

DISTRIBUTION PATTERN OF TRACE METAL CONCENTRATIONS, CONTROLLED BY MULTI-SOURCE FACTORS: NORTH AEGEAN SEA (EASTERN MEDITERRANEAN).

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Abstract

Dissolved Cd, Cu, Ni and Mn were measured in North Aegean seawater in order to evaluate the influences controlling their concentrations. The study area is subjected to certain factors both natural and anthropogenic: Black Sea- Levantine water outflows, river- atmospheric inputs, trawling activities, resuspension processes, etc. In general, the increased fresh and brackish water inputs in the North Aegean plateaus result in elevated trace metal levels in the surface layer, while the bottom nepheloid layer depicts a clear trend of increased concentrations in the Thermaikos Gulf.

Keywords Trace metals (Cd, Cu, Ni, Mn), freshwater inputs, sediment resuspension, Aegean Sea, Eastern Mediterranean

Introduction

The present work is a summary of recently collected data concerning trace metal concentrations in seawater within the framework of E.U. Projects: MATER, INTERREG and INTERPOL. The study area includes the North Aegean plateaus and deep basins from the Dardanelles Straits to the east to the Sporades basin to the west as well as the Thermaikos Gulf to the northwest. Water depths reach 1550 m in the basins whereas on the plateaus never exceed 200 m and especially in the Thermaikos shelf area do not exceed 100 m. The shelf area receives freshwater inputs from many rivers (Evros, Nestos, Strymon, Axios, Aliakmon, Penios, Loudias) draining the Balkan Peninsula with estimated annual water discharge $11 \text{ km}^3 \text{ yr}^{-1}$. Also, it receives surface brackish Black Sea water outflowing from the Dardanelles Straits varying from 100 to $1200 \text{ km}^3 \text{ yr}^{-1}$. Moreover it is known that the shelf area is subjected to increased trawling activities, which result in sediment resuspension.

The aim of this work is to compile previous works in the area and summarize briefly the most important input sources and processes, which affect dissolved trace metal distribution in the Thermaikos Gulf-North Aegean Sea system.

Methods

The data under consideration have been produced within the framework of three European research programmes, namely MATER-MTP II, INTERREG and INTERPOL, conducted in the area from 1997 to 2004. A total of 600 seawater samples have been collected during 9 cruises and were analysed for dissolved Cd, Cu, Ni and Mn. Detailed description of sampling and analytical protocols is given elsewhere (1).

Results

The mean concentrations of the metals measured in the different water layers during all seasons are presented in Table I.

Depth layers		Cd (nM)	Mn (nM)	Ni (nM)	Cu (nM)
Thermaikos Gulf	0-20 m (n=109)	0.089	23.68	5.60	2.14
	20-70 m (n=64)	0.094	51.92	5.99	2.31
N. Aegean Plateaus & basins.	0-50 m (n=100)	0.110	9.50	8.66	3.34
	50-450 m (n=156)	0.089	3.26	5.66	2.26
	450-1200 m (n=146)	0.093	1.13	5.43	2.04

It has been well documented (1) that in the North Aegean inflowing low salinity waters carrying increased amounts of trace metals mix with high salinity low metal content intermediate waters of Levantine origin and result in trace metal enrichments in the surface open waters. This is particularly true for Cu, Ni and Mn as it is shown from the near-linear relationship with salinity. (Fig. 1).

The specific topography of the area, e.g. coexistence of extensive shelf-slope areas and deep basins favours sediment transport from rivers and the coastal zone towards the deeper parts of the system. The presence of benthic nepheloid layer (BNL) in the Thermaikos Gulf and over the outer shelf and shelf break has been reported by many authors (2,3). Especially in the Thermaikos Gulf the presence of a BNL is a constant feature. Increases in dissolved trace metal concentrations have been observed occasionally near the sea-bed

along the slope or in the deep basins. Moreover, in the Thermaikos Gulf dissolved trace metal concentrations and especially Mn are constantly elevated in the BNL layer, and near the river mouths, a feature clearly depicted in North-South transect of the Thermaikos gulf (Fig. 2).

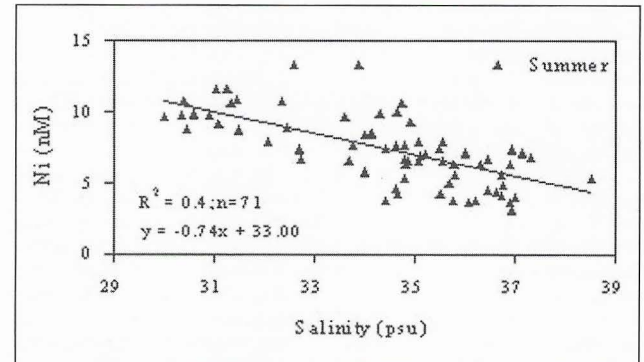


Fig. 1. Salinity vs Ni in the North Aegean.

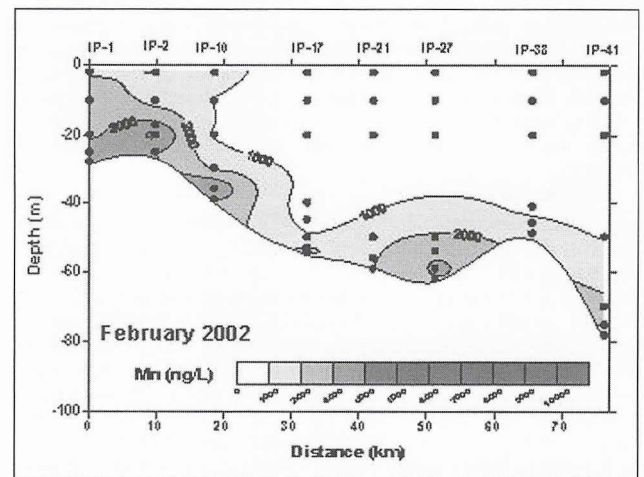


Fig. 2. Dissolved Mn distribution in the Thermaikos Gulf north-south transect.

References

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