Mesoproterozoic Mn mineralisation in North China Craton and its paleoceanographic significance

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The solution and precipitation of Mn in inorganic systems are primarily redox-controlled. Precambrian manganese ores show a strong concentration of deposits in the Paleoproterozoic and a lesser occurrence in the Neoproterozoic, leaving a conspicuous gap in the Mesoproterozoic. The Mesoproterozoic Wafangzi ferromanganese oxide deposit in North China Craton provide a rare opportunity to track the possible factors leading to the boring period for manganese metallogenesis,.

The Wafangzi ferromanganese oxide deposit is characterized by high Fe and Mn contents, low trace elements concentrations (e.g. Co, Ni, Mo, Cu, Mo, Pb, Zn, REE), and significant negative Ce anomalies. All of these features suggest that the deposit was formed by fast oxidative precipitation of Mn and Fe derived primarily from hydrothermal venting. Negative Ce anomalies are believed to be inherited from the ambient seawater during fast precipitation, indicating the ambient seawater must have more striking negative Ce anomalies. The negative Ce anomalies coupled with high Fe and Mn contents in the Wafangzi ferromanganese oxides reveal a relative well-oxygenated Mesoproterozic submarine seawater.

We propose that it was the decreasing of Mn hydrothermal input in the Mesoproterozoic due to tectonic inactivity between two periods of supercontinent formation, rather than oceanic redox chemistry in the Earth's middle age, which resulted in the deficiency of sedimentary manganese ore in the Mesoproterozoic eon