Fe-Nd- isotopes and trace element geochemistry of the Neoproterozoic iron formation in Xinyu, Yangtze region, China

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We have measured the Fe-Nd-isotopic ratios and trace element concentrations of a suite of Neoproterozoic iron formation (NIF) samples from the Yangjiaqiao Formation in Xinyu area, Yangtze region, South China. The Xinyu NIF is thought to be correlated with the Fulu NIF, which deposited during the Sturtian glacial episode. The Xinyu NIF is deformed and suffered from greenschist facies metamorphism. It is mostly about 10-m-thick and is composed mainly of magnetite, quartz and chrolite. The underlying country rock is magnetite-bearing phyllite, and the overlying country rock is pyrite-chrolite-bearing phyllite.

The Shale-normalised REE patterns of the Xinyu NIF display LREE depletion relative to heavy REE, and they show weak anomalies of Eu and Y/Ho values. It has weakly negative εNd(t) which has linear relationship with Al_2O_3 contents. These features indicate that the Xinyu NIF is a mixture of low hydrothermal and detrital components. The Xinyu NIF lacks Ce anomalies and has positive $\delta^{56}Fe_{\text{-IRMM}}$ compositions as high as ~1.6‰, indicating a low oxygen fugacity environment.

The iron isotope data from different sites in Xinyu erea (e.g., Liangshan, Songshan, Yangjiaqiao) show a similar trend of increasing $\delta^{56}Fe_{\text{-IRMM}}$ up-section from ~0‰ to ~1.6‰. This corresponds to a trend of decreasing in MnO contents and the shift from underlying magnetite-bearing country rock to overlying pyrite-bearing country rock as well, reflecting the change of the oxygen fugacity in the depositional environment. Therefore, the Xinyu NIF likely deposited during a transgression period, which can be caused by ice melting. As a positive $\delta^{56}Fe$ shift has been reported from the Rapitan iron formation, the formation of the NIF during the sealevel rising may be a global event that results from the “snowball earth”.