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Paleogeographic and Tectonic Evolution of Qinling Orogen: Constraints from Provenance of Sediments in Mesozoic Basins

WANG Anqi[1], YANG Debin[1, 2, 3 *] and YANG Haotian[1]

[1] *College of Earth Sciences, Jilin University, Changchun* 130061, *China*
[2] *Key Laboratory of Mineral Resources Evaluation in Northeast Asia, Ministry of Natural Resources, Changchun* 130061, *China*
[3] *Key Laboratory for Evolution of Past Life and Environment in Northeast Asia, Ministry of Education, Changchun* 130026, *China*

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Abstract: Mesozoic strata in the Nanzhao and Mashiping basins recorded the tectonic evolution history of the Qinling Orogen (QO). We presented new detrital zircon laser ablation–inductively coupled plasma–mass spectrometry U–Pb ages and in situ Hf isotopic data in order to constrain the depositional age and provenance of the Taishanmiao, Taizishan, Nanzhao, and Mashiping formations (from oldest to youngest) of the North QO (Fig. 1). Detrital zircons from Taishanmiao and Taizishan formations within the Nanzhao Basin yield five (1855, 923, 732, 433, and 240 Ma) and seven main age populations (1938, 1858, 822, 729, 432, 303 and 218 Ma), the eHf(t) values range from -20.2 to +7.6 and -15.0 to +6.8, respectively. In addition, detrital zircons from Nanzhao and Mashiping formations within Mashiping Basin have two (2270 and 117 Ma) and eight age populations (1850, 1629, 1418, 1282, 1110, 836, 440, and 122 Ma), the $e_{Hf}(t)$ values range from -17.3 to +3.5 and -24.9 to +9.7, respectively. Combined U-Pb ages, Hf isotopic compositions and age-diagnostic fossils, we proposed that the Taishanmiao and Taizishan formations formed during the late Triassic. The Nanzhao Formation deposited in the early Cretaceous rather than previous late

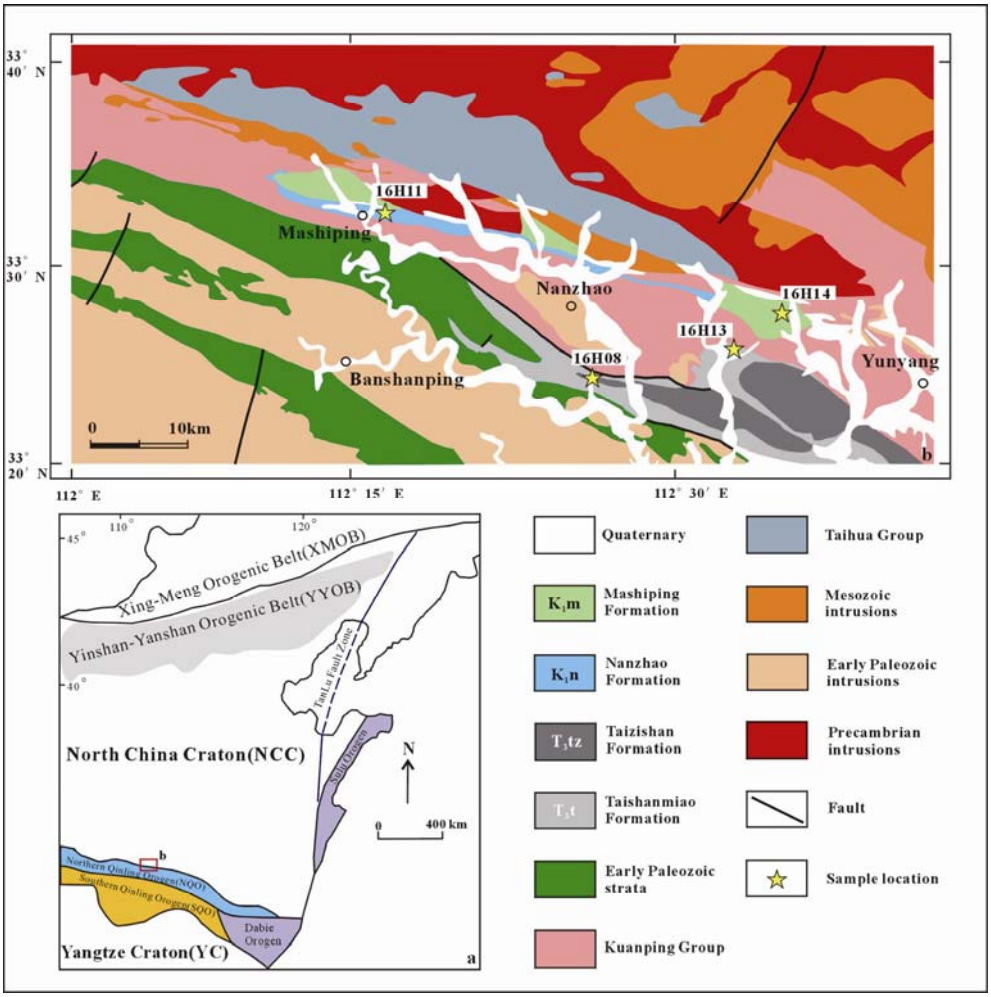

Fig. 1. (a) Simplified tectonic map of the NCC (modified after Wang et al., 2019); (b) Geological map of the Nanzhao and Mashiping basins of the QO showing the location of the samples analyzed

