

MERCURY LEVELS IN SEDIMENTS FROM GREEK COASTAL AREAS

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Abstract

This study examines total mercury levels in coastal and lagoon surface sediments (n= 55) from the Aegean and Ionian Sea. The results obtained were compared to bibliographic data from the Greek marine environment and spatial and temporal trends were evaluated.

Keywords: Mercury, Sediments, Aegean Sea, Ionian Sea

Introduction

Mercury is one the most toxic pollutants in the environment and in the last years several policies for the limitation of the use of this metal are coming into force. Thus, continuing monitoring studies can prove a useful tool in order to evaluate such initiatives. The aim of this study was to: a) determine Hg levels in sediments from 5 regions in the Aegean and Ionian Sea, b) compare these data to previously reported ones and obtain an overview of mercury distribution along the Greek coasts and c) identify main sources of pollution.

Study areas

The study areas of our research were the coastal areas of Western Saronikos Gulf (area 1a), Larymna Bay (area 2) and Maliakos Gulf (area 3) at the central Aegean Sea and two lagoons of the Corfu Island, Antinioti (area 17) and Korission lagoon (area 18) at the northern Ionian Sea (Fig. 1).

Results and discussion

Total Hg in sediments was determined with microwave assisted-extraction with HNO₃ followed by CVAAS analysis [1]. In the Aegean Sea, the concentrations determined ranged from 0.06 to 0.32 µg/g in the Western Saronikos Gulf, 0.14 - 0.54 µg/g in Larymna Bay and 0.12 - 0.34 µg/g in Maliakos Gulf. The higher concentrations were found at areas impacted from industrial activities, and more specifically in the vicinity of a crude oil refinery (Saronikos Gulf) and a ferro-nickel smelting plant (Larymna Bay). Higher levels (0.48 - 3.89 µg/g) were determined in lagoon sediments from the Ionian Sea. We believe that mercury in the two lagoons of the Corfu Island may have a natural origin, since no intense sources of pollution are recognized in these areas. Currently, additional research is conducted by our team, in order to determine sources and forms of mercury in surface and subsurface sediments.

Tab. 1. Total mercury content in Greek coastal areas in µg/g dry weight

Area	Area code	Hg _T (µg/g)	Reference
Western Saronikos Gulf	1a	0.06-0.32	Present study
		0.18-0.23	2
Elefsis Gulf	1b	0.10-0.51	2
		0.14-0.54	Present study
Larymna Bay	2	0.12	4
		0.12-0.34	Present study
Maliakos Gulf	3	0.02-0.18	2
Pagasetikos Gulf	4	2.90-8.88	5
Thessaloniki Gulf	5	0.21-0.31	6
Axios River	6	0.07-0.46	2
Strymonikos River	7	0.53	2
Stratoni	8	2.95-5.25	5
Kavala Gulf	9	0.06-0.29	2
Nestos River	10	0.32	2
Evros River	11	0.10-0.25	2
Aegean Sea	12	0.03-0.07	2
Korinthiakos Gulf	13	0.03-0.08	2
Argolikos Gulf	14	<0.01-0.06	2
Crete Island	15	0.11-0.30	7
Ionian Sea	16	0.67-3.89	Present study
Antinioti Lagoon	17	0.48-1.39	Present study
Korission Lagoon	18	<0.10-1.36	2
Patraikos Gulf	19	0.36-0.71	7

The results of our study were compared with previously published data from other Greek coastal areas [2] - [6]. Some of these data are presented in Table 1; Figure 1 shows the locations of the areas. Elevated mercury levels were found in sediments of the Gulf of Thessaloniki (area 5) and Gulf of Kavala (area 9) in the northern Aegean Sea. These levels were attributed to industrial and municipal wastewaters. Sediments from Elefsis Gulf (area 1b) in Saronikos Gulf, Patraikos Gulf (area 19) in central Greece and Stratoni (area 8) in the northern Greece were moderately enriched in Hg and were comparable to the estuarine sediments of the transboundary Rivers of Strymonikos (area 7), Nestos (area 10), Axios (area 6) and Evros (area 11) in the northern Aegean Sea. The lower levels were found in the coasts of Crete Island (area 15),

Korinthiakos (area 13), Argolikos (area 14) and Pagasetikos Gulf (area 4). As far as it concerns temporal trends, in two occasions, Western Saronikos Gulf and Larymna Bay, an increase over time has been observed.

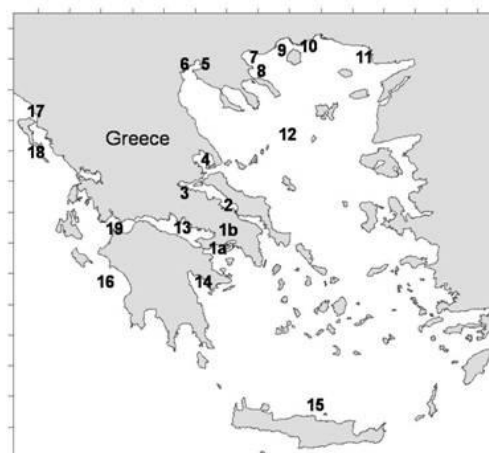


Fig. 1. Locations of the examined areas.

Summarizing the above results, the higher levels of mercury were found close to industrial sites and harbors, while urban runoff was recognized as a secondary source. Thus, we can conclude that mercury contamination in Greek coastal areas is mostly related to fossil fuel combustion and crude oil leakages from ships and washing from the urbanized sites.

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