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Early Paleozoic Magmatism and Crustal Evolution in the North Qinling Orogen

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1 Introduction

The North Qinling orogenic belt is characterized by diverse rocks, multi-phase tectonic-magmatic events, which is composed of not only basement rocks of the Qinling Group, but also numerous magmatic rocks in different ages of the Jinningian, Caledonian, and Hercynian periods (Fig. 1, Meng and Zhang 1999; Zhang et al., 2001; Lu et al., 2003; Dong et al. 2011, 2016; Zhang et al., 2013). The Qinling Group was previously interpreted as the oldest

Precambrian basement unit of North Qinling (e.g., Zhang et al., 2001; Diwu et al., 2014). Therefore, the North Qinling terrain is a key geological unit to reveal the relationship of the collision and assemblage between the North and South China blocks, and also an ideal place to study crustal evolution. In this study, we provide chronological and chemical evidence for the evolution of the basement and tectonic provenance of the Qinling orogenic belt for further understanding geodynamic background of the orogenic processes of North Qinling.

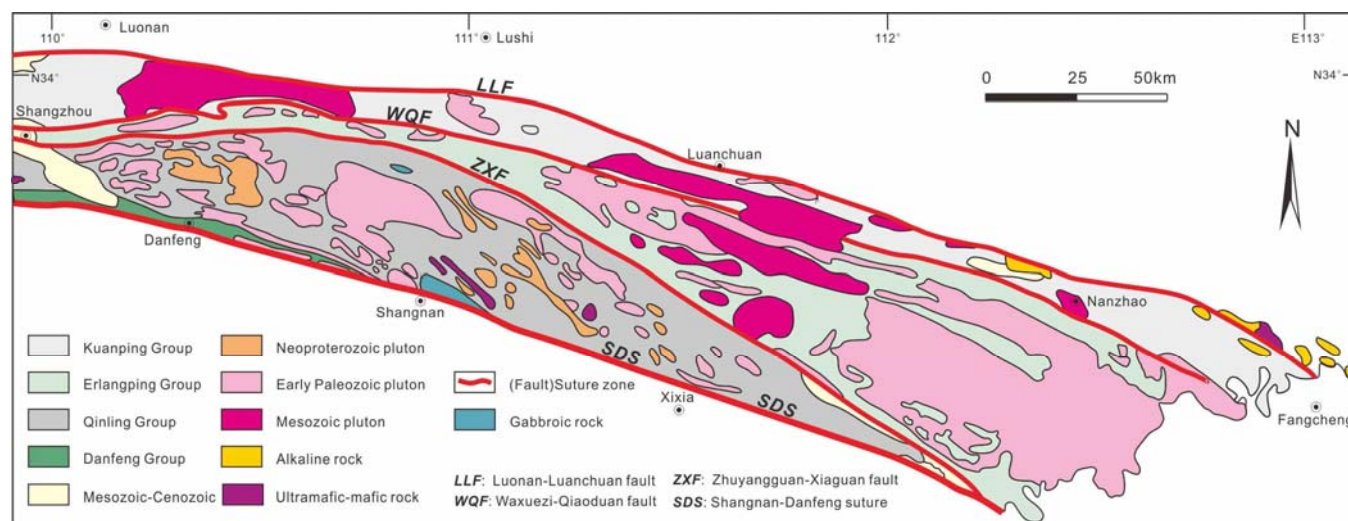


Fig. 1. Geological sketch of the eastern part of North Qinling, modified after Lu et al. (2003) and Zhang et al. (2013).

2 Samples and Analytic Results

In order to better reveal Paleozoic magmatism and crustal evolution in North Qinling, detailed measurements of Sm-Nd isotopic composition of whole-rock samples, and Lu-Hf isotopic data of zircons from the same analytic spots by the LA-MC-ICP MS technique, were performed for different rocks collected from two major rock units of the Qinling Group (felsic gneisses and amphibolites) and

granitoids (Jinningian, Caledonian and Hercynian periods) in the eastern North Qinling terrain.

Combined with previous studies on these Early Paleozoic magmatism in North Qinling, the crustal growth and reworking here are systematically summarized in this study. Our results have shown that crustal formation in the eastern North Qinling is characterized by episodic growth, which mostly took place in Proterozoic through reworking of ancient crustal material at ~2300 Ma and 2000 Ma.

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Significant evidence for continental crustal growth and recycling at ~1600 Ma, 1000~630 Ma, and ~500 Ma has also detected in the North Qinling orogenic belt.

By a comparison with the magmatism and crustal evolution of the adjacent terrains, we come to the conclusion that North Qinling should be interpreted as a separate geological entity with an individual evolution different from the South and North China blocks before Proterozoic (Zhu et al., 2011; Diwu et al., 2014). Crustal growth took place in the southern margin of the North China block in late Archean (e.g., ~2700 Ma) and the South Qinling terrain mainly in Neoproterozoic and the northern margin of the Yangtze block in late Archean and Mesoproterozoic periods, while the North Qinling terrain began massive growth after the Mesoproterozoic time.

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