

Rare earth elements of Ediacaran carbonate rocks and their significance as paleoenvironmental proxies

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Rare earth elements plus Y (REY) data of a composed section of the carbonate rocks of the Bambuí Group, in the southern portion of the São Francisco basin, Brazil, are presented here. The REY behavior changes from base to top of the section and matches the C and Sr isotope variations that subdivide the unit in three Chemostratigraphic Intervals (CI-1 to CI-3). The lower CI-1 exhibit REY enrichment and flat shale normalised distributions that record a high freshwater input in the basin after deglaciation. As the sea level rise, the lower continental influence generates La, Gd and Y positive anomalies in the CI-2 carbonate samples, but LREY enrichment over HREY is still observed. Interestingly, the appearance of a “seawater” type REY normalized distributions is observed in the CI-3 samples when the basin becomes restricted. These carbonate rocks exhibit pronounced La positive anomalies, chondritic Y/Ho ratios and LREY depletion in relation to HREY. Rather than open marine conditions, the CI-3 records a decrease in the silicate chemical weathering in the source areas due to higher denudation rates and a change in the dissolved influx with major contribution from carbonate rocks. The increased concentration of carbonate ions in the restricted sea drives a REY fractionation process similar to that of modern ocean. Constant positive Ce/Ce* values throughout the shallow and deep sections suggest anoxic early diagenetic conditions, inefficient circulation and a stratified water column. Such conditions, combined with the change in the dissolved influx, could have limited the habitable environment in the basin. Finally, our data show that the REY contents of ancient biochemical precipitates are not an unequivocal tool neither to track open and restricted marine settings nor to distinguish proximal and distal environments.