* Corresponding author. E-mail: yangdb@jlu.edu.cn

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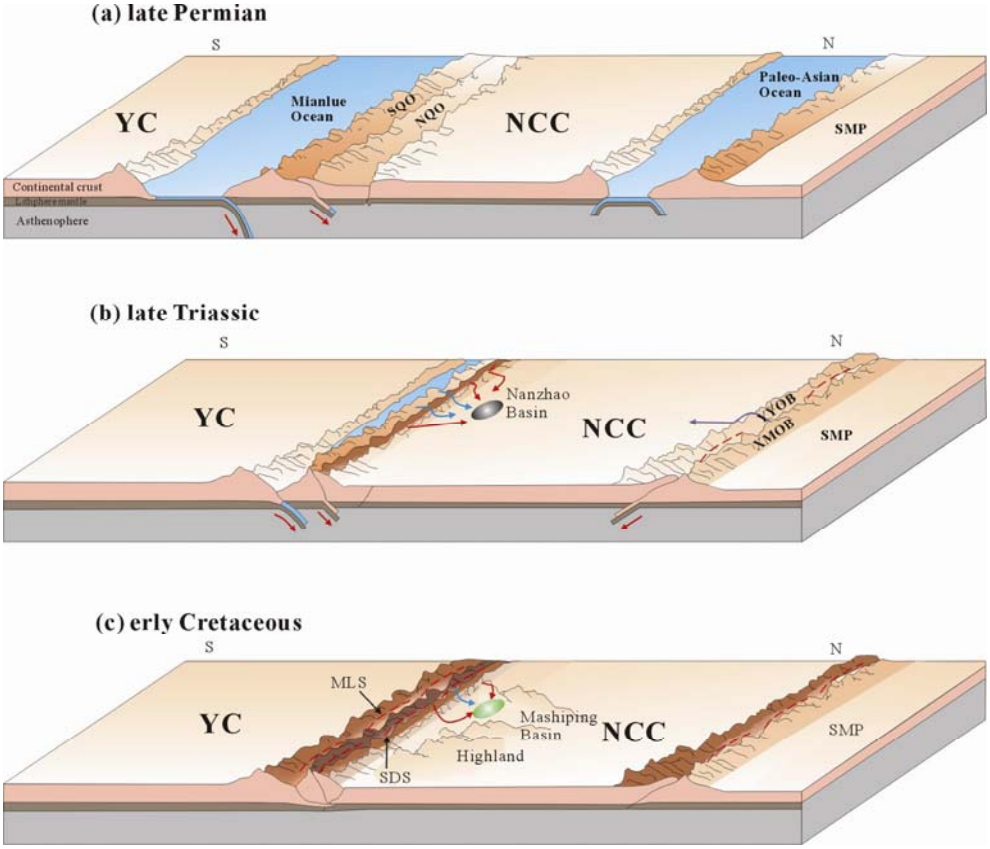

Fig. 2 Schematic model of the tectonic evolution of the southern NCC and QO (revised after Wang et al., 2018). NCC: North China Craton; NQO: North Qinling Orogen; SQO: South Qinling Orogen; YC: Yangtze Craton; SMP: Southern Mongolian Plate; (a) middle-late Permian: the Mianlue Ocean subducted under the Sorth Qinling tarrane; (b) late Triassic: a topographic high formed the QO as a result of collision between the South and North Qinling tarranes. The Mianlue Ocean continuely subduct until close. (c) The second uplift of the QO as a result of opposite direction subduction of the NCC and YC.

Jurassic. The Mashiping Formation deposited during the early Cretaceous. Detrital zircons from late Triassic strata were generally derived from the North QO, the South QO, the North China Craton, and with a minor from the Xing-Meng Orogenic Belt. Nanzhao Formation were mainly sourced from the QO, and with only a minor contribution from the North China Craton basement. The early Cretaceous conglomerates of the Mashiping Formation were formed mainly from recycled earlier detritus. The provenance shift in the Mesozoic sediments indicates that the QO was strongly uplifted twice. The northward subduction of the Mianlue Ocean during the late Triassic and intracontinental subduction of the Yangtze Craton beneanth the QO and north thrusting of QO during the early Cretaceous caused the uplifted and erosion of the QO (Fig. 2).

Keywords: detrital zircon; U-Pb dating; Hf isotopes; Mesozoic; Qinling Orogen

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About the first author

WANG Anqi, male; born in 1995; graduate student; student of College of Earth Science, Jilin University. Email: 2577091349@qq.com; phone: 13341591706.

About the corresponding author

YANG Debin, male, born in 1979; professor; graduated from Jilin University; Email:yangdb@jlu.edu.cn, phone: 13504308830.