

DISTRIBUTION AND ORIGIN OF HYDROCARBONS IN SEDIMENTS FROM ELEFSIS BAY, GREECE (EASTERN MEDITERRANEAN)

E. Sklivagou^{1*}, I. Hatzianestis¹, N. Rori², F. Rigas²

¹ Hellenic Centre for Marine Research, Mavro Lithari, 190 13 Anavyssos, Greece - * jenny@ncmr.gr

² School of Chemical Engineering, National Technical University of Athens. 15700 Athens, Greece.

Abstract

Hydrocarbons were studied in surface sediments and sediment cores collected from the Elefsis Bay. Aliphatic hydrocarbon concentrations (AHC) in surface sediments ranged from 170 to 753 $\mu\text{g/g}$, while polycyclic aromatic hydrocarbon (PAH) values varied between 981 and 7255 ng/g . Concentrations in the western core remained high for both AHC and PAH till to 10 cm depth. In the eastern core, the high hydrocarbon values persist to 19 cm depth.

Keywords: sediments, petroleum, PAH

Introduction

Elefsis Bay is an almost enclosed embayment, which is situated in the northern Saronikos gulf, in central Greece. The Bay receives industrial effluents and domestic wastes, which generate severe ecological stresses in the area, resulting in almost anoxic conditions during summer.

The aim of this work is to study the horizontal and vertical profiles of AHC and PAH in Elefsis Bay sediments, in order to assess their levels and sources and to investigate the history of their inputs.

Materials and methods

Surface sediment samples (0-2 cm) were collected from three stations during June 1995 and June 2000. In addition, two sediment cores were collected in December 2001 (Fig. 1). The AHC and PAH were determined by gas chromatography / mass spectrometry [1].

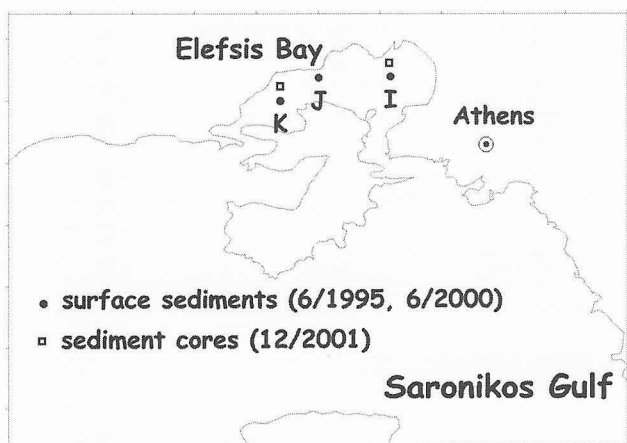


Fig. 1. The sediment sampling locations.

Results and discussion

Surface sediments

The concentrations of aliphatic hydrocarbons (AHC) found in Elefsis Bay sediments during the two sampling periods ranged between 170 and 753 $\mu\text{g/g}$ (Fig. 2). These AHC values clearly indicate that the area suffers from substantial petroleum contamination [2].

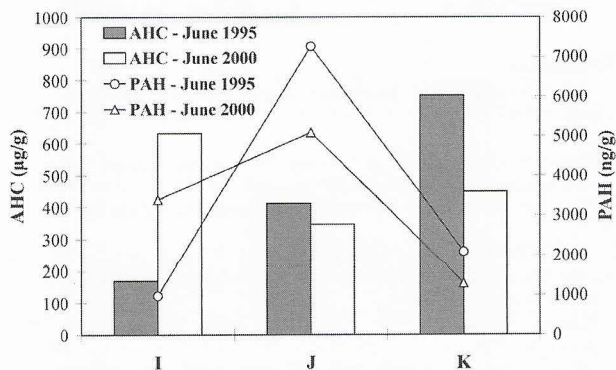


Fig. 2. AHC and PAH concentrations in the surface sediments.

Furthermore, the ratio unresolved/resolved compounds (U/R), which is widely used in order to identify the origin of the hydrocarbons, gave values indicative of significant petroleum contamination (U/R=17-46).

Twenty-four PAH compounds were determined in this study, comprising parent compounds with two to six aromatic rings, dibenzothiophene, retene and the alkylated products of phenanthrene and dibenzothiophene. Total PAH concentrations in Elefsis Bay sediments ranged between 981 and 7255 ng/g (Fig. 2), indicating a high degree of pollution in comparison with other Greek areas [2]. In the PAH mixture, the compounds with four or more aromatic rings and mainly, fluoranthene and pyrene, were dominant in all cases. These compounds are known to be of pyrolytic origin.

Sediment cores

AHC concentrations in the western core (K core) ranged between 4 and 805 $\mu\text{g/g}$ (Fig. 3). The high AHC values remained almost constant down to 10 cm depth and the maximum value was recorded in the 8-9 cm layer. On the other hand, PAH concentrations ranged from 79 to 3536 ng/g (Fig. 3). The vertical profile of PAH values showed pronounced maxima in the layers 6-7 and 7-8 cm.

In the eastern core (I core), AHC concentrations were observed in the range of 18 - 551 $\mu\text{g/g}$, while PAH values varied between 44 and 2259 ng/g (Fig. 3). The vertical distribution for both parameters was relatively uniform till to 19 cm depth and the maximum values were recorded in the 2-3 cm layer.

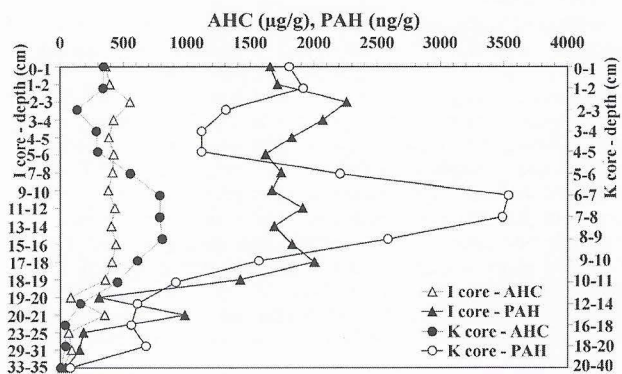


Fig. 3. Vertical profiles of AHC and PAH in the two sediment cores.

References

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