

Ca and Nd isotopic compositions of the carbonates from the Vindhyan basin, India: Implications for the basin evolution and Mid-Proterozoic seawater chemistry

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The Mid-Proterozoic Vindhyan basin is the largest (178,000 km²) among the Indian Proterozoic basins and contains thick pile of undeformed and unmetamorphosed sediments (both clastics and carbonates). The Bundelkhand Granite separates the Vindhyan basin into the Son valley and the Chambal valley sub-basins. To understand the connectivity between the two sub-basins, the source of the continental flux in the Vindhyan water mass and the interaction between the Proterozoic atmosphere and hydrosphere, the three prominent carbonate horizons from both sub-basins were analysed for their geochemical and Nd and Ca isotopic compositions. The carbonates were dissolved using 1.5 N HCl in order to eliminate any silicate contribution. The major and trace element concentrations were analysed using a quadrupole ICP-MS (Thermo Scientific, X series 2) while the Nd and Ca isotope measurements were performed using a TIMS (Thermo Scientific, Triton Plus), both at the Centre for Earth Sciences, IISc. The $\epsilon_{Nd(t)}$ values of the carbonates from the two sub-basins broadly overlap and suggest inputs from old cratonic sources. The 1.6 Ga old [1] carbonates, however, show a prominent shift towards higher $\epsilon_{Nd(t)}$ values suggesting contributions from a juvenile source, possibly the rhyolitic tuffs which erupted at the same time. The $\delta^{44/40}Ca_{SRM915a}$ of the Vindhyan carbonates shows a 0.4‰ variation, which is much larger than our analytical uncertainty of 0.08‰. The Son Valley carbonates typically show lower $\delta^{44/40}Ca_{SRM915a}$ than the Chambal Valley carbonates. The lower $\delta^{44/40}Ca_{SRM915a}$ values together with higher Sr concentrations and the presence of relict fan fabrics suggest aragonite precipitation in the lowermost carbonate horizon in the Son Valley, whereas in the Chambal Valley, calcite precipitation dominated.

[1] Ray *et al.* (2003) *Precambrian Research* **121**. 103-140