

HUANG Tao, YANG Liqiang, WANG Zhongliang, LIU Xiangdong, LI Hailin, ZHANG Binglin, WANG Jiangang and ZHAO Yunfeng, 2014. Inherited Zircons from the Linglong Granite: Constraints on Pre-Mesozoic Crustal Evolution and Its Implications for Mesozoic Gold Mineralization in Jiaobei Terrane, China. *Acta Geologica Sinica* (English Edition), 88(supp. 2): 1624-1625.

Inherited Zircons from the Linglong Granite: Constraints on Pre-Mesozoic Crustal Evolution and Its Implications for Mesozoic Gold Mineralization in Jiaobei Terrane, China

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The North China Craton, one of the largest and oldest Archean to Paleoproterozoic cratons in China, experienced destruction in the Mesozoic (Zhu et al., 2011). The Jiaobei Terrane is located in the southeast margin of the North China Craton (Deng et al., 2011), which underwent intensive destruction, and it is the largest gold producing area in China (Yang et al., 2014). Multiple thermal events happened since the Precambrian, and formed the Precambrian metamorphic basement and Mesozoic magmatic rocks. The Linglong granite, widely exposed in the Jiaobei Terrane, was attributed to the intensive late Jurassic magmatic activity. The granite was derived from partial melting of the lower crust (Ma et al., 2013), with a lot of inherited zircons witnessing the multiple thermal events. These inherited zircon grains can provide important clues for the crustal evolution.

In this study, inherited zircons in the Linglong granite are selected for U-Pb dating, trace element and Hf isotopic compositions analysis to reveal the crust evolution and Mesozoic gold mineralization in the Jiaobei Terrane. We recognized that the main crustal growth events took place at ~2.9 Ga and ~2.7 Ga, and two episodic crust reworking occurred at ~2.5 Ga and 2.2~1.8 Ga, and two distinctively metamorphic events occurred at ~2.5 Ga and 1.95~1.8 Ga, respectively. The ~2.5 Ga magmatic and metamorphic events were linked to the underplating of mantle plumes (Zhao et al., 2001), contemporaneously, the supracrustal sequence of the Jiaodong Group were deposited. The bimodal magmatism formed at ~2.1 Ga, suggesting a crustal extension event and a possible relation with rifting, which were followed by the formation of the Paleoproterozoic sedimentary rocks of the Jingshan Group

and the Fenzishan Group. Metamorphism at 1.95~1.8 Ga was linked to the collision events (Liu et al., 2013). Since then, there were no records of tectothermal events until the Permian, but only sedimentation occurred at ~1.7 Ga and ~1.0 Ga, corresponding to the formation of the Zhifu Group and the Penglai Group, respectively. This indicated that the cratonization of the North China Craton was finished at ~1.8 Ga. At the end of the Permian, the Yangtze Block subducted northward beneath the North China Craton, and the Sulu UHP metamorphic belt formed, but there was also no magmatic activity in the Jiaobei Terrane at that time. The intensive late Jurassic magmatism may indicate that the North China Craton began to destruct, and the fertile Archean basement of Jiaobei Terrane melted to form the Linglong granite. Because the gold deposits in the Jiaobei Terrane are mainly hosted in the late Jurassic granites and the Archean basement, the fertile Archean basement maybe provide the sources of mineral materials indirectly and directly.

Acknowledgements

This study was financially supported by the National Natural Science Foundation of China (Grant Nos. 41230311), the National Science and Technology Support Program (Grant No. 2011BAB04B09), and Open Research Fund Project of State Key laboratory of Geological Processes and Mineral Resources (Grant No. GPMR201307).

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