

# Exploring Paleoproterozoic Marine Redox Conditions during the Great Oxidation Event: Geochemistry of post-glacial carbonate rocks of the Aravalli Supergroup, Rajasthan, India

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The Paleoproterozoic metasediments of the Aravalli Supergroup, Rajasthan, India, have ages between 2400 and 1900 Ma. Though there was no previous report of Paleoproterozoic glaciation from these rocks, we have identified features indicative of glacio-marine conditions at the time of deposition of the lowermost lithological unit of the Aravalli Supergroup in the Umra area, Rajasthan. The area has extensive outcrops of Paleoproterozoic carbonates, setting an example and recording the early stages of  $\delta^{13}\text{C}$  positive Lomagundi excursion of up to  $\sim 6.8\%$  (PDB) (Purohit et al., 2010; Goswami et al., 2023). Negative  $\delta^{13}\text{C}$  isotopic values (up to  $-6.4\%$  PDB) from the lower part of the carbonate sequence indicate fluctuating conditions during the early stages of the post-glacial depositional condition, marking the initiation of the Lomagundi excursion (Goswami et al., 2023).

A reduced paleoenvironmental condition is implied by the uranium mineralization that occurs in the Paleoproterozoic metasediments of the Umra subbasin, which is hosted by the carbon phyllites overlying the carbonates that record the positive  $\delta^{13}\text{C}$  Lomagundi event. The carbon phyllites were deposited towards the end of the Great Oxidation Event (GOE) and Lomagundi excursion when there was a sudden drop in atmospheric  $\text{pO}_2$ . Geochemical data from the carbonate rocks indicate deposition during a fluctuating atmospheric conditions marked by alternating reduced marine and oxidizing conditions. Similar fluctuating conditions towards the end of Lomagundi have also been recorded by carbonates from various places. One such example is found in the Woolly dolomites, Western Australia where the  $\delta^{13}\text{C}$  values immediately after Lomagundi event begin with negative values of up to  $-5\%$  (PDB) and increase later mimicking a small post-Lomagundi positive excursion (Bekker et al., 2016). The present research centers on identifying comparable variable redox conditions documented in the metasediments of Umra, Rajasthan, India. We provide models to enhance our comprehension of the Lomagundi and Great Oxidation Events, in a global context.

[1] Purohit et al. [2010]. *Gondwana Research* **18(2-3)**, 538-546.

[2] Goswami et al. (2023) *Precamb Res* **399**, 107240.