

Mesoarchaean tectono-metamorphic event from Bundelkhand craton, central India

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Bundelkhand craton is exposed over ~29,000km² area in north-central India. The craton consists of slivers of Archaean greenstone successions within granitoids and gneisses, latter containing components with ages: 3.5 Ga [1], 3.3 Ga, 2.7 Ga and 2.56-2.49 Ga [2]. The amphibolites from the greenstone slivers yield depleted mantle ages clustering around 4.9-4.2 Ga and 3.4-3.3 Ga [3]. While the older age range may correspond to protolith formation, the younger cluster may indicate age of metamorphism.

Our study concentrates on a greenstone sequence SW of Mauranipur. The sequence consists of interlayered amphibolite-calc silicate-biotite schist-quartzite and have steeply dipping foliation. Amphibolites are of two types: Type-1, retrogressed amphibolites with garnet porphyroblasts in a matrix of chlorite-quartz, Type-2 amphibolites with hornblende-defined foliation and cross-cutting quartzofeldspathic veins. Garnet porphyroblasts are extensively replaced by chlorite in Type-1 amphibolite. The Type-1 amphibolite is interbanded with a calc-silicate, latter consisting of alternate bands of garnet-amphibole-calcite-quartz and clinopyroxene-epidote-calcite-quartz. Garnets in the Type-1 amphibolite and in calc-silicate have compositions: Prp₁₁₋₁₄Grs₁₃₋₁₅Alm₆₅₋₆₉Sps₅₋₉ and Grs₃₀₋₅₀Alm₁₅₋₃₂Sps₃₄₋₃₇, respectively. The P-T condition of metamorphism is ~5.7 kbar, 425-450°C and this has been obtained from the garnet-bearing layer of calc-silicate by determining the intersection of stable reactions by using THERMOCALC.

We conclude that the age of this metamorphic event from Bundelkhand craton was probably ~3.3 Ga, as obtained from the Nd isotope systematics of the amphibolites. The P-T conditions of metamorphism indicates a high geothermal gradient of ~30°C/km in contrast to ~12°C/km recorded during Neoproterozoic [5] from the craton.

- [1] Sarkar *et al.* (1996) *Rec. Res. in Geology* **16**, 76–92.
 [2] Mondal *et al.* (2002) *Pre. Res.* **117**, 85–100. [3] Malviya *et al.* (2005) Joint Meeting Earth & Planetary Sciences, Japan.
 [5] Saha *et al.* (2010) *Contrib. Mineral. Petrol.* **161**, 511–530.

C, O, Sr isotope compositions of sediments of the Mesozoic Kutch basin, NW India

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The Mesozoic period of earth history is known for the preservation of bulk of global hydrocarbon reservoirs. It is also known that this period is marked by global scale anoxic events reflecting in the C, O and Sr isotope records of marine carbonates [1]. In this work we report C, O and Sr isotope compositions of marine carbonate rocks belonging to the Mesozoic Kutch sedimentary basin of NW India. The sediments of the Kutch basin range in age from Bathonian stage (169.2 Ma) of Middle Jurassic to the Albian (98.9 Ma) of the Cretaceous. Carbonate sediments belonging to the lower Jhurio (Bathonian to Callovian) and Jumara (Callovian to Oxfordian) Formations have been analyzed for their $\delta^{13}\text{C}$, $\delta^{18}\text{O}$ and $^{87}\text{Sr}/^{86}\text{Sr}$ values showing wide ranges mainly due to the effect of later diagenesis. Using the proxies such as Mn/Sr, $\delta^{18}\text{O}$ and $^{87}\text{Sr}/^{86}\text{Sr}$ the best-preserved C, O and Sr isotope compositions of ambient seawater compositions has been estimated (Table 1).

| Formation | $\delta^{13}\text{C}_{\text{Carb}}$ | $\delta^{18}\text{O}$ | $\delta^{13}\text{C}_{\text{Org}}$ | $^{87}\text{Sr}/^{86}\text{Sr}$ |
|-----------|-------------------------------------|---------------------------|------------------------------------|----------------------------------|
| Jumara | -1.5 to 1.6 (n = 15) | -10.7 to -5.8 (n = 15) | -29.4 to -24.6 (n = 12) | 0.707080 to 0.707441 (n = 15) |
| Jhurio | -1.0 to -1.6 (n = 2) | -6.4 to -9.4 (n = 2) | -30.9 to -26.9 (n = 2) | |

Table 1: Best-preserved C, O and Sr isotope compositions of Mesozoic Kutch carbonates

While the best-preserved $\delta^{13}\text{C}$ and $^{87}\text{Sr}/^{86}\text{Sr}$ values of Kutch carbonates are well in agreement with the global curves, the $\delta^{18}\text{O}$ values show large depletion up to 5‰ when compared to the ambient global mean. The observed diagenetic trends indicate possible thermal maturity of organic matter and hence generation of hydrocarbon reservoirs as also corroborated by surface geochemical prospecting methods.

- [1] Jones, C.E. & Jenkyns, H.C. (2001) *Am. J. Sci.* **301**, 112–149.