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Rare earth element characteristics of Paleoproterozoic cap carbonates pertaining to the Sausar Group, Central India: implications for ocean paleoredox conditions

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Abstract

The Paleoproterozoic era is marked by significant changes in the level of oxygen in the atmosphere and chemistry of the ocean, and the presence of world-wide glaciation. Geochemistry of chemogenic sediments provide clues to these changes. The Sausar Group (2478-2250 Ma) of Central India is one of the few places in the world where Paleoproterozoic glacial unit overlain by a cap carbonate horizon has been identified. Major, trace and rare earth element (REE) contents of Paleoproterozoic cap carbonates of the Sausar Group, have been analysed for their implications for ocean redox conditions during interglacial periods of the Huronian glaciation. The La/La*, Gd/Gd*, Lu_{sn}/La_{sn} and Y/Ho ratios of the cap carbonate reflect their pristine marine nature. Conspicuous Ce anomaly (Ce/Ce* up to 1.75), accompanied by the enrichment of Fe, Mn, Zn and U, provides insight into the redox state of the ocean at the time of deposition of the cap carbonate succession. Based on these observations, we infer anoxic depositional conditions in the basin during the interglacial period of the Paleoproterozoic glaciation before the Great Oxidation Event (GOE), and the level of oxygen in the atmosphere fluctuating between 10⁻⁵ and 10⁻² of the present atmospheric level (PAL).

Key words: Paleoproterozoic cap carbonates, REE geochemistry, positive Ce anomaly, Great Oxidation Event, Sausar Group, Central India.

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