Natural heavy metal and metalloid concentrations in sediments of the Minho River estuary (Portugal): baseline values for environmental studies

M. Mil-Homens · A. M. Costa · S. Fonseca ·
M. A. Trancoso · C. Lopes · R. Serrano · R. Sousa

Abstract Forty-nine surface sediment samples from the Minho estuary sector between Tui and Caminha were analyzed for grain-size contents, Al, As, Cr, Cu, Hg, Li, Pb, Sn, and Zn concentrations. Selected heavy metal (Cu, Cr, Hg, and Zn) and metalloid (As and Sn) distributions were normalized against Al and Li with the main goal of compensating for natural grain-size variability and to separate natural from anthropogenic contributions, by using a combination of normalization techniques (definition of regional geochemical baselines (RGB) and determination of enrichment factors (EF)). Lead did not reveal a significant relationship with Al and Li. Aluminum explained more variance than Li for As, Cu, Hg, and Zn. Assuming the general non-impacted metal character of the Minho River estuary sediments, RGBs are defined for differentiating between natural and anthropogenic contributions. Based on RGB defined for each heavy metal/metalloid, the degree of enrichment is estimated through the determination of EF. Despite the relatively low total heavy metal and metalloid concentrations, the defined RGB identifies a set of samples characterized by presenting As, Cu, Cr, Hg, and Zn enrichments relatively to expected natural levels. Mercury is the element showing the highest level of enrichment relative to the baseline values being spread through all the study area. Tin present enrichments relatively to Al and or Li always lower than 1.5 suggesting natural contributions.

M. Mil-Homens (✉) · C. Lopes
Instituto Português do Mar e da Atmosfera, I.P.,
Av. Brasília,
1449-006 Lisbon, Portugal
e-mail: mario.milhomens@ipma.pt

M. Mil-Homens · A. M. Costa · C. Lopes
Unidade de Geologia Marinha,
Laboratório Nacional de Energia e Geologia, I.P.,
Estrada da Portela, Apartado 7586,
2721-866 Alfragide, Portugal

A. M. Costa
Arqueociências, IGESPAR, I.P. and LARC, CIBIO/InBIO,
Rua da Bica do Marquês. No. 2,
1300-087 Lisbon, Portugal

S. Fonseca · R. Serrano
Laboratório de Referência do Ambiente, Núcleo
Operacional de Química Inorgânica,
Agência Portuguesa do Ambiente, I.P.,
Rua da Murgueira, 9-9A, Zambujal, Apartado 7585,
2611-865 Amadora, Portugal

M. A. Trancoso · R. Sousa
Laboratório de Biocombustíveis e Ambiente,
Laboratório Nacional de Energia e Geologia, I.P.,
Azinhaga dos Lameiros,
1649-038 Lisbon, Portugal

🖄 Springer