Structural characteristics and geochronology of thrust faults in the Naling- Xuancheng area, Middle and Lower Reaches of the Yangtze River

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The Middle and Lower Reaches of the Yangtze River area is one of the most important metallogenic belt in China. This is rich in mineral resources and has great potential for prospecting by exploration for many years in this area, and thus became a heavily studied area for its metallogenic processes and mechanism (Chang et al., 1991, 2012; Zhai et al., 1992; Mao et al., 2004a; Lü et al., 2013). Studies over the years have shown that the metallogenic processes are closely related to the Yanshanian tectonics and magmatism to constitute a tectono-magmatism-metallogenesis system, in which the tectonics are the key factor for development, evolution and occurrence of ore deposits (Chang et al., 1991, 2012; Zhai et al., 1992; Mao et al., 2004a; Dong et al., 2011; Song et al., 2011; Lü et al., 2013). The Middle and Lower Reaches of the Yangtze River area shows an extensional or transitional period to extensional setting in the late Mesozoic, in which a period of large-scale metallogenesis and voluminous intrusions occurred (Mao et al., 2004b; Hua et al., 2005; Zhou et al., 2008; Li et al., 2010a; Chang et al., 2012; Chen et al., 2014).

The Maoshan nappe tectonics were discovered in the Mount Maoshan area, Jiangsu Province in the 1980s (Zhu et al., 1988), which indicates that a distinct late Mesozoic compression event occurred in the Middle and Lower Reaches of th Yangtze River. A large quantity of geological borehole data reveal that the Paleozoic strata are overlain by Lower Cretaceous strata in the area of Maoshan nappe tectonics, and thus a deduction was drawn that the nappe developed in the Early Cretaceous. However, the widely accepted late Mesozoic compression events are Phase B of the Yanshanian Movement in the earliest Early Cretaceous (Zhao et al., 2004; Xing et al., 2008; Chen et al., 2013; Li et al., 2014) and regional compression at the end of the Early Cretaceous (Zhu et al., 2018). Although a nappe developed and resulted in Sinian strata overthrust on Lower Cretaceous strata in the North Wuyi area (Yu et al., 2008), other achievements about compressional events in the Early Cretaceous are very few. However, all evidence, including structural characteristics and active time, about the nappe is from borehole data, which greatly restricts our understanding of the evolution of the Maoshan nappe tectonics area, and more work is needed. Now, it is widely accepted that the late Mesozoic extensional activity was pulsative in eastern China (Zhang et al., 2003; Mao et al., 2004a; Shu et al., 2009; Zhu et al., 2018), which resulted from subduction of the Western Pacific Plate (Zhu et al., 2012a, 2012b). Therefore, if the Maoshan nappe tectonics developed in the Early Cretaceous, this will supplement important evidence for the late Mesozoic evolution of eastern China. In addition, late Mesozoic thrust faults would influence the development, evolution and occurrence of ore deposits in the Middle and Lower Reaches of the Yangtze River. In summary, it is necessary to study the structural characteristics and precise time of the Maoshan nappe tectonics.

The Jiulianshan anticlinorium is situated in the southern part of the Mount Maoshan-Jiulianshan area and between the Nanling county and the Xuancheng city, named the Nanling-Xuancheng area, which is the southward extension of the Maoshan nappe tectonics. Based on detailed field observation and a large-scale profile survey, thrust faults were discovered to be exposed in the Liqiao, Yangxian, and Miaopu areas of the Jiulianshan anticlinorium. Two fault fracture zones are developed in the Miaopu area, one emerged between the Devonian Wutong Formation and Cretaceous pyroclastic rocks, the other crops out under the Wutong Formation sandstone characterized by low angle dips. There are dykes in the two fault fracture zones, and their intrusion times are all about 132 Ma according to zircon LA-ICP-MS U-Pb dating, which restricts the formation time of the fault fracture zones well and indicates that a thrust fault developed in the Jiulianshan anticlinorium at about 132 Ma. A tuff, located in the footwall of the Yangxian thrust fault, formed at about 137 Ma, which proves that the time of thrust movement is right.

Zircon U-Pb dating was also performed on the Qiaotouyang pluton, an intrusion in the fold hinge of the eastern Tongling Uplift, and yielded an intrusion age of 141 Ma. The Qiaotouyang pluton, the Fenghuangshan pluton and the Shatanjiao pluton are arranged as a string of beads and were emplaced between 144 and 141 Ma, which suggests that the fold-and-thrust belt mainly formed before 144 Ma and the Indosinian-Early Yanshanian thrust faults were revived in the late Mesozoic. The thrust fault in the Miaopu area is a minor fault belonging to imbricate faults in the hanging wall of the major thrust fault, its thrust activity shows that multi-stage activities may have occurred during the Maoshan-Jiulianshan nappe tectonics.

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