have defined the North Khentei belt.

2. Geologic setting

The first event is development of a subduction zone along the Bayangol fault system resulting in Late Precambrian-Early Paleozoic accretionary terrain of flysch and subsequent plutonism at south and east of the Bayangol subduction zone. Flysch is represented by two dominant rock series, the Precambrian Yeroo Series and Lower Paleozoic Haraa Series. The Yeroo Series consists of mostly of green schist grade metamorphic rocks consisting of quartzite and volcanic schist between the Bayangol and Yeroo fault zones and variably metamorphosed shale, siltstone, sandstone, conglomerate, and volcanic tuff in southeast of the Yeroogol fault. Within the Yeroogol fault zone the Yeroo Series rocks exhibit amphibolite grade metamorphism with crystalline schist and migmatite.

The Lower Paleozoic Haraa Series lies on the south-east side of the Yeroogol fault system and consists of sandstone, shale, siltstone, conglomerate, phyllite, quartz-sericite and sericite-chlorite schist, and some intermediate tuff.

As a result of subduction along the Bayangol fault Early Paleozoic Boroo Complex (450-520m) intrusive rock was emplaced east of the Bayangol fault zone. The Boroo Complex consists of small plutons of medium-grained biotite and biotite-hornblende granodiorite and granites, which intrude Yeroo, and Haraa Series rocks. The Boroo Complex rocks are dislocated by renewed movement along the Salbartai fault system. Contact skarns are frequently developed as exo-skarns

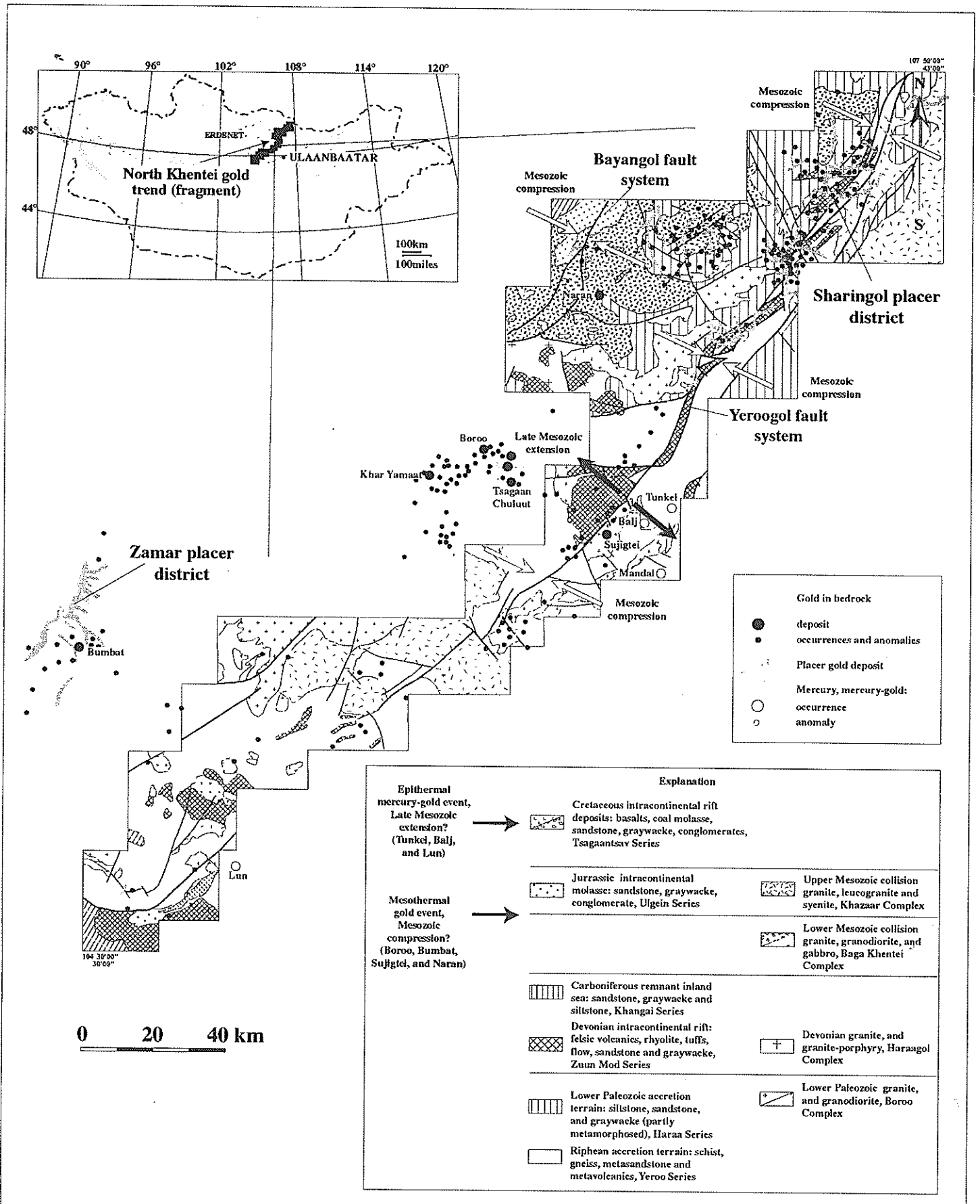


Figure 1. North Khentei gold trend (fragment). Distribution of gold placers, gold deposits, occurrences and anomalies in bedrock, and mercury and mercury-gold occurrences and anomalies related to the Yeroogol and Bayngol fault systems. Gold prospects are concentrated along Yeroogol, Bayngol and associated fault systems. Mercury prospects are restricted to the east side of the Yeroogol fault system.

and endo-skarns along the margins of these intrusions.

