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Metallogenic Epoch and Genetic Type of Tin-polymetallic Ore Deposits in the Southern Great Xing'an Range, China

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Abstract: In recent years, a great breakthrough has been made in prospecting of tin-polymetallic ore deposits in the southern Great Xing'an Range (SGXR), making it the most important tin-polymetallic ore cluster in northern China. Up to now, there are more than 50 tin and tin-bearing deposits and mineralized spots in the SGXR, with a combined total proven reserve of more than one million tonnes (Mt) (Inner Mongolia Institute of Geological Survey, 2013), such as the Huanggangliang Fe-Sn deposit, Dajing Sn-Cu-Ag deposit, Baiyinchagan Sn-Ag-Pb-Zn-Sb deposit, and Weilasituo rare metal-Sn-W-Pb-Zn-Cu-Mo deposit (Fig. 1).

We systematically tested ages of tin-polymetallic ore deposits

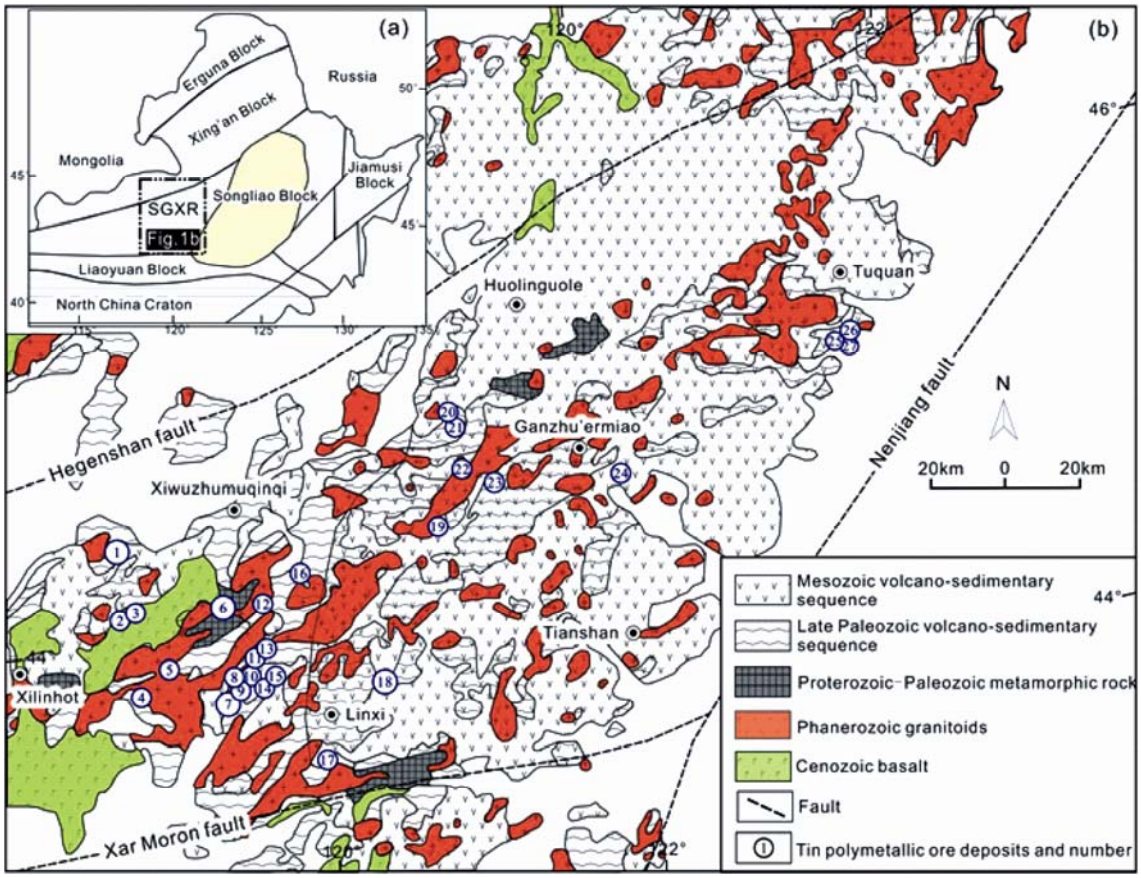

Fig.1 (a) Simplified geotectonic units of northeastern China, showing location of the SGXR and (b) geologic map of the SGXR (modified after Ouyang et al., 2015), showing locations of tin-polymetallic ore deposits in the SGXR.
Notes: Names of numbered deposits: 1-Baiyinchagan, 2-Maodeng-xiaogushan, 3-Duoribojile, 4-Xiwudengxi, 5-Wulanheburigacha, 6-Weilasituo, 7-Huanggangliang, 8-Yuanlinzi, 9-Chamuhan, 10-Anle, 11-Baogaigou, 12-1704 Highland, 13-Xiaohaiqing, 14-Sumugou, 15-Baiyingao, 16-Daolundaba, 17-Bianjiadayuan, 18-Dajing, 19-Baiyinnuoer, 20-Ejixisheng, 21-Hongling, 22-Dongshanwan, 23-Haobugao, 24-Aonaodaba, 25-Kaoshangacha, 26-Meng'entaolegai, 27-Shuanglonggang

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and mineralization-related intrusive rocks in the SGXR. Our new dating results along with geochronological data of previous researchers indicate that the deposits formed between 144 Ma and 133 Ma, that the ore causative intrusive rocks formed during 143–132 Ma, and that the tin-polymetallic ore deposits are closely related to the Early Cretaceous granitic rocks, especially differentiated porphyritic-like texture granitic rocks.

Genesis of the tin-polymetallic ore deposits in the SGXR can be divided into three types, namely, magmatic hydrothermal vein type, altered granite-magmatic hydrothermal vein type, and skarn type.

