



Sources, patterns and characterisation of Polycyclic Aromatic hydrocarbons (PAHs) in urban and rural areas of Southern Italian soils

Matar Thiombane (1), Stefano Albanese (1), Marcello Di Bonito (2), Annamaria Lima (1), Roberto Rolandi (1), Daniela Zuzolo (3), Shihua Qi (4), and Benedetto De Vivo (5)

(1) Federico II, Naples, Department of Earth Sciences, Environment and Resources, Napoli, Italy (thiombane.matar@unina.it), (2) School of Animal, Rural and Environmental Sciences, Brackenhurst Campus Southwell NG25 0QF Nottingham Trent University, Unites Kingdom., (3) Department of Science and Technology, University of Sannio, via dei Mulini 59/A, 82100 Benevento, Italy., (4) State Key Laboratory of Biogeology and Environmental Geology, China University of Geosciences, 430074 Wuhan, People's Republic of China., (5) Pegaso University, Piazza Trieste e Trento 48, 80132 Naples & Benecon Scarl, Dip. Ambiente e Territorio, Via S. Maria di Costantinopoli 104, 80138 Naples, Italy

Polycyclic aromatic hydrocarbons (PAHs) are a typical group of persistent organic pollutants (POPs), identified as a kind of carcinogenic substance and prevalent in the environment media such air, water and soils. The aim of this work is to investigate concentration levels, profile, possible sources and toxicity equivalent quantity (TEQ) level of sixteen PAHs, including sixteen US Environmental Protection Agency (EPA) priority pollutants, in soils of five large regions of the south of Italy. Soil samples (0–20 cm top layer) from eighty urban and rural areas were collected, and analysed in the Key Laboratory of Biogeology and Environmental Geology of Ministry of Education at China University of Geosciences in Wuhan, with a Gas chromatography-mass spectrometry (GC-MS).

This study showed that \sum 16PAHs in urban and rural areas, ranged from 7.62 to 755.1 ng/g with a mean value of 84.85 ng/g, and from 1.87 to 11,353.62 ng/g with a mean of 333.1 ng/g, respectively. Further, urbanized towns such as Rome, Naples and Palermo displayed high PAHs total concentration; such higher values were found as well in rural areas of Campania region. Considering the different PAHs molecular ratios sources diagnostic such as LWMPAHs/HWMPAHs, Fluo/(Fluo +Pyr), BaA/(BaA +Chr), Ant/(Ant +Phe), and IcdP/(IcdP +BghiP), PAHs pollution sources in the southern Italian soils is mostly pyrogenic which is likely related to biomass combustion and vehicular emission. The occurrence of PAHs in Sicilian soils is more referred to petrogenic emission from crude oil combustion and refineries. Regardless, Campania region, displayed higher Toxicity equivalent Quantity (TEQBAP) level with TEQBAP values of 661.05 ng g⁻¹ and 54.20 ng g⁻¹, in rural and urban areas, respectively, and might be related to presence of a large solid waste incinerator plant, illegal waste disposal and burning, and illegal practice of industrial toxic and solid urban waste dumping in the metropolitan area of Naples.

Keywords: Southern Italy, PAHs, ratio diagnostic, soil pollution sources, Toxicity Equivalent Quantity (TEQ)