

Fe isotopic characteristics of Neoproterozoic iron formations in South China

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Chemical sediments, including carbonates and iron formations (IFs), have been used to understand the ambient environmental conditions. The Cryogenic iron formations present a unique opportunity to track the evolution of Neoproterozoic interglacial marine chemistry during the deposition of iron-rich chemical precipitates.

The Cryogenic section in South China includes Changan, Fulu and Nantuo Formation. The Changan Formation corresponding to the Sturtian glaciation consists of glacial-marine diamictite. The Fulu formation overlying the Changan Formation is composed of sandstones and shales, containing one or three ironstone beds in the basal.

Fe isotope compositions of the IFs from Guangxi and Hunan Province have been studied. The $\delta^{56}\text{Fe}_{\text{IRMM-014}}$ values of bulk samples range from 0.58‰ to 2.30‰, with an average of 1.29‰.

Heavy isotope compositions can be produced by partial oxidation of aqueous Fe(II), given the 3‰ fractionation in $^{56}\text{Fe}/^{54}\text{Fe}$ during redox transformations between oxides and aqueous Fe(II), which makes the iron isotopes a useful tool in the redox state of the water mass. The high $\delta^{56}\text{Fe}$ values obtained from the Cryogenic IFs are similar to those of Neoproterozoic and Paleoproterozoic banded iron formations, indicating the similarity in redox states of their ambient water masses.