(1) Magmatic hydrothermal vein type tin-polymetallic deposits: Orebodies of this type of tin-polymetallic ore deposits are usually controlled by faults. Metallogenic element assemblages mainly include Sn-Ag-Cu-Pb-Zn (e.g. Baiyinchagan), Sn-Cu-Ag (e.g. Dajing), Sn-Cu-Zn (e.g. Maodeng-Xiaogushan), and Sn-Cu-W-Ag (e.g. Daolundaba). Sn-bearing minerals mainly contain cassiterite and stannite, and gangue minerals are mainly quartz and fluorite. Ore structure is mainly of bulk, brecciated, and vein types. Alteration mainly includes slicification, fluotization, chloritization, tourmalinization, and kaolinization (Li, 2019).

(2) Altered granite-magmatic hydrothermal vein type rare metal-tin-polymetallic deposits: Three types of mineralization usually developed in this type of deposits, for example the Weilasituo deposit, including: the deep section altered granite-type orebody dominated by Sn and associated with Zn, Rb, Nb, and Ta; the middle section cryptoexplosive breccia-type orebody being mainly of Li with Sn, Zn ,Cu, and Rb; and the shallow section quartz vein-type and net vein-type Sn, W, Zn, Cu, and Mo orebodies. Among them, the quartz vein-type orebodies are the most economically valuable ore type. Sn-bearing minerals mainly contain cassiterite and stannite, and gangue minerals are mainly quartz and lepidolite. Ore structure mainly contains bulk, breccia, vein, and disseminated ores. Alteration minerals are mainly composed of quartz, albite, amazonite, lepidolite, topaz, and sericite (Liu, 2018).

(3) Skarn type tin-polymetallic deposit: Orebodies of this type deposit usually develop within the skarn belt formed by contact-metasomatic action of the Early Cretaceous granite and marble of the Permian Dashizhai and/or Zhesi formations. Orebodies occur as laminated or lumpy. Sn-bearing minerals are mainly cassiterite, stannite, and nordenskildine, and gangue minerals are mainly composed of garnet, diopside, and amphibole (e.g. Huangganglіang). The alteration zoning in the Huangganglіang Fe-Sn deposit is obvious and develops from granitic rock to marble successively: kalification, sericitization, skarn (garnet, diopside, and ferromagnesite), epidotization, and silicification (Zhou, 2011).

Key words: Tin-polymetallic ore deposits, Metallogenic epoch, Genetic type of deposit, Southern Great Xing'an Range.

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