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Regional Middle Paleozoic metamorphism in the southwestern Gyeonggi Massif, South Korea: Its implications for tectonics in Northeast Asia

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ABSTRACT

The Hongseong area in the southwestern Gyeonggi Massif in South Korea is considered to represent the eastward extension of the Qinling–Dabie–Sulu collision belt in China. We have carried out zircon U–Pb SHRIMP dating and P–T estimations of the gneisses and amphibolites in the eastern Wolhyeonri complex within the Hongseong area in order to constrain their metamorphic and tectonic evolutions. The protoliths of the migmatitic biotite gneisses formed during the Neoproterozoic and underwent granulite-facies metamorphism (750–880 °C, 12–15 kbar) at 442–413 Ma. These rocks subsequently experienced amphibolite-facies retrograde metamorphism at 585–660 °C and 7.5–10.3 kbar. Mylonitic biotite gneiss, hornblende gneiss, and folded amphibolite in the study area yield metamorphic ages that range from 429 to 420 Ma. The protoliths of some garnet amphibolites that formed at 470–456 Ma are arc magmatic rocks; they experienced metamorphism at the boundary between amphibolite- and eclogite-facies (ca. 625–700 °C and 13–15.5 kbar) before 418 Ma and underwent retrograde amphibolite-facies metamorphism (ca. 625–700 °C and 8–9 kbar) at 418–405 Ma. These data suggest that a regional intermediate-P/T metamorphic event occurred during the Middle Paleozoic. In contrast, Paleoproterozoic augen gneiss blocks enclosed in the Deokjeongri gneiss complex preserve evidence of high-pressure (HP) metamorphism (840–960 °C, 17–21.8 kbar) at 234–230 Ma, which are similar to the previously reported results from eclogite blocks in this area. The occurrence of Middle Paleozoic regional metamorphism before the Permo-Triassic HP metamorphism in the Hongseong area may be correlated with the Middle Paleozoic metamorphism in the Qinling belt in China; such regional metamorphic events were caused by the collision of microcontinents with the North or South China Cratons prior to the collision between the North and South China Cratons in the Permo-Triassic.

1. Introduction

The Triassic Qinling–Dabie–Sulu collision belt, which is located between the North and South China Cratons (Fig. 1), has been well established since the discovery of high-pressure (HP) and ultra-HP eclogites and their associated rocks (Fig. 1; e.g., Ames et al., 1993; Li et al., 1993; Yin and Nie, 1993; Ernst and Liou, 1995; Chang, 1996; Zhai and Cong, 1996; Zhai and Liu, 1998; Liu and Liou, 2011). The presence of a Middle Paleozoic collision belt located between the microcontinents and the North China Craton has also been recognized in Qinling (Fig. 1; Ratschbacher et al., 2003; Hacker et al., 2004; Dong et al., 2011; Liu et al., 2011, 2013; Xiang et al., 2012; Wu and Zheng, 2013). The North and South Qinling Blocks of the Qinling belt are bounded by the Shangdan Suture Zone; they are considered to represent microcontinents that separated from the North or South China Cratons (Ratschbacher et al., 2003; Dong et al., 2011; Liu et al., 2011, 2013; Xiang et al., 2012; Wu and Zheng, 2013). The initial collision between the North Qinling Block and the North China Craton occurred at ca. 430 Ma and was followed by the collision between the South Qinling Block and the North Qinling Block at ca. 400 Ma (e.g., Dong et al., 2011). Finally, the collision between the South China Craton and the North China Craton occurred during the Triassic (e.g., Wang et al., 1989; Zhai and Cong, 1996). Therefore, the Middle Paleozoic collision between these microcontinents (i.e., the North and South Qinling blocks) and the North China Craton play an important role in our understanding of the evolution of the Qinling–Dabie–Sulu collision belt.

