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Anoxic marine conditions recorded by late Archean Superior-type Banded Iron Formations from the Bastar Craton in Central India

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The chemical and isotopic compositions of unaltered banded iron formations (BIF) are widely utilized in understanding Precambrian marine and atmospheric redox conditions. Most of the Archean BIFs are Algoma-type, i.e., associated with metavolcanic sequences, while those deposited in stable conditions, i.e., Superior-type are rare. In this study, we determined trace element compositions in individual silicate and iron oxide layers from a well-preserved Superior-type banded magnetite quartzite (BMQ) from the Bastar Craton in India.

Low concentrations of Zr (<1.5 μg/g), Sc (<0.5 μg/g), Th (<0.11 μg/g) and ΣREE (<9 μg/g), suggest these BIFs were minimally influenced by detrital contamination. The positive anomalies of La, Gd and Y, as well as depletion in LREE and MREE with respect to the HREE suggest that the analyzed BIF have seawater-like composition[2]. Cerium anomalies are absent in both Fe- and Si-rich layers indicating anoxic marine conditions and the positive Eu anomalies support involvement of hydrothermal fluids. The Si-rich layers have strongly suprachondritic Y/Ho ratios (avg. 51.5), whereas, the Fe-rich layers are moderately suprachondritic (avg. 35.5). The Th/U ratios in Fe-rich layers are unfractionated with an avg. Th/U of 3.87, while the Si-rich layers have fractionated Th/U (avg. 2.54) ratios. This suggests an oceanic crust derived hydrothermal fluids for Fe-layers and the role of oxidative weathering and riverine input for Si-rich layers[2]. The variation in Y/Ho and Th/U between individual layers support a primary origin for the banding. With radiogenic neodymium isotopic analysis under progress, we intend to gain additional insights into the solute sources in these BIFs.

[1] Bolhar, Kamber, Moorbath, Fedo & Whitehouse (2004), *Earth and Planetary Science Letters 222*(1), 43-60.

[2] Bau, Frei, Garbe-Schönberg & Viehmann (2022), *Earth and Planetary Science Letters*, *589*, 117579.