

Geochemistry of Rare Earth Elements in Mollusk Shells from a Sediment Core from Southeastern Sri Lanka and Its Paleooceanographic Implications

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Bio-mineralization of carbonate shells is sensitive to changes in the physico-chemical conditions of the ambient water. Despite the possible vital effects, Rare Earth Elements (REE) could be incorporated in biogenic carbonates without major mass fractionation, thus it can be used as a proxy for climate, environmental and oceanographic applications. Mollusk shells (43) from families *Veneridae* and *Potamididae* collected at different depths of a sediment core retrieved from the Pottuvil Lagoon were used to trace REE imprints of environment changes around southeastern Sri Lanka during the Holocene. Shells were digested using the reverse aqua-regia (3:1 HNO₃: HCl) method and the REE contents were measured using ICP-MS. Chronology of the sediment core was established by the Bacon age-depth modeling based on calibrated AMS ¹⁴C dates of mollusk shells and bulk sediments. North American Shale Composite (NASC) normalized REE patterns showed that the shells are enriched in light REE (LREE) with prominent negative Eu and Ce anomalies and a slightly positive Gd anomaly. In addition, total REE (Σ REE), Y/Ho ratio, and magnitude of LREE enrichment exhibited distinct variations with depth. The phases of increased Σ REE concentration, Y/Ho and enhanced LREE enrichment with troughs or no Ce anomaly were corresponded with increased terrestrial input recorded in lithogenic proxies from 5141 to 4223 BP and from 2918 to 2688 BP. The phases of decreased Σ REE concentration, Y/Ho and declined LREE enrichment with enhanced Ce anomaly were consistent with decreased terrestrial input during 4223–4021 BP and 3537 to 3260 BP periods. Thus, these periods reflect (i) declined salinity (freshening) in the ambient water and a wet climate; (ii) increased salinity in the ambient water and a dry climate, respectively. Based on the whole shell geochemistry of REE, this study was able to reconstruct the paleooceanographic conditions around southeastern Sri Lanka from the Mid to Late Holocene.

Keywords: Holocene, Marine, Terrestrial, REE, Paleoclimate; AMS ¹⁴C dating

Financial assistance under the grants NSF/SCH/2018/06 and NSFC 41861144026 is acknowledged.