Rare earth elements in carbonate rocks of the Bambuí Group, Brazil, and their relationship with early diagenetic environments

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Rare earth elements plus yttrium (REY) mass fractions of ancient carbonate rocks have been widely used to track paleoenvironmental conditions of ocean water column. Here we used these proxies as an effort to find secular variations in seawater chemistry recorded in the Ediacaran-Cambrian carbonate rocks of the Sete Lagoas Formation, at the base of the Bambuí Group. The samples are from a borehole section (~175 m thick) located in Arcos city, SE Brazil. The REY data were obtained in the acid leachates of the samples using a SF-ICP-MS Element XR (Thermo, Germany).

The normalized REY distributions show little potential for preservation of the water column signal, as the "seawater type" REY pattern is mostly absent. Instead, the REY patterns exhibit a stratigraphic segmentation and correlation with the carbonate facies, and they most likely reflect penecontemporaneous to early diagenetic processes. From base to top, the following REY patterns are observed: (i) the cap carbonates atop the basal diamictites have the highest ΣREY and display LREY depletion and slight Ce negative anomalies, suggesting significant freshwater input in the basin during transgression; (ii) stromatolitic limestones with framboidal pyrite exhibit flat REY normalized distributions, that reflect bacterial sulfate reduction; (iii) pure limestones with high Sr contents (> 1000 μg/g) show LREY depletion that is probably a result of authigenic carbonate formation in an alkaline early diagenetic environment; (iv) dolomites display MREY enrichment with marked Y negative anomaly, probably developed during dolomitization; (v) the topmost pure limestones exhibit La and Y positive anomalies, becoming LREY depleted upwards.

Despite the absence of a record of the seawater column in most cases, the REY data of the carbonate rocks potentially provide clues of processes at the water/sediment interface, which can help in tracking early diagenetic metabolisms active through the Ediacaran-Cambrian boundary.