

## Rare Earth Elements in Sediments off Southern California: A New Anthropogenic Indicator

Ilhan Olmez, Edward R. Solkovitz, Diana Hermann, and Robert P. Eganhouse

<sup>1</sup>*Massachusetts Institute of Technology, Nuclear Reactor Laboratory, Cambridge, MA*

<sup>2</sup>*Woods Hole Oceanographic Institution, Woods Hole, MA*

<sup>3</sup>*Southern California Coastal Water Research Project, Long Beach, CA*

### ABSTRACT

The rare earth elements (REE) composition of sediment cores from the San Pedro Shelf (60 m) and the Santa Barbara Basin (588 m) are contrasted. The Santa Barbara Basin core has relatively uniform REE concentrations throughout its 60-cm length and a REE composition similar to the crustal abundance. In contrast, the upper 20 cm of the 36-cm San Pedro Shelf core collected in 1981 is enriched in the light REE (La, Ce, Nd, Sm) but not the middle REE (Eu) or the heavy REE (Yb, Lu). These upper sediments and two effluent particulate samples obtained in 1979 have REE signatures markedly different from crustal material. This is a result of anthropogenic inputs beginning in the early 1960s from the Joint Water Pollution Control Plant wastewater outfall 6 km upcurrent from the San Pedro Shelf core. The source of the light REE enrichment are petroleum-cracking catalysts and their products; these include bottom ash, fly ash, and wastewater from oil-fired power plants and oil refineries. Cracking catalysts, which are produced primarily from two REE minerals, bastnasite and monazite, are strongly enriched in the light REE. With their unique signature and source, the REE may be a new tracer for anthropogenic inputs in coastal environments.

**Due to distribution restrictions, the full-text version of this article is available by request only.**

Please contact [pubrequest@sccwrp.org](mailto:pubrequest@sccwrp.org) to request a copy.