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Carbon, oxygen isotope geochemistry of the Paleoproterozoic carbonate rocks, Gwalior Basin, Central India

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The Paleoproterozoic interval is characterized by the first evidence for incontrovertibly free oxygen in the ocean/atmosphere system. In this study, carbonates from the Gwalior Group, Bundelkhand craton, Central India, and particularly the Morar Formation were analyzed for carbon and oxygen isotopes. Carbonate sediments reflect the physicochemical and biological conditions of their deposition. Gwalior basin overlying the Bundelkhand gneiss unconformably in central India (max. thickness ~1.8 km) is exposed over an area of 2400 km^2. The Gwalior group is subdivided into lower Par Formation and upper Morar Formation. The siliciclastic Par Formation is restricted to the southern margin of the Gwalior basin. It comprises sandstone, fanglomerate/conglomerate, carbonaceous shale and represents the more significant proportion of sedimentary pile of the basin. Conformably overlying the Par Formation, rocks of Morar Formation (max. thickness~ 800m) represents the dominant part of the outcrop area of the Gwalior basin and are composed mainly of iron formation and limestone with subordinate fine-grained argillaceous sediments. Geochronological data of the mafic rock present within the basin have yielded dates of 1830± 200 Ma (Rb-Sr isochron) and 1854± 7Ma (U-Pb zircon Concordia). The lower age limit for the Gwalior Group is constrained at 1.83 Ga (cf. Dubey, 1930). The dating of carbonates within the Morar Formation with Pb-Pb systematics and recorded ages of 1914 ±120 Ma and 1866±250 Ma. Recently generated Sm-Nd mineral isochron age of 1787 ±60 Ma from basaltic sill that separates the Par and Morar Formations.

Limestones of the Morar Formation have been selected for this study. The $\delta^{13}C$ values vary from -1.08 to 0.73‰ (V-PDB). The $\delta^{18}O$ values of these samples display a range from -8.85 to -11.78‰ (V- PDB). The reported $\delta^{13}C$ and $\delta^{18}O$ values of Morar carbonates indicate that they represent slightly deeper facies marine carbonates and are similar to many Paleoproterozoic carbonate successions worldwide.

[1]Paul,P.,Chakraborty,P.,Shiraishi,F.,Das,K.,Kamei,A.and Bhattacharya, S., 2020. Clue on ocean redox condition from trace element and rare earth element (REE) composition of iron formation and carbonate rocks from the late Paleoproterozoic Morar Formation, Gwalior Group, central India. *Journal of*