Trace metals in surface sediments of the shelf and upper slope between the Tagus River mouth and Cape Sines (Portugal)

[a]Jesus C C, [b]de Stigter H, [a]Miranda P, [c]Oliveira A, [a]Rocha F

The geographic pattern of trace metal enrichment and their links to recent sediment transport was investigated on the continental shelf and upper slope between the Tagus River mouth and Cape Sines (Portugal). In order to do so, the fine-grained fraction (<63 μm) of 106 surface sediment samples was analysed for total concentration of Ca, Al, Fe, Mg, Ti, Mn, Zn, Cr, Pb, Ni, Cu and As, mineral composition and grain-size.

The elemental contents of the fine-grained sediment fraction appear to a large extent determined by the amount of fine-grained fraction of the bulk sediment. Considering the spatial distribution pattern of trace metals and the correlations among them, two groups with different behaviour can be distinguished: i) Cr, Ni and ii) Cu, Pb, Zn, As. Chromium and Ni show relatively high concentrations on the inner shelf south of the Setúbal Canyon. The elements of the second group also show higher concentrations on sediments from the inner shelf, in this case close to the inlets of estuaries and coastal lagoons. This is most conceivably related to co-precipitation of these trace elements with Mn and Fe (hydr)oxides. Enrichment factors were calculated using as baseline elemental concentrations from pre-industrial sediments. The area of the shelf and upper slope showing significant trace metal enrichment (EF > 1.5) per element follows the sequence: Pb > Zn > Cu > Cr > Ni. Generally, the enrichment of trace metals tends to decrease with increasing water depth, suggesting that the excess of trace metals must be derived from land. The areas of the Lisbon-Setúbal-Sines shelf most affected by enrichment of trace metals include the entire Lisbon shelf, the Sado mud patch and the inner shelf between Tróia and Sines. Enrichment of Pb and Zn on the Lisbon shelf and the Sado mud patch, and of Cu in the latter area points to the nearby Tagus and Sado estuaries as the likely sources of enrichment. Since the enrichment of Pb is found to extend over a much wider area of the shelf and upper open slope than that of other trace elements, it seems likely that atmospheric input is an important source of Pb contamination, in addition to rivers discharging terrigenous sediments to the shelf.

[a] *GeoBioTec, Department of Geosciences, University of Aveiro, Portugal (ccesar.jesus@gmail.com)*
[b] *NIOZ – Royal Netherlands Institute for Sea Research, P.O. Box 59, 1790 AB Den Burg, Texel, The Netherlands*
[c] *Divion of Marine Geology - Hydrographic Institute – Portuguese Navy, Lisbon, Portugal*