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A Geochronological Study of the Xuanlong Type Sedimentary Iron Deposits in North China Craton: Evidence From U-Pb Ages of Detrital Zircons From the Chuanlinggou Formation

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1 Precambrian Ore-Forming Events of the North China Craton

The North China Craton (NCC) is the largest cratons in China, with a surface exposure of 1.5 million square kilometers. The NCC consists of the Western Block, Eastern Block, and the Trans-North China Oregon that formed due to the collision of the western and eastern blocks in the Paleoproterozoic (Zhao et al., 2005, 2012). The Precambrian age represents an important period of mineralization in NCC, forming numerous large-sized Fe, B, REE, and Pb-Zn deposits. Genetic types and temporal – spatial distribution of ore deposits in NCC are reflective of the tectonic evolution of the craton (Zhai, 2010, 2012; Shen et al., 2006).

Banded Iron Formations (BIFs) represents the most important Precambrian mineralization in NCC. It accounts for about 80% of the total BIF-derived iron ores in China. Existing zircon U-Pb ages indicate that the BIFs of the NCC mostly formed in the 2.5-2.6 Ga interval (Zhao et al., 2013; Li et al., 2011, 2012a, 2012b; Zhang et al., 2012; Shen et al., 2012). Other important iron deposits include the Damiao magmatic Fe-V-Ti-P deposit formed at ca. 1720 Ma (Zhao et al., 2004) and the Bayan Obo REE-Fe-Nb deposit formed at ca. 1.3 Ga (Zhu et al., 2012), the latter having been to be of IOCG type (Hitzman 2002; William et al., 2005). Sedimentary iron deposits are also well developed in NCC. They are best illustrated by the Xuanlong deposits and thus known as the Xuanlong type iron deposit. Although the Xuanlong-type deposits have been studied and mined for many years, their formation ages are poorly constrained.

2 Geochronology of the Xuanlong Type

Deposit

The Xuanlong type deposits occurred mostly in the Xuanhua area from the north Trans-North China Oregon. They are hosted in shallow marine clastic and carbonate sedimentary rocks, as best represented by the Chuanlinggou Formation of the Changcheng Group. Zircon U-Pb geochronology using the LA-MC-ICP-MS method was performed on the clastic rocks from the lower member of the Chuanlinggou Formation that is the hanging wall of iron ore bodies in the Jiangjiazhai and Pangjiapbu mines,. A total of 186 detrital zircon U-Pb ages yield three major age populations, with the weighted average ages 1765, 1848, and 2450 Ma respectively, which are consistent with three most significant tectonic-magmatic events of the NCC. Four younger ages of magmatic zircons been obtained, and the age range is 1657-1694Ma, which marks the lower limit of the formation age of the Chuanlinggou Formation. By inference, the Xuanlong type iron deposits must have formed before 1657 Ma.

Two age peaks at 2450 and 1848 Ma of detrital zircon grains from the Chuanlinggou Formation correspond well to the Neoproterozoic rift-related magmatism of the NCC and the Paleoproterozoic collision of the western and eastern Blocks (Zhao et al., 2005). The two The third peak at 1765 Ma can be linked to the mafic dyke swarms prevailing in the NCC, which have been interpreted as a magmatic response to the breakup of the Columbia Supercontinent. Subsequent uplift and weathering of the mafic dikes could have provided an important source for the Xuanlong type deposits.

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