

Polycyclic aromatic hydrocarbon geochemistry in a marine area affected from the dumping of polluted dredged river sediments

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Polycyclic aromatic hydrocarbons (PAHs) are widespread contaminants in the marine environment and considered persistent organic pollutants. PAH sources levels, composition and geochemistry were studied in the sediments of a coastal site in Saronikos gulf, Greece, where the dredged urban river (Kifissos river) sediments were dumped for a period of 20 months (May 2010 - December 2011). Kifissos river is the metropolitan river of Athens and is highly contaminated by PAHs. Surface sediments were collected from 5 stations prior of dumping, during dumping operations (October 2010, April 2011, October 2011) and 4, 12 and 24 months after the end of dumping. PAHs were determined by gas chromatography - mass spectrometry, applying the appropriate procedures. In total 46 individual compounds including the alkylated ones were quantified and several characteristic source ratios were calculated: for the four ring and larger parent compounds specific isomeric ratios, while for the smaller parent PAHs the $C0/(C0 + C1)$ ratios for several alkyl PAH series.

Total PAHs were increased in surface sediments from 451 ng/g to 6175 ng/g during dumping and decreased to 3351 ng/g 4 months after dumping and to 1570 ng/g 24 months after dumping. The composition of PAH mixtures and the examination of the various diagnostic criteria revealed a clear predominance of pyrolytic compounds, coming from different combustion sources, before dumping. During dumping, high abundances of methylated PAH were recorded, similar to those measured in the river sediments, showing petroleum origin. After dumping a part of methylated derivatives were lost, resulting in equal amounts of pyrolytic and petrogenic PAH 4 months after the dumping, while after a period of 24 months, although total PAH concentrations remained increased, their compositional profiles were again characteristic of combustion origin, comparable to those before the dumping.