

DISTRIBUTION AND ORIGIN OF ALIPHATIC AND POLYCYCLIC AROMATIC HYDROCARBONS IN SARONIKOS GULF SEDIMENTS

I. HATZIANESTIS¹, A. HANTZI², E. SKLIVAGOU¹ and F. RIGAS²

¹ National Centre for Marine Research, Aghios Kosmas, Hellinikon, Athens

² School of Chemical Engineering, National Technical University of Athens

E-mail: jhat@ncmr.gr

EXTENDED ABSTRACT

The aim of this work is to investigate the levels, sources and impact of aliphatic and polycyclic aromatic hydrocarbons in Saronikos gulf, a marine area suffering from intense ship traffic and receiving major urban discharges from the Athens metropolitan area and industrial effluents from the industries located at the northern part of the gulf. Surface sediments were collected from 15 stations in June 2000 and their hydrocarbon content was determined by gas chromatography-mass spectrometry.

Very high aliphatic hydrocarbon concentrations (1721 µg/g) were measured close to Keratsini, where the previous sewage outlet was located before the operation of the primary treatment unit in Psyttalia. Significant hydrocarbon pollution was also found in Elefsis bay (347 – 633 µg/g) and close to the new sewage outlet (346 µg/g). In the rest Saronikos gulf hydrocarbon values were clearly lower (21 – 89 µg/g) with a decreasing trend from the urban coastal zone to the outer parts of the gulf. However, the presence of an unresolved complex mixture (UCM), which dominated the aliphatic fraction in all samples, along with other diagnostic criteria such as the ratio unresolved/resolved compounds (U/R), the n-alkane carbon preference index (CPI) and the composition of the pentacyclic triterpanes detected, clearly demonstrates the occurrence of petroleum inputs in the whole area. Natural n-alkanes of terrestrial origin were also identified in most stations.

Polycyclic aromatic hydrocarbons (PAH) determined include the parent compounds with MW from 128 to 278, dibenzothiophene, retene and the methylated derivatives of naphthalene, phenanthrene and dibenzothiophene. Seriously contaminated sediments were found close to Keratsini (sum of PAH concentrations 7057 ng/g), in Elefsis bay (1657 – 5738 ng/g) and close to the sewage outlet in Psyttalia (3518 ng/g). In the rest stations total PAH values ranged between 119 and 811 ng/g and were similar with those reported in other Mediterranean coastal areas with no important pollution problems.

The study of the compositional patterns of PAH mixtures provides useful information regarding their sources and transport pathways. In most sediment samples the compounds with four or more aromatic rings, which are known to be of pyrolytic origin, were dominant. PAH with 2-3 rings (petrogenic origin) were less abundant, but the presence of some petroleum related residues in the whole area was evident from the composition of the naphthalene and phenanthrene series, namely the parent and methylated compounds.

Key words: Aliphatic hydrocarbons, polycyclic aromatic hydrocarbons, sediments, Saronikos gulf, gas chromatography-mass spectrometry.