The second tectonic event is one of extension along the Yeroogol fault system with the formation of the Yeroogol graben filled with Devonian lava and volcanic breccia. A sequence of Silurian-Devonian volcano-sedimentary rock lies within the graben between northeast trending structures of the Yeroo fracture system. This sequence of rocks consists of sub-volcanic rhyolite porphyry and tuff, andesite lava and breccia, shale, sandstone, and conglomerate that intrude or lie unconformably upon Yeroo and Haraa Series rocks and Boroo River Complex plutons. These rocks may be up to three hundred meters thick. Erosion has removed much of the Devonian stratigraphy.

The Permian-Triassic Baga Khentei complex was emplaced along the trend of the Yeroogol graben at this time and intrudes Silurian-Devonian and older rock. The Baga Khentei is made up of many small plutons and apophyses along the Yeroogol fracture system. These rocks are composed of biotite-hornblende diorite, quartz-diorite, and gabbro diorite. Within the fracture zone these intrusives are generally gneissic. The absolute age of the Baga Khentei complex is reported to be 230-240m.

The third major geologic event is one of compression and the emplacement of the Triassic-Jurassic Khazaar complex along the Yeroogol fracture where it intrudes metamorphosed Yeroo Series and Lower Paleozoic and Silurian-Devonian sediments. The principal phase of the Khazaar Complex consists of coarse and medium-grained leucocratic granite and biotite and biotite-hornblende granodiorite. The final phase of the Khazaar intrusions consist of fine grained leucocratic sodium rich biotite granite. The absolute age of the Khazaar Complex is reported to be 180-250m.

The fourth significant event is one of inter-continental extension and the filling of Jurassic-Cretaceous basins now being mined for their coal at Sharingol. Basalt dikes and flows are concentrated along the southwestern end of the Yeroogol fault system in southern part and conglomerates are common along the northeast extension of the fault system. Some relic Cretaceous conglomerates are host of placer gold deposits.

3. Gold potential

Examination of gold occurrences along the North Khentei gold belt suggests three significant gold mineralization zones. All three of these mineralized zones are roughly parallel the northeast-southwest trend of the Bayangol and Yeroogol fault systems.

The first zone occurs within a southwest play of the Bayangol fault itself and comprises gold occurrences hosted by Boroo Complex granites and Haraa Series metasediments. By far the largest occurrences are the granite hosted gold deposits such as Boroo although the metasediments hosted vein deposits are typically higher grade, but only Bumbat deposit has been economically exploited. The Naran gold occurrence is the Boroo Complex hosted type with considerable size potential.

The second mineralization zone shows southeast trending and sub-parallel to the Yeroogol trend. This zone is related to the Yeroogol fault system with occurrences consisting of vein, stockwork and silica altered hosts principally cutting Devonian volcanic and sedimentary rocks and some granite bodies. Deposits along this trend include Sujigtei deposit, smaller occurrences, and newly discovered prospects in the central part of the North Khentei gold trend.

These deposits and occurrences could be classified as mesothermal quartz low-sulfide veins, veinlets or quartz stockwork in metasediments, volcanics or granites; and rarely as a moderate-sulfide, arsenic, base metal, and Hg-rich in shear zones. These gold deposits and occurrences may be associated with a period of Triassic (Mesozoic) compression along the Yeroogol and Bayangol fault systems.

The trend zone lies just southeast trend and parallel to the Yeroogol fault zone. This zone may merge in the Yeroogol fault northeast of Yalbag. This zone is dominated by very high mercury values with frequent occurrences of cinnabar at Tunkel, Balj, Mandal (with associated gold, arsenic and antimony and some base metal values). This zone extends from central part of Sharingol placer district to the Lun prospect some 250 kilometers southwest adjacent to the southern part of the trend. The Lun occurrence is reported as mercury-gold showing in metasediments.

These occurrences of mercury and gold-mercury (Tunkel, Balj, Mandal and Lun) may represent peripheral part of epithermal gold-bearing hot-string systems, and probably associated with

a period of Cretaceous (Late Mesozoic) rift extension along the Yeroogol fault or graben leading to basin and range type geology.

Thus North Khentei gold potential is determined by two types of gold mineralization mesothermal and epithermal, which have occurred during Mesozoic compression and late Mesozoic extension along North Khentei tectonic belt major fault systems.

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