

COMPOSITION AND ORIGIN OF THE NOVIGRAD SEA SEDIMENTS, EASTERN ADRIATIC COAST

Željka Fiket ^{1*}, Nevenka Mikac ¹ and Goran Kniewald ¹

¹ Ruder Bošković Institute - zeljka.fiket@irb.hr

Abstract

Composition of the sediments, their origin and deposition conditions in the Novigrad Sea, a small bay in the central part of the eastern Adriatic coast, was studied.

Keywords: Estuaries, Geochemistry, Sedimentation, Central Adriatic Sea

Introduction

The Novigrad Sea is a small, semi-closed bay located in the central part of the eastern Adriatic coast. The main characteristics of sediments of the wider area of the Novigrad Sea, including Zrmanja River and bay of the Karin Sea, were investigated. The Zrmanja River is a small karstic river which discharges in eastern part of the Novigrad Sea forming highly stratified estuary [1]. Geochemical, sedimentological and mineralogical analyses of sediments were carried out in order to gain insight into the composition of the sediments, the origin of materials and the deposition conditions in the Novigrad Sea.

Sampling and methods

For purposes of this study, sediment cores were taken at several locations including Zrmanja River, Novigrad Sea, Karin Sea and Velebit channel. Each core was cut into 2 cm subsamples prior to further analysis. Identification of the mineral composition of sediments was performed by X-ray powder diffraction (XRD). Sediment samples were granulometrically characterized by wet sieving.

The content of carbonates was determined volumetrically. Multielemental characterization of sediments after total digestion was performed by high resolution inductively coupled plasma mass spectrometry (HR ICP-MS). Analysis included determination of major, trace and rare earth elements.

Results and Discussion

Results indicate that the bulk samples are predominantly made up of carbonates, quartz and halite, while clay minerals occur as minor phases. Granulometric characteristics of the sediments indicate an increase in silty component (from 24% to 87%) downstream of Zrmanja River toward the deeper part of the Novigrad Sea. Share of carbonates also decreases from the river (64%) to the estuarine sediments (19%). Sediments with highest clay content and consequently highest metal content were collected from the deepest parts of the Novigrad Sea. Based on the results of statistical analysis three main components of the sediments can be distinguished: 1) lithogenic component - elements bound to clay minerals, 2) authigenic component - elements bound to Fe-Mn hydroxides, 3) biogenic component - elements bound to carbonates.

The vertical distribution of elements in sediment cores reflects source rock geochemistry, hydrogeological conditions, early diagenetic transformations and possible anthropogenic influence. Enrichment of sediments with metals downstream of the Zrmanja River and within the Novigrad Sea is related to salt-induced coagulation of colloidal materials and precipitation of Fe-Mn oxyhydroxides and clay particles. The sedimentation processes in the Novigrad Sea are therefore predominantly influenced by Zrmanja River. Smaller streams, as well as water inflow from the Karin Sea have less pronounced but still important influence on sedimentation in this basin.

References

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