Analysis on metallogenic mechanism of gold ores in western Guizhou province

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Abstract. The metallogenic mechanism of gold ores in western Guizhou Province is analysed based on previous research data. These ores have been deeply explored in previous studies, which have suggested that Emeishan Basalt and source beds arising from the basalt eruption are major provenances of gold ores in south-western Guizhou Province. The source beds form under the impacts of paleogeography of land-ocean transitional facies/lithofacies, ores with special structures and hydrothermal sedimentation. The substances exposed on the surface of the earth are enriched on quaternary red earth after weathering. The times and time of cyclic hydrothermal alteration need to be further examined.

Keywords: Gold Ores, metallogenic rules, western Guizhou province.

1. Introduction
Western Guizhou Province is rich in gold-ore resources, including rocky gold, placer gold and associated gold, among which rocky gold occupies absolute advantages, whereas the other two types of gold are more scarce (Guizhou province geology and mineral bureau, 2014). Many experts and scholars have studied gold ores of Guizhou Province (Zhu, 1997; Liu et al., 2006; Huang et al., 2008; Liu, 2009; Wu, 2013), having achieved considerable outcomes. In combination with previous studies, metallogenic mechanism of gold ores in western Guizhou Province is analyzed to supplement basic data about research on gold ores in southwestern Guizhou Province.

2. Geological Backgrounds
Sichuan and Yunnan are the most potential provinces for prospecting super-large Pb-Zn ores and gold deposits in China (Tu et al., 2000). In the west of Guizhou Province, the metallogenic province of lead-zinc ores is on the southwestern margin of Yangtze paraplatform and in the east of Xikang Yunnan axis as a upper Yangtze metallogenic subprovince in the metallogenic province of Yangtze paraplatform, which is an integral part of polymetallogenic ore clusters in Sichuan, Yunnan and Guizhou provinces (Jin, 2006). Listed from the old to new, exposed strata include Sinian Dengying Formation, cambrian system, silurian, devonian system, carbonic system, permian system, triassic system, jurassic system, tertiary system and quaternary system, among which permian Emeishan basalts are extensively distributed across the whole area.
3. Metallogenic Conditions
Gold ores form through an extremely complicated process. The metallogenic conditions differ among different types of gold ores and in each phase of metallogenesis. On Devonian, carbonic and Permian strata, sidementary conditions are mostly orderly overlaid carbonate platforms and basins (Wang, 1994). Shallow marine carbonate rocks develop on the platforms. Inside the basins, calcareous peat sediments in deep water or relatively deep water, so does tephra. On the edge of some isolated platforms at high altitudes, biological carbonate buildups are seen, and in particular, biological reefs develop, especially permian ones(Cui, 2004).

At the end of the Permian Maokou period, plenty of depositional breaks existed within this area. Such complex landforms just came into being during the magmatic activity of Emeishan Basalt; the basaltic debris or magma violently erupted, effused, fallen or overflown into the basins were hydrated, thus leading to the formation of a range of source beds, particularly the “Dashing Stratum”(Qin et al., 1999;Nie,2009).Intermittent eruption took place several times on Emeishan Basalt, where the earth’s crusts vibrates frequently, as a result of which tidal flat faces, marginal platform faces and basin faces alternated frequently, thereby contributing to the formation of complex ore-bearing rock series(Cao, 1991; Mao et al., 1992; Huang et al., 2008; Guizhou province geology and mineral bureau, 1987).In southwestern Guizhou Province, land-ocean transitional faces are the major sedimentary conditions of gold ores, which are changing dynamically.

The lateritic gold deposits more or less differ from micro grained and disseminated ones. After their formation, the source beds are exposed on the surface of the earth, weathered and eroded finally enriched on quaternary clay. As weathered sedimentary deposits and bauxites of northern Guizhou Province, lateritic gold deposits have something in common with titanium ores in south-western Guizhou Province in terms of their formation.

4. Metallogenic Model
Metallogenic models of gold ores in southwestern Guizhou Province have been studied relatively deeply; in the early period, upper and lower ores (Goo, 1993), tectonic interpretations (Luo, 1993), karst grooves (Chen, 1994), reasons for altering shallow low-temperature strata bound deposits (Li, 1989), hot fluids inside structural traps and “integration of three sources into one” (He, 1996) and metallogenesis of Au-bearing organic fluids (Li, 1996) were studied earlier. Based on previous studies, Nia 2009)put forward the metallogenic model of gold ores in ore clusters of Western Guizhou Province: activity of Email mantle plumes-hydrothermal water circulation-hydrothermal sedimentation lead to the formation of source beds, and ores arise from enrichment owing to overlaid alteration of hydrothermal fluids. As a whole, the formation of gold ores is connected with hydrothermal activities. However, the reasons why hydrothermal fluids and hot water form remain to be explored. Although Email mantle plumes impact the formation of gold ores to certain extent, there is still a lack of clear evidences for proving the particular roles of these plumes, which need to be further investigated. The metallogenic model of lateritic gold deposits is simpler mainly owing to late accumulation of source beds after weathering, which is similar to weathered residual deposits such as bauxites and titanium deposits. However, whether micro grained and disseminated gold ores can directly enrich to facilitate the formation of lateritic gold deposits has been rarely studied.

5. Conclusion
Based on previous studies, the comprehensive analysis suggests that: 1) Emeishan Basalt is the main but not the only provenance of gold ores in western Guizhou Province. 2) “Source beds” form on Emeishan Basalt and both of them make up gold deposits through hydrothermal alteration, while some of them are exposed on the surface of the earth, thus leading to the formation of lateritic gold deposits. 3) The times and time of hydrothermal alteration are still unknown. In addition, there is a lack of research on whether the enrichment of micro grained and disseminated gold ores can directly contribute to the formation of lateritic gold deposits.
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