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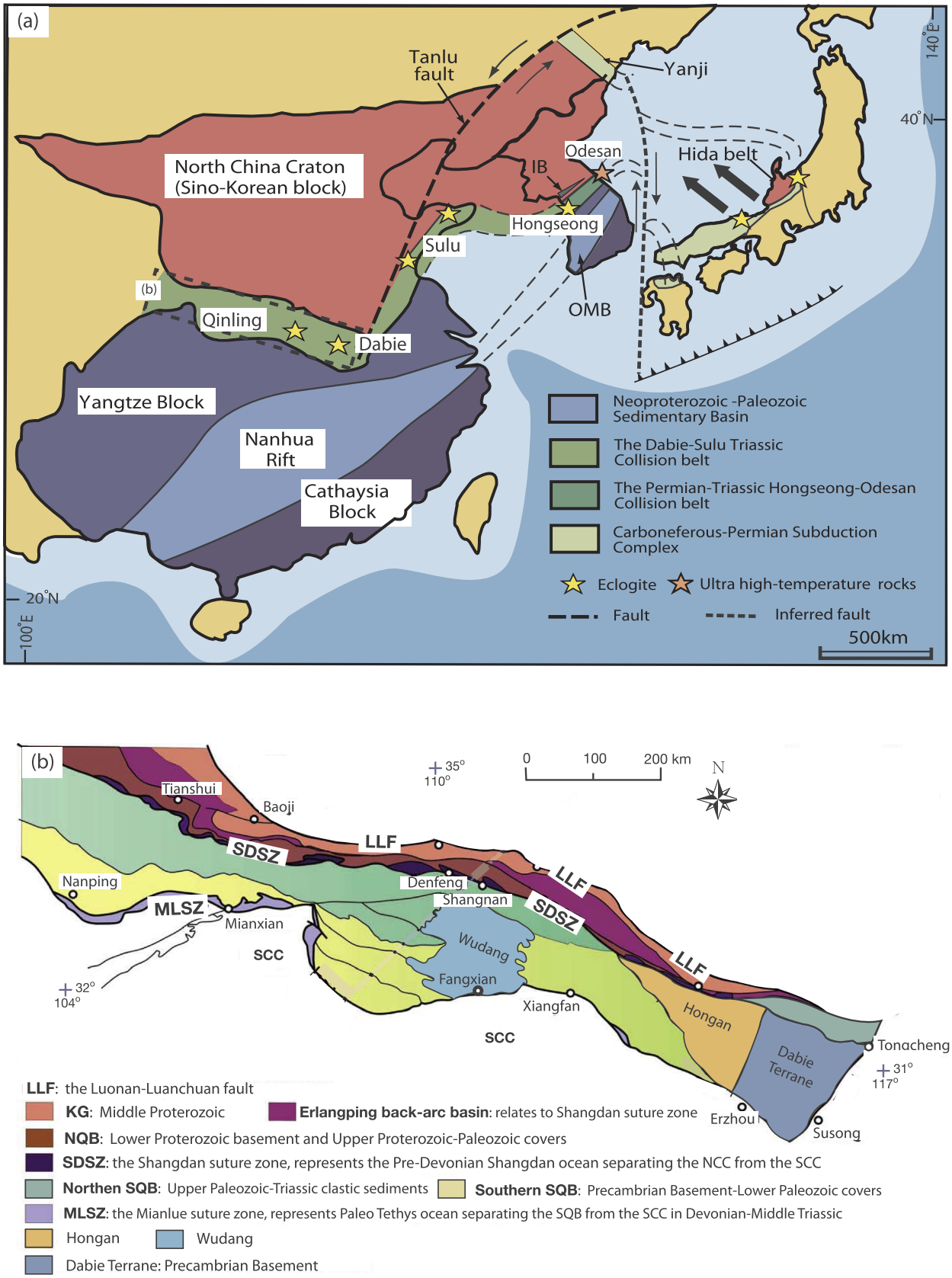

Fig. 1. (a) The Qinling–Dabie–Sulu–Hongseong collisional orogen in eastern Asia. Modified from Oh and Kusky (2007). (b) Simplified tectonic map of the Qinling orogenic belt. Modified from Dong et al. (2011). IB: Imjinggang Belt, OMB: Ogcheon Metamorphic Belt, KG: Kuanping Group, NQB: North Qinling Block, SQB: South Qinling Block, NCC: North China Craton, SCC: South China Craton.