



Organic pollution bound to PM₁ particulate matter in indoor air

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Introduction

People spend between 70 and 90% of their time indoors

Studies have found that exposure to air pollutants indoors can be significantly higher than outdoors, even in urban environments.

Regardless of this, air quality standards currently apply only to outdoor, ambient air.



The main objective of research studies is to determine air quality in different types of indoor environments and, according to these data and corresponding health effects develop guidelines for indoor air quality.

The mass concentration of PM_{10} particulate matter is not the only important parameter for the health risks assessment of indoor pollution



Toxic compounds can be adsorbed on fine and ultrafine fraction

Polycyclic aromatic hydrocarbons (PAHs) are a huge group of organic compounds bound to particulate matter (PM) omnipresents in outdoor and indoor air.

Due to their high toxicity and potential carcinogenic effects, they can have adverse effects on human health.



PAH - were among the first pollutants recognized as potential carcinogens

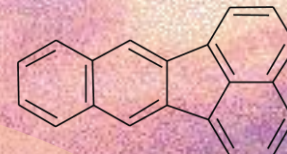
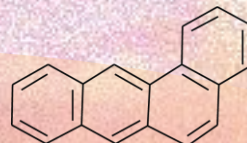
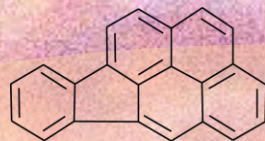
- products of the incomplete combustion of fossil fuels and other organic materials and originate from a different types of natural and industrial processes

INDOOR - fuel type, housing age, housing structural material, ventilation quality, and food preparation method, human behavior (e.g., cooking, cigarette smoking, cleaning)

Materials and methods

The aim of this study was to determine 11 PAH mass concentration in the PM₁ fraction of particulate matter in Croatian households.

- PM₁ samples
- 33 households
 - from May to December 2023
 - 50 m³
 - were kept at -18 ° C until analysis
 - high-performance liquid chromatography with fluorescence detector.



PAHs : fluoranthene (Flu)

pyrene (Pyr)

benzo(a)anthracene (BaA)

chrysene (Chry)

benzo(j)fluoranthene (BjF)

benzo(b)fluoranthene (BbF)

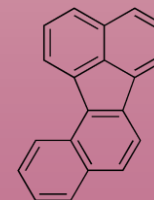
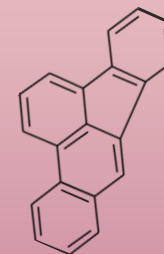
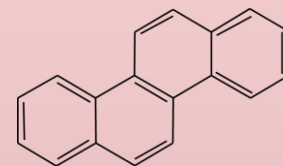
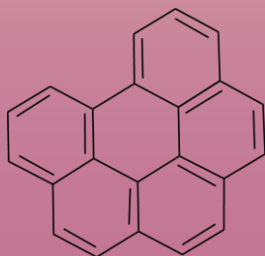
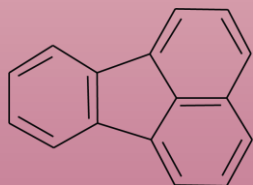
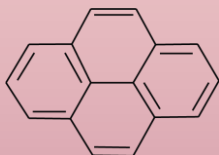
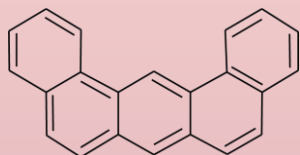
benzo(k)fluoranthene (BkF)

benzo(a)pyrene (BaP)

dibenzo(a,h)anthracene (DahA)

benzo(ghi)perylene (BghiP)

indeno(1,2,3-cd)pyrene (IP)



