HEAVY METALS DISTRIBUTION IN MARINE SEDIMENTS OF THE EAST ADRIATIC SEA

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Abstract

Heavy metals (Cd, Pb, Cu, Zn and Ni) concentration and distribution were determined in marine sediments along the Montenegrin coast in the East Adriatic as there is luck of historical, continuous data about heavy metals pollution of this area. The distribution shows that metals concentration decrease in the sediment samples from SE to NW along the coast. The concentrations are generally not high, revealing that the investigated coastal area is not polluted.

Keywords: Adriatic Sea, Metals, Sediments

Introduction

Sediments are usually regarded as the ultimate sink for heavy metals discharged into the marine environment, thus determination of the distribution and concentrations of the heavy metals in sediments is of great importance in environmental pollution studies [1]. The study area is the Montenegrin coast which belongs to the Eastern South Adriatic. The Adriatic Sea is located in the central-north part of the Mediterranean Sea. It is relatively shallow sea especially subjected to pollution due to its semi-enclosed character [2]. Heavy metals in the surface sediments from Montenegrin coast may originate either from natural sources (weathering, pluvial and fluvial erosion), but also from anthropogenic sources (e.g. industrial and municipal effluents, port activities, traffic, rivers, atmospheric inputs). Surface sediment samples collected from the seven near-shore and off-shore stations along the Montenegrin coast were analyzed for Cd, Pb, Cu, Zn and Ni. In the investigated area seven stations (Figure 1) were selected from the entrance of the Boka Kotorska Bay to the mouth of the Bojana river in order to estimate level of concentrations and to present spatial distribution of chosen metals that are mostly associated with anthropogenic inputs [1].

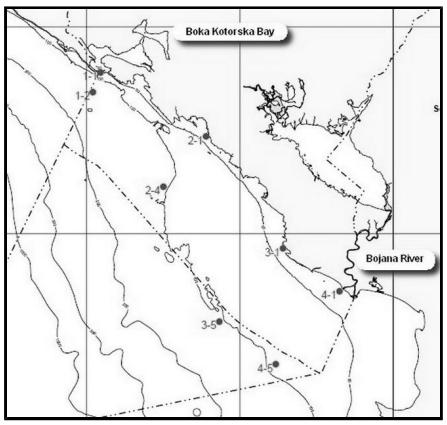

Fig. 1. The investigated area with sediment sampling sites

Meterials and methods

Seven sediment samples (on location 2-1 was sand) were taken in November 2007 with italian research vessel "G. Dallaporta" by using box corer. Concentration of Cd, Pb, Cu, Zn, and Ni in surface sediment samples were determined by Energy Dispersive Polarised X-ray Fluorescence (EDPXRF).

Results and discussion

Metal concentrations in the sediment samples (dry weight) range from 10.64 to 24.35 mg/kg for Pb, from 0.0893 to 0.2713 mg/kg for Cd, from 61.43 to 109.40 mg/kg for Zn, from 20.46 to 44.30 mg/kg for Cu and from 172.69 to 325.70 mg/kg for Ni. Minimal concentration of investigated metals was registered in front of the entrance of the Boka Kotorska Bay on locations 1-1 (Cu, Zn, Ni) and 1-2 (Cd). The exception is Pb which minimal concentration was found on location 3-1. All examined metals had maximal concentration on position 4-5 which is located 14.5 km from the mouth of the Bojana river. Comparing near and off-shore concentrations for Pb, Cd, Cu, Zn and Ni it can be noticed that all metals have shore side concentration less than metal concentrations distant from the coast. The obtained concentrations for Pb, Cd, Cu and Zn are comparable or less than those reported for sediments from different parts of the Adriatic ([3], [4]). According to some sediment quality criteria ([5], [6]), low concentrations of the examined metals indicate that investigated sediment is not polluted. Exception is Ni which level is higher than in the surroundings.

Conclusion

The distribution shows decreasing concentration trend for all metals going in SE-NW direction along the coast and increasing concentration trend with the distance from the shore side. This can be explained with the influence of the Bojana river inside and outside of its estuary, as well as with general anti-clockwise circulation of the Adriatic waters. Comparisons indicate that sediment of the examined area is not polluted.

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