SEDIMENT GEOCHEMISTRY ATLAS OF THE SEA OF MARMARA

N. Cagatay [1] *, N. Balkis [2], U. Sancar [1], Z. Cakir [1], F. Yucesoy- Eryilmaz [3], M. Eryilmaz [3], E. Sari [2], S. Akcer [1], D. Biltekin [1]

[1] Istanbul Technical University, EMCOL (Eastern Mediterranean Centre for Oceanography & Limnology) - cagatay@itu.edu.tr

[2] Istanbul University, Marine Sciences and Management Institute

[3] Mersin University, Department of Geological Engineering

Abstract

The Sea of Marmara has been subjected to organic and metal pollution sourced from municipal and industrial activities, the mineralized zones and high-background rocks in its drainage basin, and inputs from the Black Sea. The sediment geochemistry atlas of the Sea of Marmara consisting of the distribution maps of various major and environmentally important elements indicate the various sources and intensity of the pollution in different parts of the Sea of Marmara. The atlas is useful for the identification of the environmentally sensitive marine areas and selection of areas for benthic ecosystem studies, fisheries and otherrecreational and engineering activities.

Keywords : Metals, Geochemistry, Sediments, Mapping, Sea Of Marmara.

Introduction

The Sea of Marmara has been adversely affected by the high population density and industrial activity in its drainage area, and pollutant inputs from the Black Sea . For the *sediment geochemistry atlas of the Sea of Marmara*, a total of 378 surface sediment samples covering the entire Sea of Marmara is analyzed for grain size, organic carbon, carbonate, and 34 major and trace elements by the ICP-MS method . The data are presented in maps (Fig. 1) and basic statistical tables (Table 1) for different geomorphological areas. The maps are interpreted in terms of the scale and sources of organic and metal pollutants.

Results and main conclusions

The results indicate that the İzmit Gulf and the shelf off the coast of Istanbul Metropolitan area are the most polluted in terms of organic carbon and metal contents, followed by Bandırma, Gemlik and Erdek bays on thesouthern shelf. The primary source of the organic and metal pollution is anthropogenic in most areas, with siginificant input in the southern shelf from the poymetallic mineralized zones and high-background utramafic, mafic and granitic rocks.

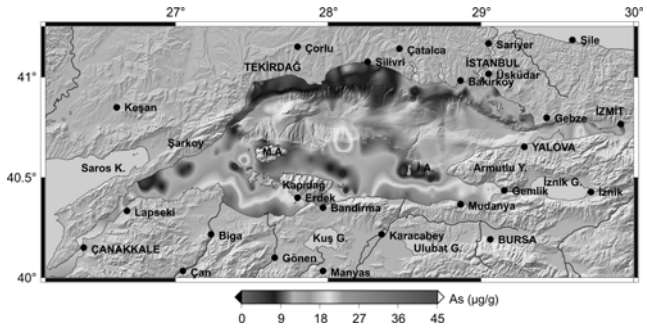

Fig. 1. Arsenic distribution in surface sediments.

The northwestern shelf, Çanakkale Strait and the shelf at its Marmara confluence are relatively less polluted than the rest of the Sea of Marmara. Compared to the average shale, Istanbul metropolitan shelf is enriched in Pb,Cr,Zn,As, Sn and Cu; İzmit Gulf in Mo, Pb, Zn,Cd veAs; nortwestern shelf in Cr, Cd, Pb and Ni; Çanakkale Strait and the shelf area at its Marmara Sea confluence in Pb, As, Cr, Zn, Ni, W and Sb; Erdek Bay in Pb, As, Sb, Zn, and W; Bandırma Bay in As, Pb, Cr, Sb, Ni, Zn and W; Gemlik Bay in As, Pb, Sb, Mo, Ni,Cr,Zn and W; southern shelf (excluding the bays) in Pb, Cr, As, Ni, Zn and W;and the deep basin and slope areas mainly in Mn ve Pb, and to a lesser degree in Cr, As,Ni, and Zn. In the deep basinal sediments, Mn is strongly enriched (enrichmentfactor= 5.2) by early diagenesis. Distribution of Pb and Cu indicate that at least a part of their source in the deep basinal areas could be the Black Sea waters.

Element distribution maps indicate that the Kocasu, Gönen and Biga rivers in the southern catchment area of the Marmara Sea are very effective in transporting anthropogenic and natural organic and heavy metal contaminants as well as lithophile elements, such as K, Rb, Li, La and Nb, mainly as asuspended load. Furthermore, these maps show that the suspended load iseffectively distributed further from the inner shelf to the outer shelf, slopes and deep basinal areas.

The sediment geochemistry atlas can be used for theidentification of the environmentally sensitive marine areas and selection ofareas for benthic ecosystem studies, fisheries and other recreational andengineering activities.

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