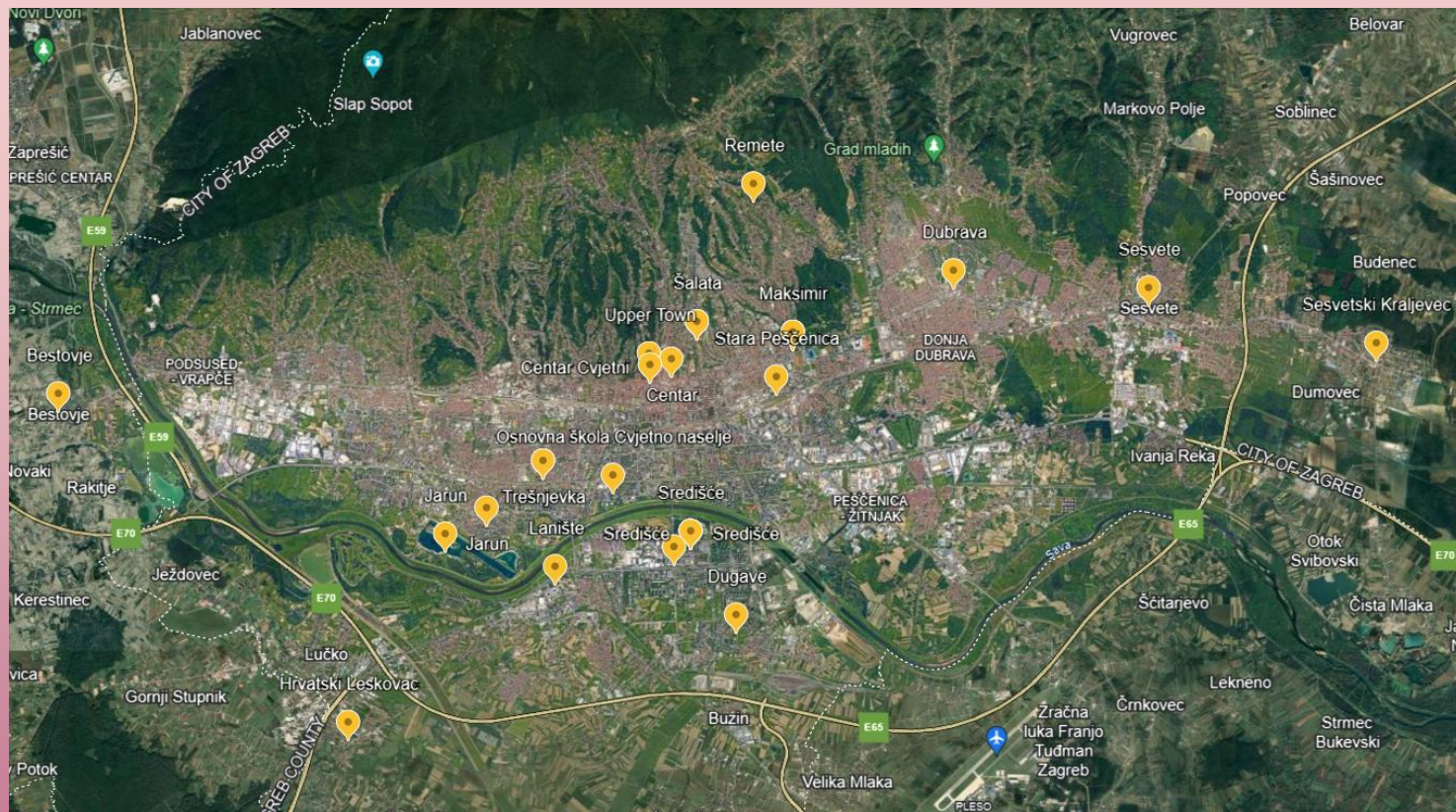


Figure 1. Sampling places around Zagreb city

Sampling of PM1 particle fraction



7 days, ~50 m³



Quartz filter, Whatman

Sample preparation and analysis



Quartz filter, 50 m³



ASE cell, 10 mL



Accelerate solvent extractor (ASE)
Cyclohexane: toluene 3:7



HPLC/FLD
mobile phase acetonitrile :
