Caledonian Intracontinental Orogenesis of Xuefengshan: Constraints on Lead-Zinc Metallogenic Geological Settings in Eastern Margin of Yangtze Block, South China

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Sediment-hosted Pb-Zn deposits in western Hubei to northwestern Hunan province, located at the eastern margin of Yangtze Block, are an important type of base-metal deposits in China. Since the lack of direct isotope-dating mineral, the ore-forming age and metallogenic mechanism of the lead-zinc deposits have been controversial (Rui et al., 2004; Tang et al., 2012; Lei et al., 2010, 2013). Most researches have been focused on single deposits, single deposit types and regional metallogenic regularity, but little attention has been paid to the lead-zinc metallogenic geological settings. Therefore, the present paper study on the Caledonian intracontinental orogenesis of Xuefengshan, and its relationship with lead-zinc mineralization.

1 Geological Setting

The lead-zinc district in western Hubei to northwestern Hunan area had a complex evolution, from an intra-continental rift during Late Neoproterozoic, to a passive continental margin during Early Cambrian-Middle Ordovician, and to foreland basin during Late Ordovician-Silurian. The ores are hosted mainly by dolostone and limestone of the Sinian Doushantuo Formation (Fm.), Dengying Fm., Cambrian Qingxudong Fm., Aoxi Fm., and Ordovician Nanjingguan Fm. in different areas, respectively. They are commonly stratabound, but may be locally stratiform, and not associated with igneous activity.

2 Caledonian Intracontinental Orogenesis of Xuefengshan

The Xuefengshan intracontinental orogenic belt (XFIOB), once called the Xuefeng Oldland (Fan et al., 1994; Qiu et al., 1996), is an important Precambrian basement between the Yangtze and Cathaysia Blocks. By considering the regional unconformity and tectonic deformation, we proposed that the XFIOB was developed on the basis of a weak crustal zone, which might be easily reactivated during a subsequent intracontinental orogeny, different from the Indosinian oblique convergent zone model (Wang et al., 2005). Indeed, the Xiang-Gui folded belt (XGFB), which was characterized by the EW trending weakly deformed structures (Tang et al., 2014; Bai et al., 2014) and the Ordovician underlie the Devonian rocks, was not part of the XFIOB. Then, the XFIOB was divided into three parts (Fig. 1): (i) the Xuefengshan thrust belt (XFTB), a west-verging asymmetric positive flower structure consisting of opposite-dipping thrusts with a sinistral strike-slip component (Qiu et al., 1998); (ii) the Xuefengshan folded belt (XFFB), represented by NNE trending open folds and cleavages (Jia, 1994; Zhang et al., 2010); and (iii) the Yangtze undeformed foreland (YZUF), with characteristics of the parallel unconformity between the Silurian and Devonian.

3 Discussion

The lead-zinc metallogenic geological settings of the study area is different from the typical MVT deposits, which are formed as a result of arc-continent collision, Andean-type subduction, or basin inversion (Bradley et al., 2003; Leach et al., 2010). The Pb-Zn deposits were hosted in Sinian-Ordovician platform carbonates of the passive margin. An Early Devonian Rb-Sr isochron age (Duan et al., 2012) places lead-zinc mineralization near the end of Caledonian orogenesis. The XFIOB was a far-field effect of Caledonian collision between South China and an unknown plate, somewhat akin to the present-day Tien Shan ranges in the far foreland of the India-Asia.
collision. Whatever its cause, the uplift of Xuefengshan probably played an important role in focusing mineralizing fluids during Caledonian orogenesis (Fig. 1).

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References


