

SHRIMP U–Pb zircon dating of the Wulian complex: Defining the boundary between the North and South China Cratons in the Sulu Orogenic Belt, China

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Abstract

Neoproterozoic metasedimentary and metavolcanic rocks of the Wulian Group are associated with gneissic granitoids at the northern margin of the Sulu UHP Belt, adjacent to the Wulian–Yantai Fault, and are collectively referred to as the Wulian complex. SHRIMP U–Pb dating of detrital zircon from the metasedimentary rocks of the Wulian Group indicates a range in age from 3478 to 625 Ma. Based on zircons <10% discordant, they can be broadly divided into four populations: >3000 Ma, with the oldest age being 3339 Ma; 2700–2400 Ma, with a peak at 2436 Ma; 2200–1800 Ma, with a peak at ~2156 Ma; and at ~770 Ma. These results indicate that deposition of the Wulian Group was after ~770 Ma and that some detrital material most likely came from Neoproterozoic sources in the South China Craton (SCC). SHRIMP U–Pb zircon dating of a metavolcanic rock defines a weighted mean ²⁰⁶Pb/²³⁸U age of 761 ± 8 Ma, which is consistent with other rocks of South China affinity and can be correlated with syn-rift magmatism during the breakup of the supercontinent Rodinia. The Wulian Group, together with Neoproterozoic granites of the Wulian complex, constrains the location of the Triassic suture zone between the North China and South China Cratons. Based on our new data, the suture must lie north of the Wulian complex and is marked by the Baichihe–Yantai Fault.

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1. Introduction

The Qingling–Dabie–Sulu Orogen extends over 1500 km in a broadly E–W direction in central China and was formed by the northward subduction of the South China Craton (SCC) beneath the North China Craton (NCC) in the Triassic (Liou et al., 1996; Hacker et al., 1995, 1998, 2000, 2006; Li et al., 1993, 2000; Zheng et al., 2003a, 2004; Liu et al., 2004). The Sulu Terrane is the eastern segment of this orogen and is detached from the Qinling–Dabie Belt by the Tan–Lu Fault. In the Sulu region, the orogen consists of two main tectonic elements: the Sulu Terrane in the southeast and the Jiaobei Terrane in the northwest, sepa-

rated by the Wulian–Yantai Fault (Fig. 1). The Sulu Terrane is composed of typical UHP metamorphic rocks, including eclogites, gneisses and marbles. The occurrence of micro-diamond and coesite as inclusions in minerals such as garnet and zircon reveals temperature–pressure conditions of 740–840 °C and >2.8 GPa for the UHP metamorphism (e.g., Xu et al., 1992; Wang et al., 1995). Zircon cores and mantles preserve protolith ages between 800 and 600 Ma (Li et al., 1993, 2000; Hacker et al., 1998, 2006; Leech et al., 2006; Zheng et al., 2006), reflecting an affinity with the SCC. The UHP metamorphism at Sulu occurred in the Triassic at 240–220 Ma, based on Sm–Nd, U–Pb and Ar–Ar investigations (Li et al., 1993, 2000; Jahn, 1998; Hacker et al., 1998, 2006; Xu et al., 2006; Ratschbacher et al., 2006; Webb et al., 2006; Y.B. Wu et al., 2006).

The Jiaobei Terrane is bounded to the northwest by the Tan–Lu Fault and to the southeast by the Wulian–Yantai Fault, and comprises both Precambrian basement and Mesozoic mag-

