

The giant Early Cretaceous gold mineralization event related to the North China Craton destruction in the Jiaodong Peninsula

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China is the largest gold producer in the world. Its gold production is increasing rapidly and had reached 453 tons in 2016. The Jiaodong peninsula in the eastern China is the most important gold-producing district with a total gold ore reserve of >4000 tons, accounting for nearly 1/3 of the total national gold reserve. The gold deposits at Jiaodong are mostly hosted in the Mesozoic granitoids and are structurally controlled by faults and shear zones that cut the Mesozoic granitoids. The gold deposits are divided into two styles according to ore occurrence, referred to as “Linglong-style” and “Jiaojia-style”. The “Linglong-style” lode gold mineralization is characterized by massive auriferous quartz veins with narrow alteration halos and usually occurs in subsidiary second- or third-order faults. The “Jiaojia-style” disseminated and stockwork gold mineralization is usually surrounded by broad alteration zones and generally develops along major first-order regional faults. Ore-forming fluids of two main style gold deposits share similar physical and chemical properties. In the early mineralizing stage, ore-forming fluids belong to the H₂O-CO₂-NaCl system, which is characterized by medium to high temperatures (250-410 °C), significant CO₂, and low salinities (< 9 wt% NaCl eq.). The fluids evolved into a H₂O-CO₂-NaCl system with medium-low temperatures (200-330 °C), decreased amounts of CO₂, and variable salinities (0.5-15 wt% NaCl eq.) in the middle mineralizing stage. Finally, in the late mineralizing stage, the ore-forming fluids transformed into a H₂O-NaCl system with low temperatures (< 100-230 °C), low salinities (< 5 wt% NaCl eq.), and no CO₂.

An important tectonic inversion took place in the eastern North China Craton (NCC) during Mesozoic, which caused a great lithosphere thinning, powerful interaction between mantle and crust, and a widespread granitic and volcanic episode. Geochronology demonstrated that gold deposits in Jiaodong formed in Early Cretaceous, mainly between 125 and 115 Ma, and was significantly younger than the regional metamorphism and granitoid magmatism. This fully indicates that the gold mineralization is coeval with widespread occurrences of bimodal magmatism that marked the peak of lithospheric thinning or craton destruction of the eastern NCC. Dehydration of the subducted and stagnant slab in the mantle transition zone has led to continuous hydration and considerable metasomatism of the mantle wedge beneath the eastern NCC. The large-scale gold mineralization in the eastern NCC in the Early Cretaceous has a genetic relation with craton destruction. The westward subduction of the west Pacific plate (Izanagi) beneath the eastern China continental margin during the Early Cretaceous was an optimal setting for a large-scale gold mineralization in the Jiaodong Peninsula.