Multiple pluses and stages of complex superimposed and reworked iron mineralization: A new metallogenic model of high grade of iron ores

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More than 85% high-grade iron ores are globally sourced from the Early Precambrian banded iron formations (BIFs) that have undergone supergene enrichment by descending meteoric solutions, and mineralizing process for the high-grade hematite ores have been correlated to weathering and leaching in a stable craton. However, although there are three Precambrian cratons including the North China Craton (NCC), the Yangtze Craton （YC）and the Tarim Craton (TC) in China, they are dominated by low-grade ores, with rare high-grade varieties, and consist predominantly of magnetite rather than hematite. This peculiar scenario has been ascribed to the unique situation of extensive reactivation and destruction of the NCC through multiple tectonic cycles, and the prolonged interaction among the Central-Asian, Circum-Pacific and Tethys-Himalayan geodynamic systems that have been unfavorable for the preservation of any supergene enrichment of the BIFs in the geological past and a lack of weathering-prone climatic conditions in the Cenozoic epoch. Alterately, this tectonic condition is favorable for the formation of tectonomagmatism-related high-grade iron ores. Based on the iron mineralization processes, we attribute the genesis of high-grade ores to multiple pluses and stages of complex superimposed and reworked iron mineralization. Furthermore, the high-grade magnetite ores in the BIFs is ascribed to Neoarchean BIFs superimposed by Proterozoic hydrothermal processes that led to desilicification and iron activation–reprecipitation, whereas those in volcanic-hosted iron deposits, magmatic Ti-Fe-(V) deposits, skarn and apatite-magnetite deposits is related to multiple stages of magma-fluid evolution that led to removal of silicates, and thus elevated iron grade, rather than immiscible silicate-free magnetite (-apatite) melt.