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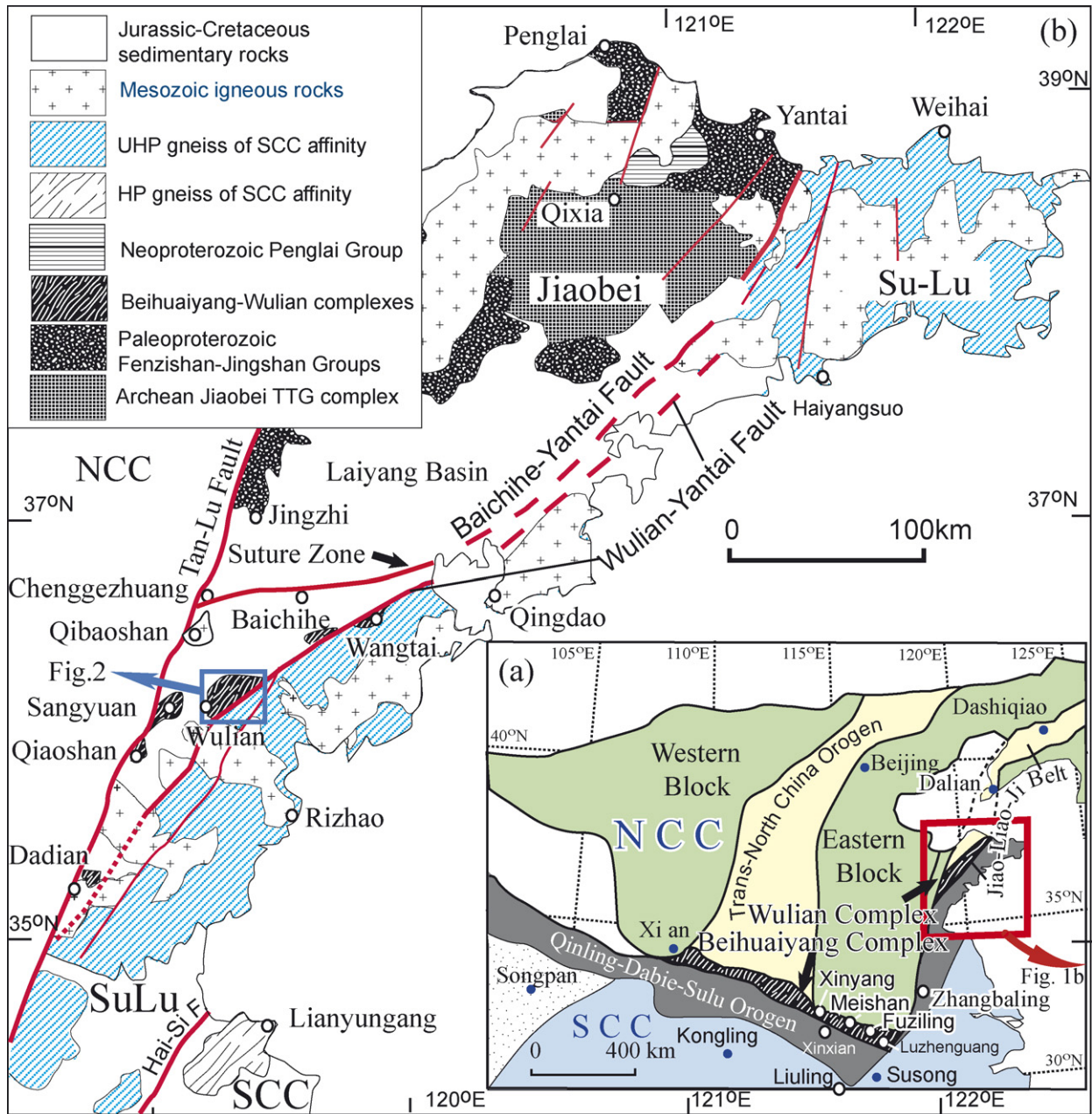


Fig. 1. (a) Simplified geological map of northern China emphasizing subdivisions of the Qinling–Dabie–Sulu Orogenic Belt and location of the Wulian Group. Rectangle shows location of (b). NCC = North China Craton; SCC = South China Craton. (b) Geological sketch map of the Sulu Orogenic Belt and adjacent parts of the Jiaobei Terrane, central-eastern China (after Faure et al., 2001; Hacker et al., 2006).

matic rocks (SBGMR, 1987, 1997; Bai and Dai, 1998; Cai et al., 2002; Zhao et al., 2005; Wan et al., 2006; Tang et al., 2006, 2007). The Jiaobei Terrane is generally considered to be the southern extension of the Jiao-Liao-Ji Belt (Fig. 1a) in the eastern part of the NCC (LBGMR, 1989; Zhao et al., 2002, 2005; Zhai, 2002; Wan et al., 2006; Li et al., 2005, 2007b; Li and Zhao, 2007). Recently, however, Faure et al. (2001, 2002, 2003) suggested that the Jiaobei Terrane probably belongs to the SCC and that the Wulian–Yantai Fault is not the suture between the NCC and SCC. This was based on the observation that both the Jiaobei and Sulu Terranes underwent similar deformation, that granulite facies restites in migmatite of the Jiaobei Terrane

were considered to be granulitized eclogites derived from the UHP rocks of the Sulu Terrane (Faure et al., 2001), and that metapelite–marble–amphibolite units (e.g. the Wulian Group and Fenzishan Group) may extend across the Wulian–Yantai Fault into the Sulu UHP Belt near Wangtai (Fig. 1b, Faure et al., 2003; Lin et al., 2004). The similarities in petrological and structural features between the Jiaobei and Sulu Terranes suggested that the boundary between the NCC and SCC might be placed north of the Jiaobei Terrane (Faure et al., 2001, 2002, 2003; Lin et al., 2004). Wu et al. (2004) and Zheng et al. (2005) also support the view that the suture lies north of the Wulian and Penglai groups (Fig. 1b), based on their interpretation that the Wulian

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