

Research Advances

Post-ore Modification and Preservation of the Indosinian Porphyry Copper Deposit in Geza Arc, Yunnan, SW China

LIU Xuelong^{1,*}, LI Wenchang^{1,2}, ZHANG Na¹, LAI Anqi¹ and LI Zhe¹¹ Kunming University of Science and Technology, Kunming 650093, Yunnan, China² Yunnan Geological Survey, Kunming 650051, Yunnan, China

Objective

The post-ore modification and preservation of porphyry copper deposits is controlled and influenced by various geological processes, and the regional uplift and denudation is the most important factors. This study used biotite mineral geobarometer and Apatite Fission Track (AFT) to restore the uplift evolution of the granitic porphyries in the Geza arc and to obtain quantitative data of rock erosion degree and denudation rate.

Methods

On the basis of the dynamics setting, metallogenic mechanism and magma source of the typical deposits in the Geza arc, this work used the AFT method to restore the uplift history and to reveal the *T-t* evolution process of

granitic rocks, and further to get the denudation quantitative data of intrusions. Through comparison of ore-forming depth with post-ore denudation, the evolution of the post-ore modification and preservation was analyzed.

Results

The AFT ages of mainly mineralized intrusions distribution of (12 ± 1) – (68 ± 5) Ma, which is significantly younger than the formation age of porphyry rocks and mineralization age of copper polymetallic deposits. Therefore, AFT ages recorded the tectonic-magmatic activity events since the granites and copper polymetallic deposits were formed. The simulation of AFT thermal history shows that the main ore-bearing porphyries were uplifted of 6.07–7.5 km, with uplift rate of 0.11–0.55 mm/

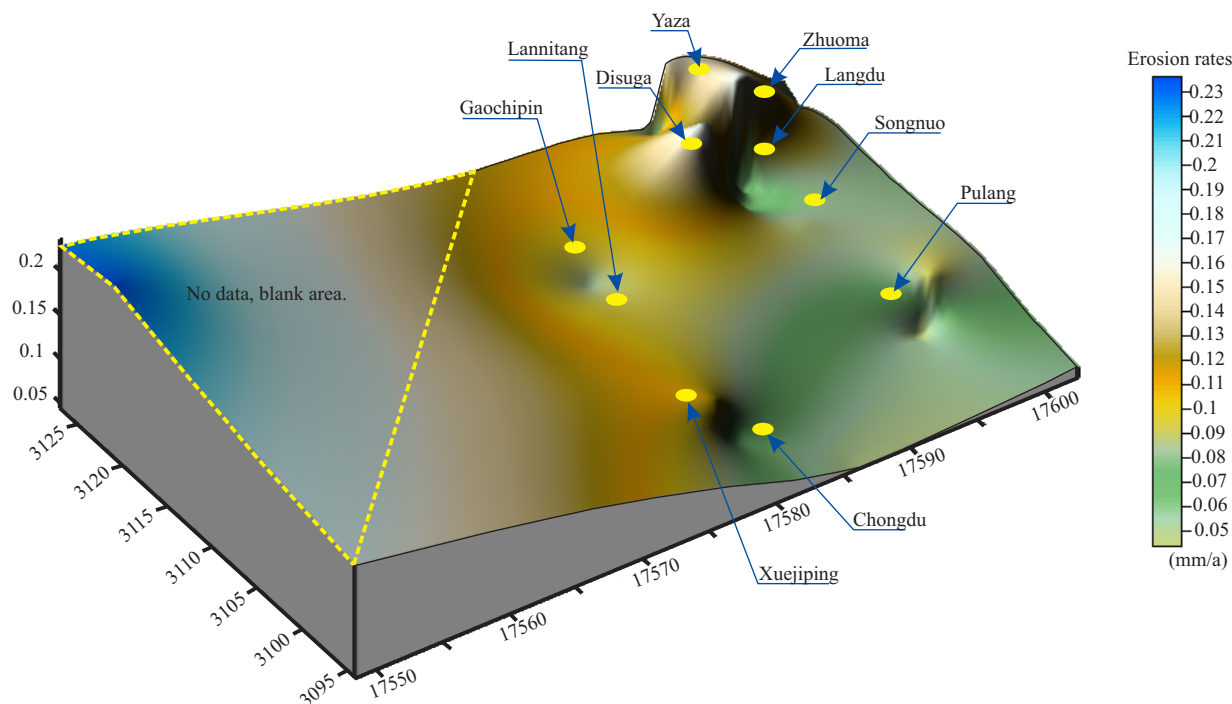


Fig. 1. 3D model showing denudation of the Indosinian porphyry deposits in the Geza arc.

* Corresponding author. E-mail: xuelongliu@Foxmail.com

a. And then, we calculated the erosion amount of 1.47–2.9 km and the denudation rate of 0.05–0.18 mm/a. According to the quantitative calculation of erosion amount of the main porphyry deposits, the denudation was divided into three grades: (1) Grade I of slight denudation. The eroded resource reserves account for a small proportion, generally smaller than 10%, such as the Pulang, Hongshan and Chongdu deposits; (2) Grade II of medium denudation. The eroded resource reserves occupy 50%±, such as the Yaza and Langdu deposits; and (3) Grade III of severe denudation. The eroded reserves account for greater than 60% (e.g., Disuga and Zhuoma) (Fig. 1).

Conclusion

The AFT and minerogenetic isotopic ages constrain the time of intrusions and cooling process, and thus limit the

exhumation history of the main porphyry copper deposits. The comparative study of emplacement depth and denudation shows that the erosion depth of the ore-forming rocks was shallower than the emplacement depth, which is much favorable to the post-ore modification and preservation of the porphyry copper deposits in Geza arc. This study may provide theoretical basis for the evaluation of the metallogenic potential and deep prospecting of the porphyry metallogenic system in this region.

Acknowledgements

This study was financially supported by the National Natural Science Foundation of China (Grant No. 41502076) and the National Basic Research Program of China (973 Program) (Grant No. 2015CB4526056).