LREE-rich beach sands from Sithonia Peninsula (Chalkidiki, Greece)

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Beach sands, being the weathering products of the adjacent Sithonia Plutonic Complex [1], have been studied for their heavy mineral and LREE content. For the mineral separation, the 125-500 μm grain-size fraction, accounting for 90.6-95.4 wt % of the whole sample, was used. Among the samples collected, three are particularly enriched in heavy minerals.

Heavy liquid (tetrabromoethane, 2.967 g/mol) and a magnetic separator were employed to determine the wt % heavy fraction and the heavy magnetic and non-magnetic fractions of the whole sample (Table 1). The heavy magnetic fraction (<0.8 amp at cross and logitudinal settings of 10º) contains epidote, allanite, biotite and hornblende, while the heavy non-magnetic fraction (>0.8 amp at same settings) contains zircon, monazite, apatite and sphene.

	Heavy fraction	Heavy magnetic fraction	Heavy non-magnetic fraction
S1	85.3	50.6	34.7
S2	26.8	16.0	10.8
S3	56.4	51.6	4.8

Table 1: Heavy, heavy magnetic and non-magnetic content (wt % relative to the bulk sample).

The content of the studied samples in LREE and Y is particularly high (Table 2). This is attributed mainly to the presence of monazite, allanite and to a lesser extent epidote.

	Y	La	Ce	Pr	Nd	Sm
S1	452	1430	2720	305.0	1030	171.0
S2	126	409	768	81.9	284	46.3
S3	213	371	730	84.2	307	62.4

Table 2: Content of the bulk samples in selected LREE (ppm).

[1] Christofides *et al* (2007) *Lithos* **95**, 243–266.

Organic matter oxidation and authigenic rhenium in late Eocene pelagic sediments

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Poor organic carbon preservation in the deep sea during Eocene warmth suggests an important change in the carbon cycle during greenhouse episodes [1]. An expected consequence of this phenomenon is that Eocene pelagic sediments should be more reducing than similar modern sediments. Measured Re concentrations demonstrate significant authigenic Re-enrichment, up to 30X average crustal concentrations, associated with very low total organic carbon (TOC; <0.2%) in late Eocene sediments from ODP Site 1090 (42°54.8′ S, 8°53.9′ E) on the Agulhas Ridge in the South Atlantic. Using measured $^{187}Re/^{188}Os$ ratios to correct for ^{187}Re decay since sediment deposition yields initial $^{187}Os/^{188}Os$ ratios that are similar to contemporaneous seawater, requiring that Re enrichment occurred during or soon after sediment deposition. Therefore these data provide strong evidence of a brief episode (a few hundred kyr) of reducing conditions. Integrating Re-Os results with previously published data [2,3] constraining paleoredox (U, U/Al) and paleoprodictivity (biogenic Ba, organic carbon and reactive phosphorus) highligts several important aspects of the reduced interval of this record. Re (ppb)/TOC % (up to 55) are among the highest reported to in recent marine sediments. The zone of elevated Re is not clearly associated with evidence of elevated paleoproductivity, suggesting that decreased in oxygen penetration depth is more likely to be due to lower bottom water oxygen, than an episode of elevated organic matter flux to the sediment water interface. Although U/Al ratios are modestly elevated across the interval with elevated Re, average Re/U (15 ng/μg) ratios are much higher than in most modern reducing sediments and higher than expected if both elements are enriched via diffusion across the sediment water interface and reductively fixed at the same depth. We suspect that elevated Re/U is the result differing reduction mechanisms within sediment pore waters. In total, these results provide empirical evidence that Re is a uniquely powerful paleoredox tracer in organic-poor, pelagic sediments.

[1] Oliveras-Lyle and Lyle (2006) *Paleoceanog*. **21**, doi:10.1029/2005PA001230. [2] Anderson and Delaney (2005) *Paleoceanog*. **20**, doi:10.1029/2004PA001043. [3] Diekmann, *et al* (2005) *Global Planet. Change* **40**, 295-313.

DOI:10.1180/minmag.2013.077.5.16