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Analysis of the Geodynamic Mechanism of the Large-Scale Gold Mineralization in Northeastern Hunan Province

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1 Geological Setting

Northeast Hunan Province roughly refers to the middle part of Jiangnan Orogen which has been regarded as an orogenic belt between Yangtze and Cathaysia Blocks. Since Proterozoic, it had undergone various tectonic and magmatic activities (e.g., Li et al., 2012). Generally, the EW-trending structure formed during Caledonian is the basic structure in the area (Jin, 1984). The intracontinental orogeny during ca. 240-235Ma initiated the development of the NNE-trending Jura-type folding and longitudinal thrust system. During ca. 230-135 Ma, convergent strike slips dominated this area and the NE-NNE-trending structures were gradually becoming the predominant structure (Fu et al., 1999). Until Late Indosinian-Yanshanian, tectonic activities in the region resulted in the very striking NE-trending deep and large faults which strongly divided this area into NE-trending tectonic blocks (Jin, 1984).

2 The Characteristics of the Gold Mineralization in Northeast Hunan

A series of gold deposits have been discovered in northeast Hunan, such as Huangjindong, Wangu and Dadong gold deposits. The three gold deposits are all hosted in the Mesoproterozoic slate of Lengjiayi Group, and are mainly controlled by the NWW-trending faults followed by the NE-trending ones. There are two genetic types of Au mineralization, including the gold-bearing quartz veins and the gold-bearing altered and fractured slate. Significantly, three metallogenic epochs, i.e., Xuefeng Period, Caledonian and Yanshanian (Han, 2010; Luo, 1988; Xu et al., 2006), have been proposed for

Huangjindong gold deposit, which is consistent with that of Dadong and Wangu gold deposits (~425Ma, 115~160 Ma and ~70Ma; Han, 2010; He, 2009; Hu et al., 1995).

The gold deposits in northeast Hunan Province have various sources. Au might be derived from Lengjiayi Group (Han et al., 2010). Later tectonic and magmatic activities drove Au to transport along deep and large faults from lower crust or mantle. The deep-sourced Au-bearing fluids mixed with meteoric water and then precipitated in the shallow crust.

3 Discussion of the Geodynamic Mechanism of the Gold Mineralization

During early Yanshanian, Yangtze Block was divided into many micro blocks by a series of NE-trending deep and large faults and these micro blocks gradually and stepwisely obducted on those of the Cathaysia Block (Yan et al., 2003). During this intracontinental compressional period, metallogenic fluids were mainly from the subducted Cathaysia Block or the lower crust. While during middle Yanshanian, the tectonic regime changed from compressional to extensional, leading to the upwelling of asthenosphere (Wang et al., 2005). The extra heating and strength triggered the widespread Yanshanian magmatic activities and NNE-trending faults. Metallogenic fluids driven by higher heat flow migrated upward along the deep and large faults. Meanwhile, the shallow tectonic expansion caused by the regional decompressing provided as a storage site. The deep-sourced metallogenic fluid might interact with the surrounding rocks and mixed with meteoric water on its way up to the surface. Huangjindong gold deposit formed during this period. During late Yanshanian, the northeastern Hunan was in the stage of post-orogenic extension. This stage led to the final stage

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of the formation of NNE-trending tectonic framework (Wang et al., 2005). Metallogenic fluid immigrated along deep and large faults and mixed with meteoric water and then gold precipitated. Dadong and Wangu gold deposits formed during this period.

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