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Orogenic Gold Metallogenic System in North Margin of Yangtze Block: Preliminary Study on Tectonic Evolution and Mineralization

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Orogenic Gold Metallogenic System in North Margin of Yangtze Block: Preliminary Study on Tectonic Evolution and Mineralization

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Abstract. The northern margin of the Yangtze massif is mainly composed of Longmenshan orogenic belt, Hannan-Micangshan uplift and Beidabashan arcuate tectonic belt. The strata are composed of sedimentary caprock and basement. The basement is Archaean-Lower Proterozoic and Mesoproterozoic volcanic rocks. Continental collision between North China plate and Yangtze plate, the three secondary tectonic units have very high similarities in geological structure, geological evolution, mineralization and deposit characteristics. Therefore, we believe that the northern margin of the Yangtze block can be classified as a metallogenic belt. The orogenic gold metallogenic belt on the northern margin of the Yangtze massif has geological conditions for forming large-scale gold deposits. However, the formation time of the gold deposit is younger, lower crustal uplift, and the degree of erosion of the sedimentary caprock is weak. The deep ore-rich body has not exposed the surface. It is suggested to carry out systematic comprehensive aeromagnetic, gravity, geophysics and other geophysical exploration work in the gold mineralization belt on the northern margin of the Yangtze block. Finally, a favorable target area is delineated.

1. Introduction

The Qinling orogenic belt is an enrichment zone of gold deposits in China. It is divided into Baoji-Luonan-Yichuan-Fangcheng fault, Shangdan main suture zone and Weilu belt-Dabashan arc fault [1]. There are four tectonic units in the southern margin of the North China Block, the North Qinling, the South Qinling and the northern margin of the Yangtze Block. At present, hundreds of large, medium and small gold deposits with important economic value, as well as more ore and mineralization sites have been found in the South Qinling gold metallogenic belt [1]. These gold deposits are related to the Yanshan intracontinental orogeny. The most important industrial ore body formation time is also concentrated in the Yanshan period (210-90Ma). The gold resources in the northern margin of the Yangtze massif are far behind those in the South Qinling and Bikou massif with similar tectonic settings. Only a few small and medium-sized gold deposits have been found sporadically [2]. So, is there any potential for gold exploration in the northern margin of the Yangtze massif? Can Longmenshan orogenic belt, Hannan-Micangshan uplift and Beidabashan arcuate tectonic belt be



considered as a gold metallogenic belt? In this paper, the gold metallogenic potential of the northern margin of the Yangtze block is discussed through regional geological comparison, the relationship between tectonic evolution and the genetic types of typical gold deposits. In order to provide some suggestions for future geological exploration work.

2. Geological Profile of the Northern Margin of Yangzi Block

The northern margin of the Yangtze massif is mainly composed of Longmenshan orogenic belt, Hannan-Micangshan uplift and Beidabashan arcuate tectonic belt (Figure 1).