water 60:40



re-dissolved
in acetonitrile



Rocket evaporator, GeneVac

Results

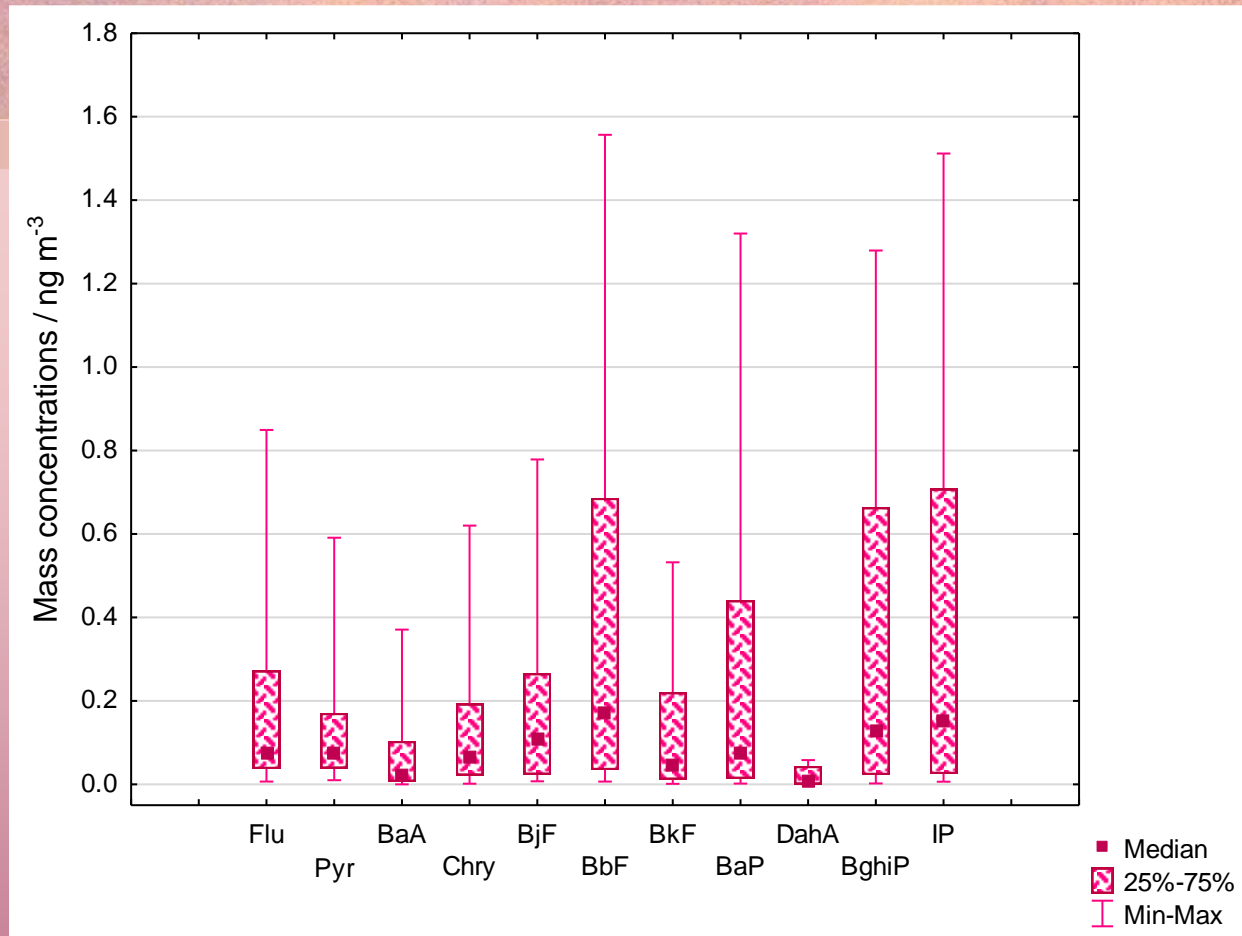


Figure 2. Box and Whisker plots showing the distribution of PAH mass fractions in Croatian households. The data are presented as median (line), 25th and 75th percentile (box), and minimum and maximum (whisker).

