WANG Changming DENG Jun, WANG Qingfei and NAN Ma 2013. Geochemistry and zircon U-Pb geochronology associated with tin-bearing granitoids: Constraints on two continental collisions in the Tengchong-Baoshan area, Yunnan Province *Acta Geologica Sinica* (English Edition), 87(supp.): 783-785.

Geochemistry and zircon U-Pb geochronology associated with tin-bearing granitoids: Constraints on two continental collisions in the Tengchong-Baoshan area, Yunnan Province

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The Tengchong–Baoshan tin mineralization in Southwest Sanjiang Tethys metallogenic domain is connected with the Burma–Western Thailand tin belt to the south, and can be traced to Tibet in the north. The granitoids are exposed in the Tengchong–Baoshan area such as the Donghe Group (Diantan, Mingguang, and Qingcaoling), Binlangjiang Group (Baihuanao, Xiqi, and Lailishan), Damaosham, Menglian, Qipanshi), Guyong Group (Xiaolonghe, Yunfengshan, Shuijinggong, and Lianghe, Gaoligong, and Zhibenshan (Fig. 1). The Tengchong–Baoshan area is composed of the greisen-type tin deposits (Xiaolonghe, Lailishan and Dasongpo), one large-sized greisen-type Sn-bearing Nb-Ta-Li deposit (Baihuanao), and one skarn-type Sn deposit (Diantan), and other the hydrothermal vein-type Sn deposit (Dadongchang) in addition to nearly a hundred mineralized occurrences (Fig. 1), which are related to tin-bearing granitoids. In this work, we present tin metallogenesis in the Tengchong–Baoshan area with regard to: (1) tin-bearing granitoids, (2) geochemistry and zircon U-Pb geochronology, and (3) two continental collisions. The granitoids are monzogranites and granodiorites that predominate over tonalite and quartz diorites. These granitoids have similar major element contents, with high SiO_2 and low MgO, CaO and P_2O_5. They have relatively high Al_2O_3 contents and K_2O contents, which define the granitoids as members of the high-K (calc-alkaline) series. Their alumina-saturation index (A/CNK molar) are high (>1). These granitoids originated from lithosphere remelting, thus belonging to S-type granite. The compositions of tin-bearing granitoids in the Tengchong–Baoshan area are compatible with crustal thickening in an intra-crustal setting but not in a subduction-related setting.

The magmatism in the Tengchong–Baoshan area is characterized by predominant S-type granitoids with emplacement ages ranging from Early Cretaceous, to Late Cretaceous and Early Cenozoic (Fig.1). In the first stage, the Early Cretaceous granitoids are related to magmatism with zircon U–Pb ages of 126–121 Ma. The Early Cretaceous granitoids likely resulted from crustal melting, which may be associated with the collision between West Burma and Tengchong–Baoshan Blocks in the Early Cretaceous (Fig. 2a). There were widespread the hydrothermal vein type and skarn Sn mineralizations related to these S-type granitoids. In the second stage, the Late Cretaceous granitoids are related to magmatism with zircon U–Pb ages of 76–67Ma. In the third stage, the Early Cenozoic granitoids were emplaced during 62–45Ma of zircon U–Pb ages. The Late Cretaceous–Early Cenozoic granitoids were generated in the lower to middle crust by partial melting. This partial melting was induced by crustal thickening related to the subduction of the Neo-Tethyan plate and the subsequent collision between the Indian and Asian continents (Fig. 2b), and the Xiaolonghe and Lailishan greisen type deposits formed during that period.

Key words: Geochemistry; Geochronology; Sn deposits; Tin-bearing granitoids; Continental collision; Tengchong–Baoshan

Acknowledgments

This research was jointly supported by the National Basic Research Program (No. 2009CB421008).