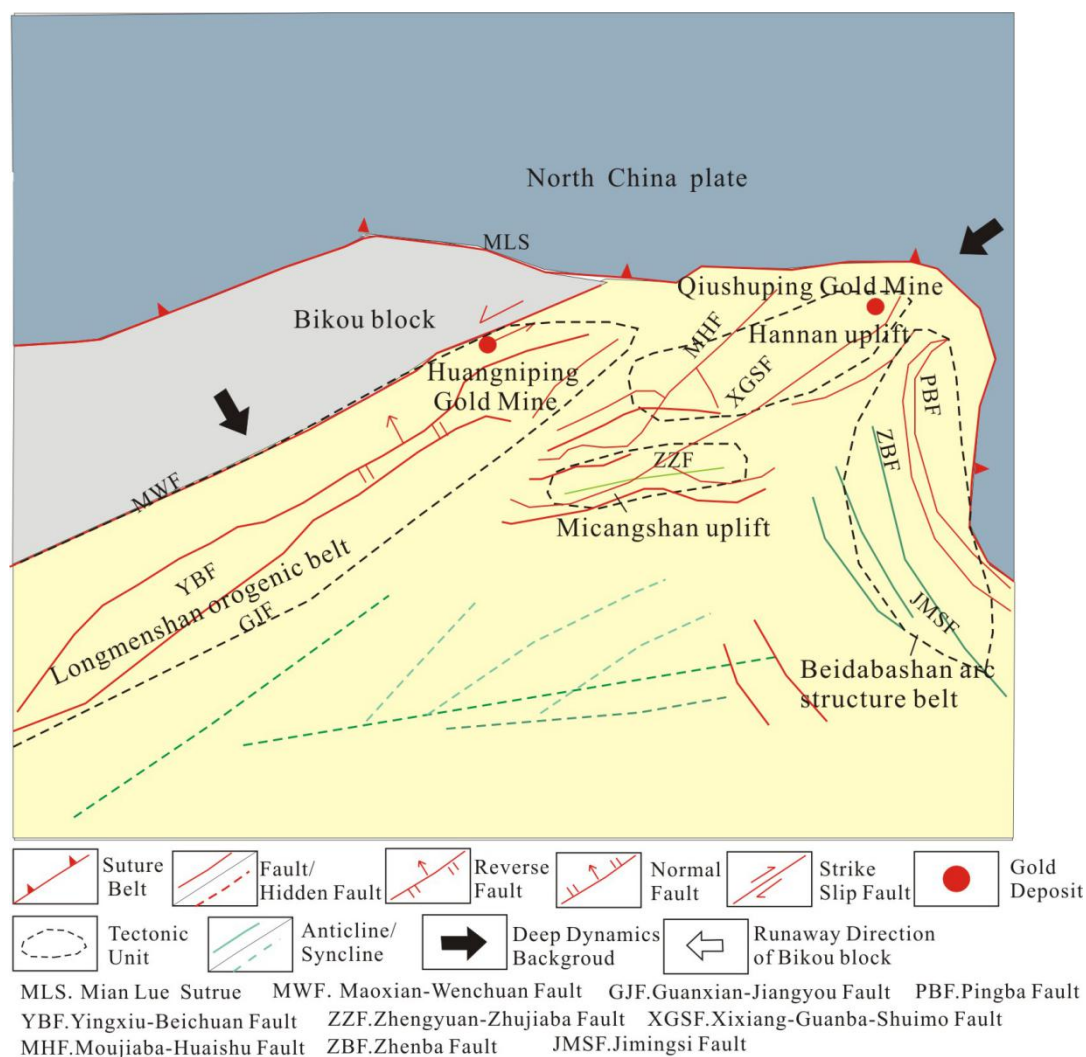


Figure 1. The sketch of tectonic units in the northern margin of the Yangtze Block

2.1. Regional Geology of the Longmenshan Orogenic Belt

The Longmenshan intracontinental composite orogenic belt is located in the northwestern margin of the Yangtze massif. Its material composition includes two parts: basement rock series and sedimentary caprock. The basement rock series is composed of volcanic rocks of Tongmuliang Group and Liujiaping Group. The volcanic rocks of the Tongmuliang Group are subjected to regional low-temperature dynamic metamorphism. The caprock is composed of shallow metamorphic marine sedimentary rocks of the South China-Middle Triassic. No magmatic rock mass was found in the exploration area.

2.2. The Brief Description of Regional Geology in Hannan-Micang Mountains

The strata of Hannan-Micangshan uplift can be divided into two parts: basement strata and sedimentary caprock, and basement strata are the main ones. The basement strata are mainly composed of Archean-Lower Proterozoic Houhe Group and Mesoproterozoic Huodiya Group. The sedimentary caprocks are mainly composed of Sinian-Ordovician, Late Ordovician-Early Silurian, Permian, Triassic, Jurassic and Cenozoic. The Hannan complex is developed in the area [3].

2.3. The Brief Description of Regional Geology in Beidaba Mountains

The arcuate tectonic belt of Beidabashan is consisted basement and sedimentary caprock. The basement in the Beidabashan area is composed of crystalline basement (Archean-Lower Proterozoic Kangding Group stratigraphy) and folded basement (Mesoproterozoic Huodia Group). The metamorphism is obvious [4]. No magmatic rocks are exposed in the area.

3. Tectonic evolution of the northern margin of the Yangtze block

The region has undergone multiple periods of structural deformation, and thrust nappe structures exist widely. During the Late Triassic, the collision between the North China plate and the Yangtze plate resulted in the escape of the Bikou block to W-SW. The Maoxian-Fenchuan and Yingxiu-Beichuan faults have been preliminarily formed on the southern margin of Bikou massif (Figure 2a).

