

## REE DISTRIBUTION IN RECENT PACIFIC SEDIMENTS AND THE RELATIONSHIP WITH MAJOR ELEMENTS GEOCHEMISTRY AND SOURCE PROVENANCES

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Rare earth elements (REE) may indicate relative significance of different sources of matter in the formation of complex objects, such as oceanic sediments. The chemical composition of oceanic sediments is formed by the following main processes: 1) continental terrigenous input; 2) scavenging from seawater; and 3) diagenesis.

Surface samples of sediments, recovered during several cruises, were used in this study. Thirty eight samples of sediments were obtained from the trans-Pacific transect from Japan to Mexico (20° N). Twenty samples of sediments from the transect through the East Pacific Rise, as well as ten sediments from North Equatorial Pacific were also analyzed. The REE analyses were carried out using the VG Plasma Quad PQ2+ ICP-MS (two internal standards: In, Re)

The composition of terrigenous and volcano-terrigenous input in shelf and slope sediments may differ significantly. Our data show that REE contents and shale-normalized patterns of coastal sediments are very close to those of source rocks. Each zone of coastal sediments is characterized by specific REE pattern: on the Japanese coast by low La/Lu ratio and positive Eu anomaly, on the Mexican coast by high La/Lu ratio, and near Hawaiian Islands by distinct positive Eu anomaly, resembling that of island basalts.

The REE contents of sediments rise smoothly from the coast to the pelagic areas. Simultaneously, the REE pattern changes: the La/Lu and Ce/Ce\* ratios increase (Fig. 1). This is related to the general laws of oceanic sedimentation: the decrease of terrigenous input and the increase in contents of authigenic Fe and Mn oxyhydroxides. In the areas with high contents of fish-bone apatite, the REE pattern has features specific for deep-sea water: negative Ce anomaly and low La/Lu ratio. The REE patterns of East Pacific Rise sediments have the same features because hydrothermal Fe and Mn oxyhydroxides scavenge REE from deep water. Thus, REE accumulation in the deep ocean is attributed either to the phosphate phase (apatite), or to Fe and Mn oxyhydroxides of hydrogenous or hydrothermal origin.

For all types of pelagic sediments (clayey oozes, radiolarian oozes, and metalliferous sediments), a positive correlation between trivalent REE and phosphorus ( $r = 0.8-0.9$ ), and a negative correlation between Ce anomaly and phosphorus ( $r = 0.75$ ) are observed. It is possible that REE of oceanic sediments are associated mainly with surface phosphate layers, which may be either on the surface of apatite, or sorbed by Fe oxyhydroxides.

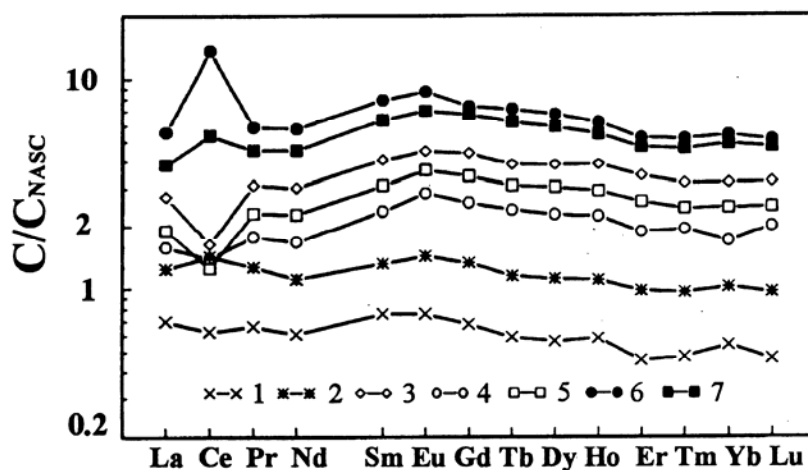


Fig. 1. REE patterns of sediments and nodules from the trans-Pacific transect. Sediments: 1, 2 – hemipelagic; 3 – with fish-bone apatite; 4 – red clays; 5 – with hydrothermal input; 6, 7 – nodules.