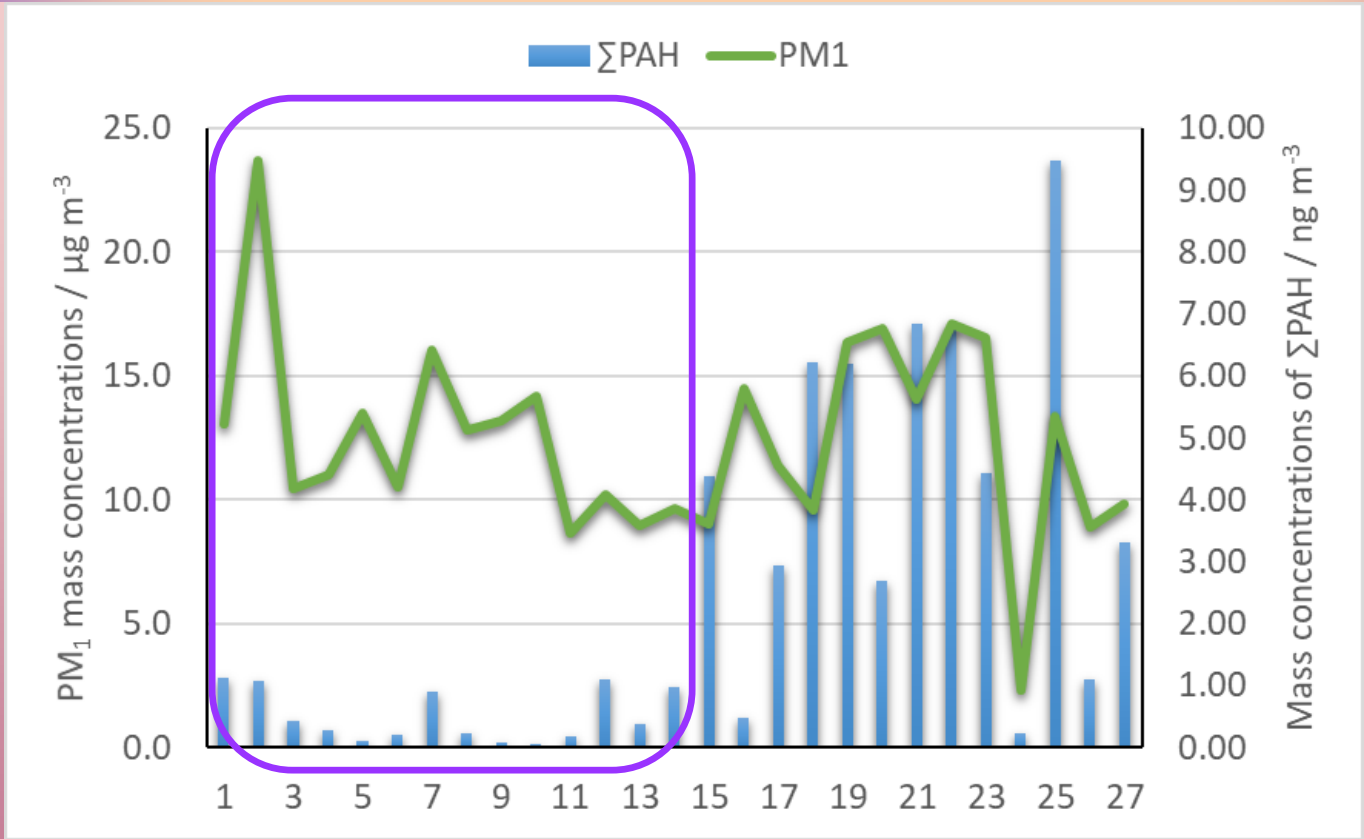


Figure 3. PM₁ mass concentrations and ΣPAH content in PM₁

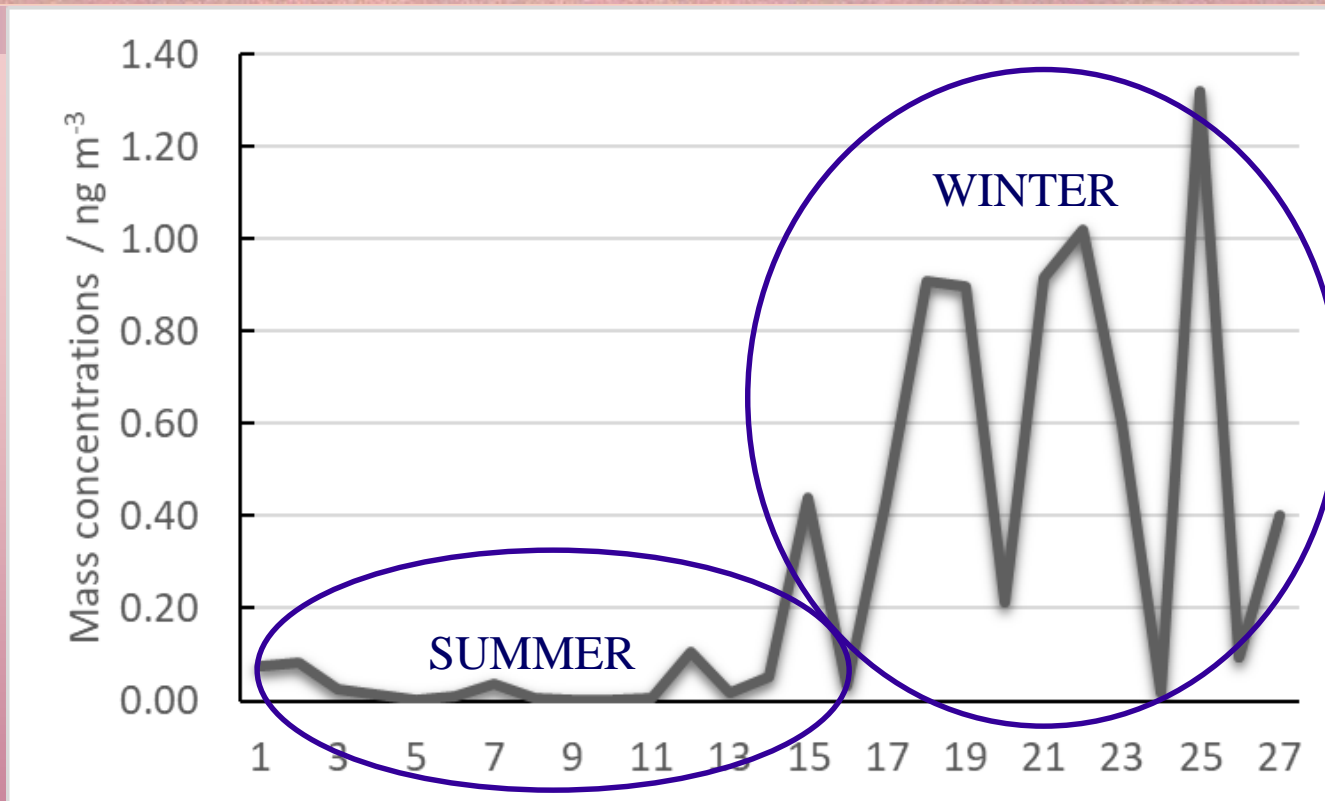


Figure 4. Mass concentration of BaP in PM₁ particle fraction collected in Croatian households

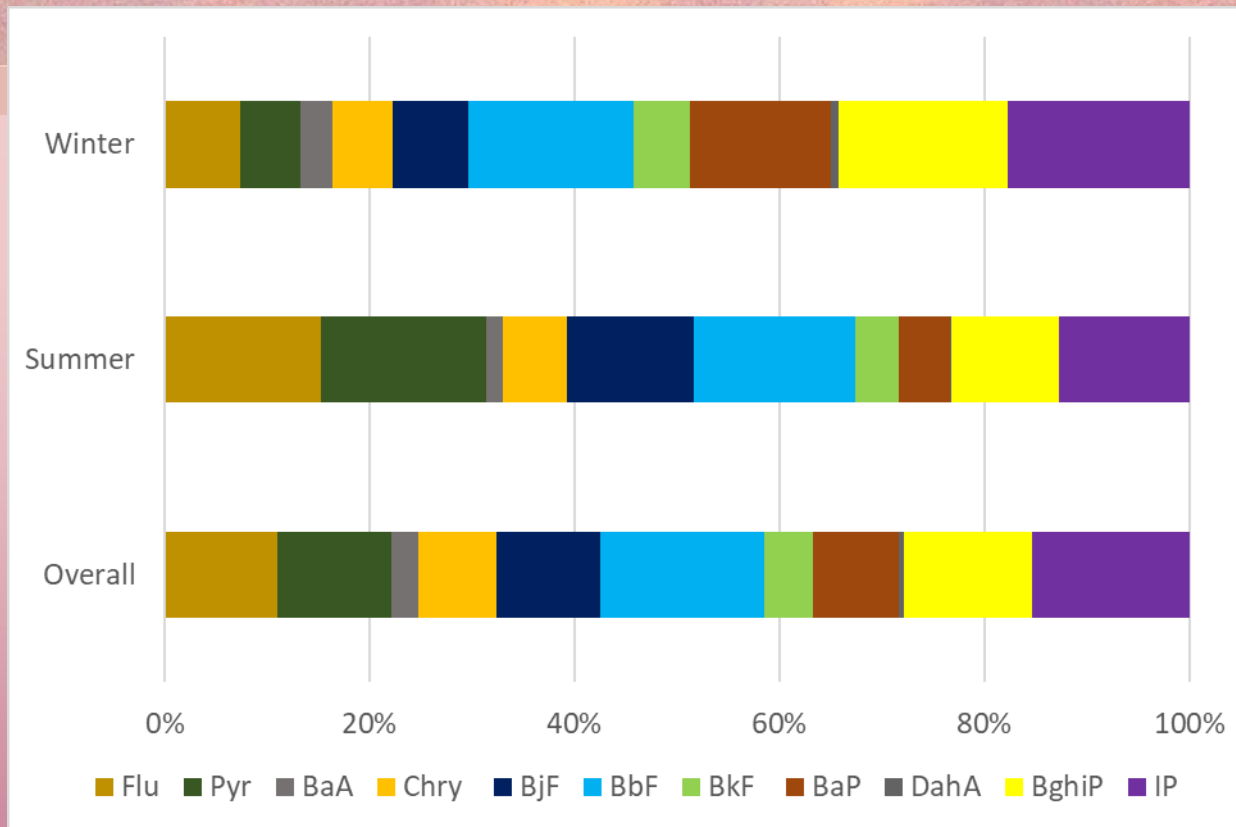


Figure 5. Contribution of individual PAHs to Σ PAHs

Conclusion



First data of PM_{10} and PAHs content in indoor air for Croatian households

The PAH concentrations



During the winter the highest mass concentrations were measured for Flu, Pyr and BbF, while during the summer they were measured for BbF, IP and BghiP

DahA had the lowest mass concentrations

Thank you!!!

ACKNOWLEDGEMENTS

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