Distribution of Heavy Metals in Core Sediment at the Montenegrian coast

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Introduction: With rapid urbanization and industrialization in coastal areas, heavy metals continuously enter the marine environment. Sediments are the main repository and source of heavy metals in the marine environment, and they play a major role in the transport and storage of potentially hazardous metals [1]. Metals are naturally present in the environment. Therefore, the presence of metals in the sediments of aquatic ecosystems can originate from both both natural and anthropogenic sources. Heavy metal concentrations in core sediments can provide information on heavy metal inputs as well as the pollution history of the aquatic ecosystem [2, 3].

Methods: Two core sediment samples were taken with a core sediment-sampler in October 2019 from two locations in Montenegro (South Adriatic Sea), which were selected based on the sedimentation rate (Fig. 1). The sediment cores have been cut into slices of 1 cm and labelled. The samples (each slice of the core) were brought to the laboratory in bags with ice and stored in a deep freezer unit the drying procedure [4]. Samples were digested in a microwave system, according to the methods described in the Laboratory Procedure Book, IAEA (International Atomic Energy Agency), Marine Environment Laboratory [5]. Determinations of metal contents (Fe, Mn, Zn, Cu, Ni, Pb, Cr, and Hg) in sediments were performed by an atomic absorption spectrometer (Shimadzu AA 7000).

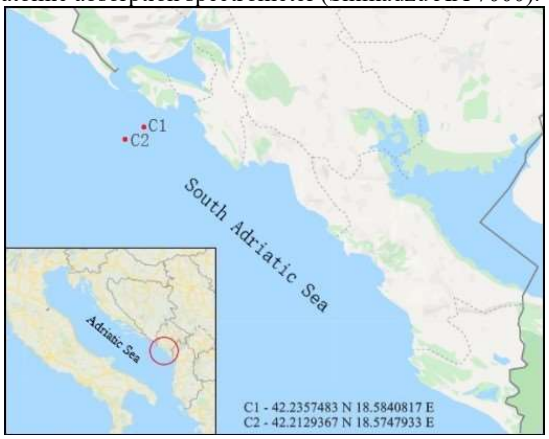

Fig. 1: Map of the investigated area

Results: Levels of Fe, Mn, Zn, Cu, Ni, Pb, Cr and Hg (mg/kg dw) in different layers of core sediments from Montenegrin coast decreased in the following order: Fe > Mn > Ni > Cr > Zn > Cu > Pb > Hg. Higher metal contents for core C1 (120 m) than for core C2 (170 m) are due to the geochemical structure. Increasing heavy metal concentrations tend to be associated with fine grained sediments, so high metal levels are found at locations with high clay contents. Each heavy metal in the core sediments showed its own distribution characteristics. Fe and Mn were the most abundant metals in both sediment cores because they are the most common elements in the Earth's Crust [6]. The mean concentrations for each element in the core sediments were lower than the background levels in the Earth's crust, except for Cr and Ni. High concentrations of Cr and Ni originated from the geochemical structure of the Montenegrian coast [7]. The levels of Cu, Zn, Mn, and Cr generally decreased with depth while Fe, Pb, and Ni contents indicated higher values in the middle and bottom layers of the both cores.

Discussion: A comparison of the vertical and spatial distributions of metals in sediment cores showed differences associated with many factors, including geochemical and biogeochemical processes, like sedimentation, precipitation and flocculation of particulate substances. Hence, it is challenging to find the principal one.

The possible primary sources of the metal contamination in the sediments are municipal and industrial wastewater discharges (for Cu and Zn), agricultural runoff (for Cu), and atmospheric deposition (for Pb).

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References: [1] Christophoridis et al. (2009) J Hazard Mat 168:1082-1091; [2] Al-Edresy et al. (2019) Int J Hydro. 3(2): 159-173; [3] Vallius (2014) Mar Poll Bull, 79(1-2): 359-364; [4] UNEP, 1985 [5] IAEA (2003) Iaea-tecdoc 1360; [6] Turekian & Wedepohl (1961) Geol. Soc. Am. Bull., 72(2): 175; [7] Joksimović et al. (2020) J Soils Sed. 20:2598-2607.