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The metallogenic regularity of magmatic nickel-cobalt sulfide deposits on the northern margin of the Qinghai-Tibet Plateau

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Magmatic Ni–Co sulfide deposits along the northern margin of the Qinghai-Tibet Plateau represent the most important domestic source of nickel and cobalt in China and constitute a key metallogenic domain within Phanerozoic orogenic belts (Fig.1) [1]. These deposits are mainly distributed in the Qilian–Longshoushan and East Kunlun belts and are typified by the world-class Jinchuan (Neoproterozoic) and the super-large Xiarihamu (Devonian). Distinct from Archean–Paleoproterozoic deposits worldwide, these systems formed during major tectonic transitions associated with supercontinent cycles. Jinchuan is interpreted to have originated from high-degree partial melting of asthenospheric mantle in a plume-related rift setting during the breakup of Rodinia (~827 Ma), where sulfide–silicate liquid immiscibility led to efficient metal segregation and accumulation [2]. In contrast, Xiarihamu formed in a Devonian extensional regime linked to the Proto-Tethys evolution, likely involving a pyroxenite-enriched mantle source and mantle plume interaction [3]. Recent discoveries in the deeper parts of Jinchuan and in peripheral areas of East Kunlun highlight the significant prospectivity of this region [4]. Integrated studies of mantle-derived mafic–ultramafic magma evolution, deep sulfide segregation, and shallow emplacement processes reveal that large-scale lithospheric extension and plume–subduction interaction played fundamental roles in controlling the timing, distribution, and metal endowment of Ni–Co mineralization along the northern Qinghai-Tibet Plateau.

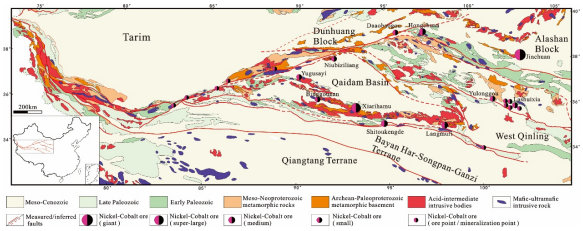


Fig. 1 Distribution of magmatic nickel-cobalt sulfide deposits on the northern margin of the Qinghai- Tibet Plateau

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