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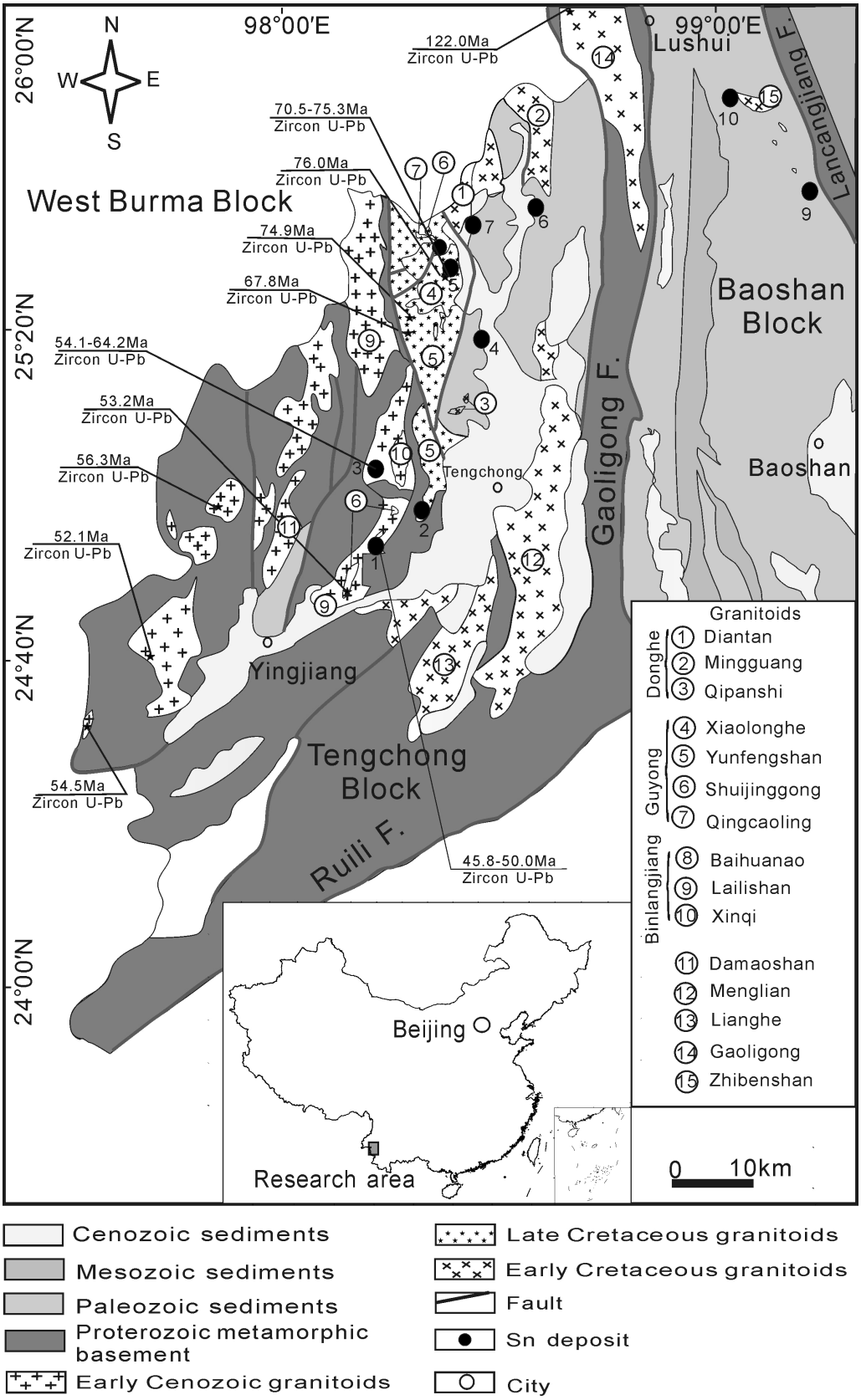

Fig. 1. Geological map showing tin-bearing granitoids and the distribution of significant tin deposits in the Tengchong–Baoshan area (modified after Mao et al., 1987; Luo, 1991; Hou et al., 2008; Yang et al., 2009; Deng et al., 2012; Xu et al., 2012).

