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Isotopic characterization of Polycyclic Aromatic Hydrocarbons for identification of sources and transfer mechanisms in Ile de France.

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Polycyclic aromatic hydrocarbons (PAHs) are organic pollutants that accumulate in the environment as mainly a result of human processes in anthropic environment. Emission of PAHs in Ile de France region is a major environmental and public health problem. Seventy percent of the Seine Watershed Rivers do not respect the requirement of the 2012 European Water Framework Directive for good chemical status due to PAHs. We study the 16 PAHs selected by the United States Environmental Protection Agency. The measurement of the ratio of stable Carbon (δ13C) and hydrogen (δ2H) isotopes may be used as a means to identify the source of PAHs. Two samplings campaign in the Seine watershed was conducted in summer and in winter during dry periods and one during rainy periods. Water and sediment were sampled from 12 locations along the Orge River (France) and classified in three categories: urban, peri-urban and rural. Extraction and purification methods have been developed and tested. This method consists on a liquid-liquid extraction and sonication extraction. The Aromatic fraction is purified and isolated on silica/alumina column before performing thin purification by using a semi-preparative High Performance Liquid Chromatography (HPLC). HPLC is used for separation of each PAH one by one. Moreover, this fractionation reduces background noise generated in part by unwanted compounds like alkanes and allows the isotopic analysis of PAH. The purity of each fraction was verified by Mass-Spectrometry Gas Chromatography in scan mode. The mean recovery of the method for all PAHs was around 80%. Isotopic analysis for carbon 13 and deuterium by Gas Chromatography-Combustion- Isotope-ratio mass spectrometry are ongoing. Beside the sampling campaign, biodegradation, hydrolysis and photolysis tests were performed. In addition, combustion testing of gasoline and diesel on an experimental device are provided to estimate the isotopic ratio of motorized vehicles in the Ile de France region.