

## **Late Archean euxinia: the Brazilian craton example**

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Microenvironments containing evidence of localized oxygenation or oxidative weathering leading to euxinia have been observed to occur in the geological record prior to the Great Oxidation Event (GOE ~2.4 Ga). Here we present multi-proxy evidence of euxinic conditions in graphitic shale phyllite that is associated with sulfur mass-independent fractionation (S-MIF) from the Nova Lima group (~2.7 Ga), Pitangui greenstone belt, Minas Gerais, Brazil.

We observe high levels of total iron (Fe) that are comprised of significant contributions of reactive iron, suggesting Fe-limited pyrite formation with scavenging of Fe (Fe<sub>ox</sub>) from the water column. Although conditions were generally reducing, cerium anomalies suggest periods of oxygen generation. The REE pattern and low Eu anomaly also indicate little to no influence of post depositional processes as hydrothermalism on our sedimentary record. Within the euxinic sections, there are expected enrichments of some trace elements (such as Mo, V and U) due to precipitation of insoluble metal sulfides and oxyhydroxides. The authigenic phases of these elements in Pitangui shale exhibit modest enrichments in relation to the average crust and the Post Archean Australian Shale (PAAS), and Mo and V show mild positive correlations with total organic carbon (TOC). Pyrite and total organic sulfur (TOS) have large positive  $\Delta^{34}\text{S}$  values indicating the same source of sulfur for both, the organic fraction and the sulfides. Our data support the local development of euxinia, in the context of a non-biological sulfur cycle, prior to extensive oxidative weathering within the biosphere.