1. Lailishan; 2. Laopingshan; 3. Baihuanao; 4. Tieyaoshan; 5. Xiaolonghe; 6. Dadongchang; 7. Daintan; 8. Dasongpo; 9.

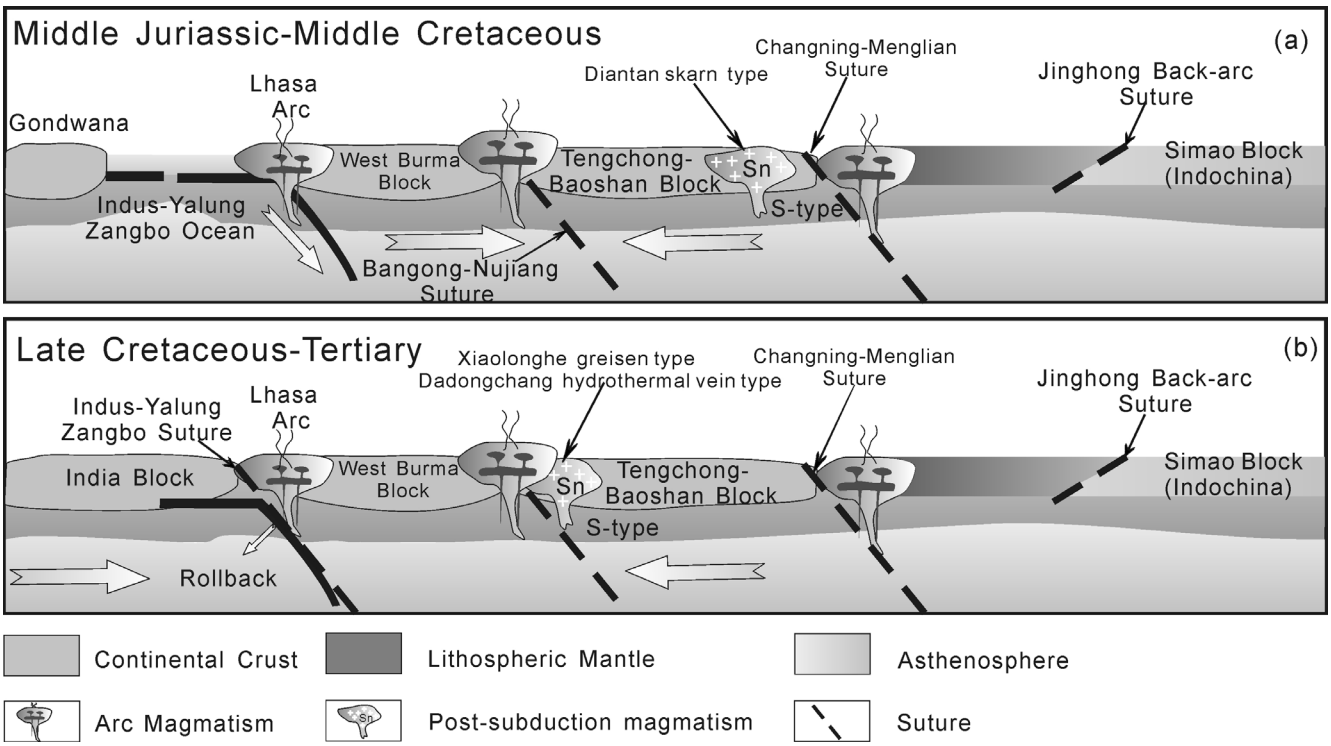

Fig. 2. Tectonic evolution and Sn metallogenesis associated with tin-bearing granitoids in the Tengchong area.
(a), During the Middle Jurassic–Middle Cretaceous, the collision between West Burma and Tengchong–Baoshan Blocks resulted in the formation of S-type granitoids related to the skarn and hydrothermal vein type Sn deposits; (b), During the Late Cretaceous–Tertiary, the India–Asia continental collision resulted in the formation of S-type granitoids associated with the greisen type Sn deposits.

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