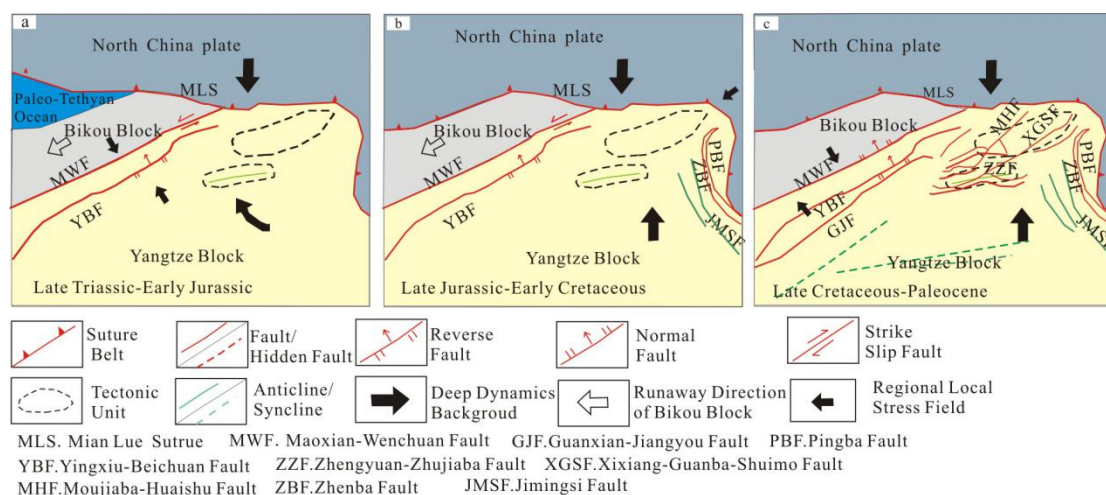


Figure 2. Mesozoic Tectonic Evolution Map of the Northern Margin of the Yangtze Block

In the late Triassic Carnesian-Norian, the Yangtze plate subducted westward along the Beichuan-Yingxiu fault. So, a series of NE-trending structures were formed in the western margin of the Micang Mountains. In the late Jurassic-Early Cretaceous, the Daba Mountains are extensively deformed southward and westward. The foreland thrust belt of Nandaba Mountains gradually formed. The tectonic effect of this period is superimposed on the east-west direction of Micang Mountain above the foreland uplift (Figure 2b).

The thrust belt gradually extends southward, forming Zhengyuan-Zhujiaba fault and Dalianghui anticline on the southern margin of Micang Mountain in Late Cretaceous-Paleocene. Then a series of NE-striking faults were formed. It staggered the early east-west trend of the Micangshan structure (Figure 2c).

Through the above analysis, it can be seen that the three secondary units in the northern margin of the Yangtze plate have obvious continuity and similarity in tectonic evolution.

4. Conclusion

4.1. Comparative study of typical gold deposits

The formation of gold deposits in the study area is closely related to the Yanshanian land-continent collision orogeny. From the age of mineralization, the Huangponping gold deposit was formed at 129 Ma, and the Qiushuping gold deposit was formed at 90 Ma. It was the same as the orogenic movement. According to the characteristics of ore-forming fluids, the two gold deposits are metamorphic hydrothermal origin. From the source of ore-forming materials, the ore-forming materials of the two gold deposits are derived from the activation of gold in the basement volcanic rocks. In terms of tectonic evolution, the arc-shaped tectonic belt in North Dabashan is similar to the Longmenshan orogenic belt and the Hannan uplift, and the same type of gold deposits are also developed [5].

4.2. Preliminary determination of the gold metallogenic belt on the northern margin of the Yangtze block

Based on the above analysis, the Longmenshan orogenic belt, the Hannan- Micang shan uplift and the Beidabashan arc structural belt on the northern margin of the Yangtze massif have very high similarities in geological structure, geological evolution, mineralization and ore deposit characteristics. Therefore, we believe that the three sub-tectonic units in the northern margin of the Yangtze block can be used as a gold metallogenic belt.

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