TRACE METAL CONTENTS IN SURFICIAL SEDIMENTS FROM THE WESTERN ADRIATIC SEA

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Abstract
Zn and Pb are well known for having a large anthropogenic component in the Adriatic Sea. These trace elements were measured along with OC and mud content in sediments to distinguish their trends among three sectors within the western Adriatic Sea (North, Central and South). The highest concentrations were found in the North within to the Po river prodelta. Discriminant analysis results showed the separation of the North from the Central and the South due to Zn, OC and mud content. Pb did not display a specific trend probably being more associated to the clay fraction of sediments.

Keywords: North Adriatic Sea, Metals, Central Adriatic Sea, South Adriatic Sea, Sediments

This work was developed in the Adriatic Sea under the PERSEUS EU Project (Policy-oriented marine Environmental research in the Southern European Seas), guided by the Marine Strategy Framework Directive (MSFD), which in turn, aims to achieve a Good Environmental Status in European seas by 2020. Mapping the spatial distribution of target trace elements at basin scale would provide a basis for a comprehensive examination of the contamination status according to descriptor 8 "Contaminants in the Marine Environment" of the MSFD. Therefore, the aim of this biogeochemical study was to evaluate spatial patterns of Zn and Pb in sediments from the western Adriatic Sea as they provide the most anthropogenic signals in this system.

Zinc displayed higher levels in sediments from the North section with respect to the Central and South sections (106±23 mg kg^{-1}, 90±11 mg kg^{-1}, 75±22 mg kg^{-1}, respectively) when compared to background values (70 mg kg^{-1}; Faganeli et al., 1991). The highest Zn value were detected near the Po River prodelta (137 mg kg^{-1}); southwards, relatively high concentrations were found near Cesenatico (87-119 mg kg^{-1}). Lead spatial distribution displayed fairly a similar behavior, with higher concentrations near the Po River prodelta (30 mg kg^{-1}) exceeding the background value of 23 mg kg^{-1}; slightly high concentrations were locally found offshore Ancona and the Gargano promontory (26 mg kg^{-1} and 28 mg kg^{-1}, respectively). Pearson positive correlation were found only between Zn and OC, and mud (r=0.77 and r=0.62, $p<0.001$, respectively). The absence of relation between OC and Pb implied that the interaction with organic matter was not an important process for the removal and metal fixation of this element. The OC and mud contents were well correlated (r=0.59; $p<0.001$). The highest contents were found mostly in the northern section, which was probably related to the high and rapid sediment accumulation due to the Po river discharge. Discriminant analysis was used to investigate whether the spatial variations of the target trace elements had statistically significant concentrations within the defined sectors of the western Adriatic Sea. The accuracy of classification matrix was 75%. There was a separation between the North, and the other two sectors (Figure 1). Variables found to be the most significant were OC, mud and Zn, and this fact suggests they presented a high variation along the western Adriatic Sea; conversely, Pb low significance pointed to a more homogeneous distribution of this element among sectors.

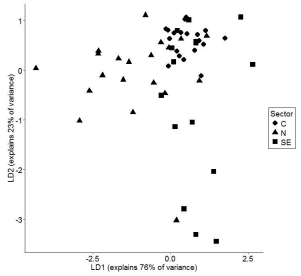

Fig. 1. Scatter plot of samples from the three sectors (North, Central and South) based on the two discriminant functions.

In general, Zn concentrations were above the background levels in the North section in the proximity of the Po river prodelta, originating from the coastal and hinterland area influenced by anthropogenic activities (Dolenec et al., 1998). The LDA results suggested that OC plays the key role in transporting this element, hence combining the chemical and granulometric features of sediments with water circulation in the Adriatic basin. Pb distribution in this basin was previously found to be related to Fe (De Lazzari et al., 2004), pointing to an affinity of this element with the clay fraction of the sediment.

References
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