



## **Effect of pedogenesis on isotopic values of paleosol components and its implication on paleoenvironmental reconstruction: A case study from Rayka, Mahi river, India**

Vijayananda Sarangi, Anurag Kumar, and Prasanta Sanyal

Indian Institute of Science Education and Research Kolkata, Department of Earth Sciences, Nadia, India  
(sarangi99vijay@gmail.com)

The carbon and oxygen isotopes in calcretes, carbon isotope in soil organic matter and *n*-alkanes in paleosols preserved in continental basins provide high-resolution, long-term and fairly continuous paleoenvironmental records. However, variation in paleosol character in an area may lead to a difference in estimation of climate as well as vegetation. For instance, variation in sub-aerial exposure can lead to simultaneous deposition of pedogenic and non-pedogenic calcretes and can impart differences in carbon and oxygen isotope composition and associated organic carbon. The present study attempts to comprehend the effect of sub-aerial exposure and pedogenesis on the isotopic composition of paleosol components that form the basis for paleoclimatic and paleovegetational reconstruction. In this context, two locations (profile-A and profile-B) separated by a distance of 500 meters at the same stratigraphic level and have undergone different pedological modification were selected. The profile-A has undergone pedogenesis resulting in the deposition of pedogenic calcretes (PC). In profile-B, a thick unit of non-pedogenic pond calcretes (NPC) indicates the absence of pedogenic modification. The lateral heterogeneity in the two profiles is due to elevation induced gradient resembling soil catenas. In profile-A, the carbon and oxygen isotope values of pedogenic calcrete ( $\delta^{13}C_{PC}$  &  $\delta^{18}O_{PC}$ ) showed more variations with a spread of 3‰ and 2.3‰ respectively. The non-pedogenic pond calcretes exhibited a narrow range of carbon and oxygen isotope values ( $\delta^{13}C_{NPC}$  &  $\delta^{18}O_{NPC}$ ). In profile-B, the  $\delta^{13}C_{NPC}$  and  $\delta^{18}O_{NPC}$  values exhibited a maximum spread of 1.3‰. As calcretes in profile-A and profile-B developed simultaneously, the difference in isotopic values indicates that the isotopic inheritance depends on the pedological modification the calcretes have undergone. The average carbon isotope of organic matter ( $\delta^{13}C_{OM}$ ) in profile-A and profile-B were -23.4‰ and -21.1‰ respectively. The difference in  $\delta^{13}C_{OM}$  values is a result of variation in sources of organic matter. The carbon isotopes of *n*-alkanes ( $\delta^{13}C_{n-alk}$ ) showed a similar trend in profile-A and profile-B indicating sources of *n*-alkanes are same in both the profiles and  $\delta^{13}C_{n-alk}$  values are unaffected by the pedological modifications. Therefore, in continental settings with lateral heterogeneity in sediment character, the robustness of the paleosol-derived long-chain *n*-alkanes makes it an ideal paleovegetational proxy.