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# Personal Exposure Monitoring of Size-Segregated aerosol and PAHs in Recreational Runners

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## Introduction

Polycyclic aromatic hydrocarbons (**PAHs**) represent ubiquitous environmental contaminants. Long-term inhalation exposure to PAHs has been associated with different types of cancer, cardiovascular, respiratory and other **diseases**. They are generated primarily during **incomplete combustion** of organic matter. In the atmosphere, PAHs are distributed in both **gaseous and particulate matter** (PM) phase. PM of different sizes can bound various amounts and types of PAHs depending on their **volatility and molecular structure**. **Personal monitoring** of PM-bound PAHs offers an opportunity to obtain more detailed information on **exposure histories** and **PAH sources** in studied areas.

## Aims

- To develop and validate an **extraction method** for **PAH** isolation from sampling filters
- To assess **total personal exposure to PAHs** bound to **PM size fractions**
- To obtain more detailed information on **exposure histories** and **PAH sources** in studied areas

## Methods

### SKC Leland Legacy Pump + Cascade impactor Sioutas

Personal Monitors

129 Volunteers



- 9 l/min
- high flow sampling
- 20 x 10 x 7 cm; 1 kg



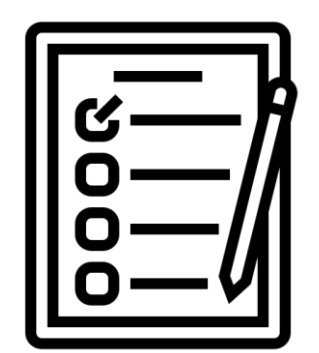
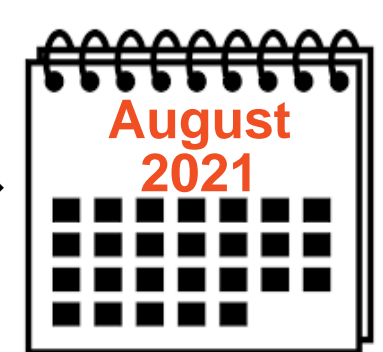
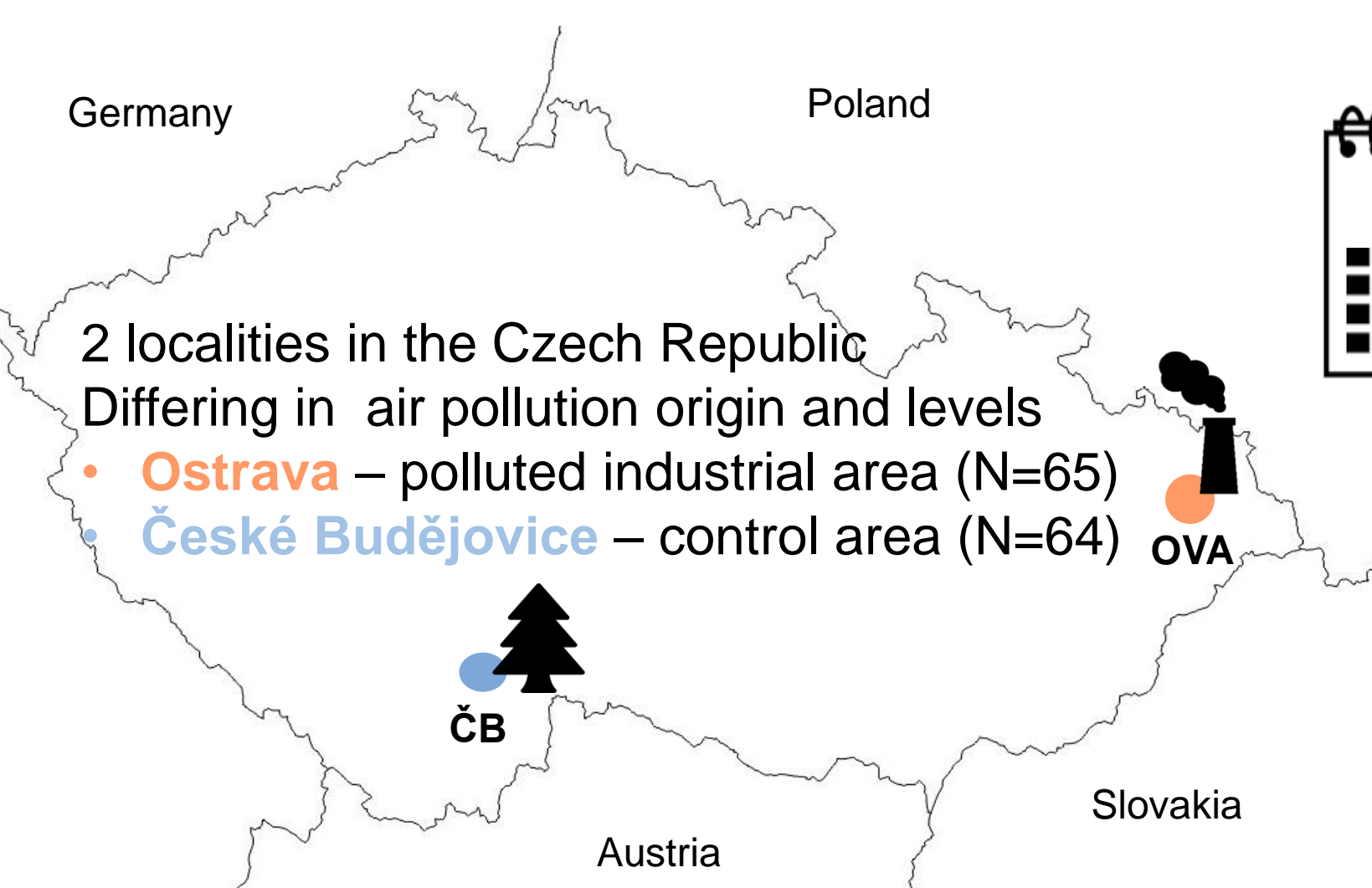
- 5 stages -> 5 size fractions
- > 2.5
- 1-2.5
- 0.5-1
- 0.25-0.5
- < 0.25

0.25-2.5 µm

- Teflon filters



Sampling

Detailed  
questionnaireCotinine,  
PAHs metabolites  
In urine

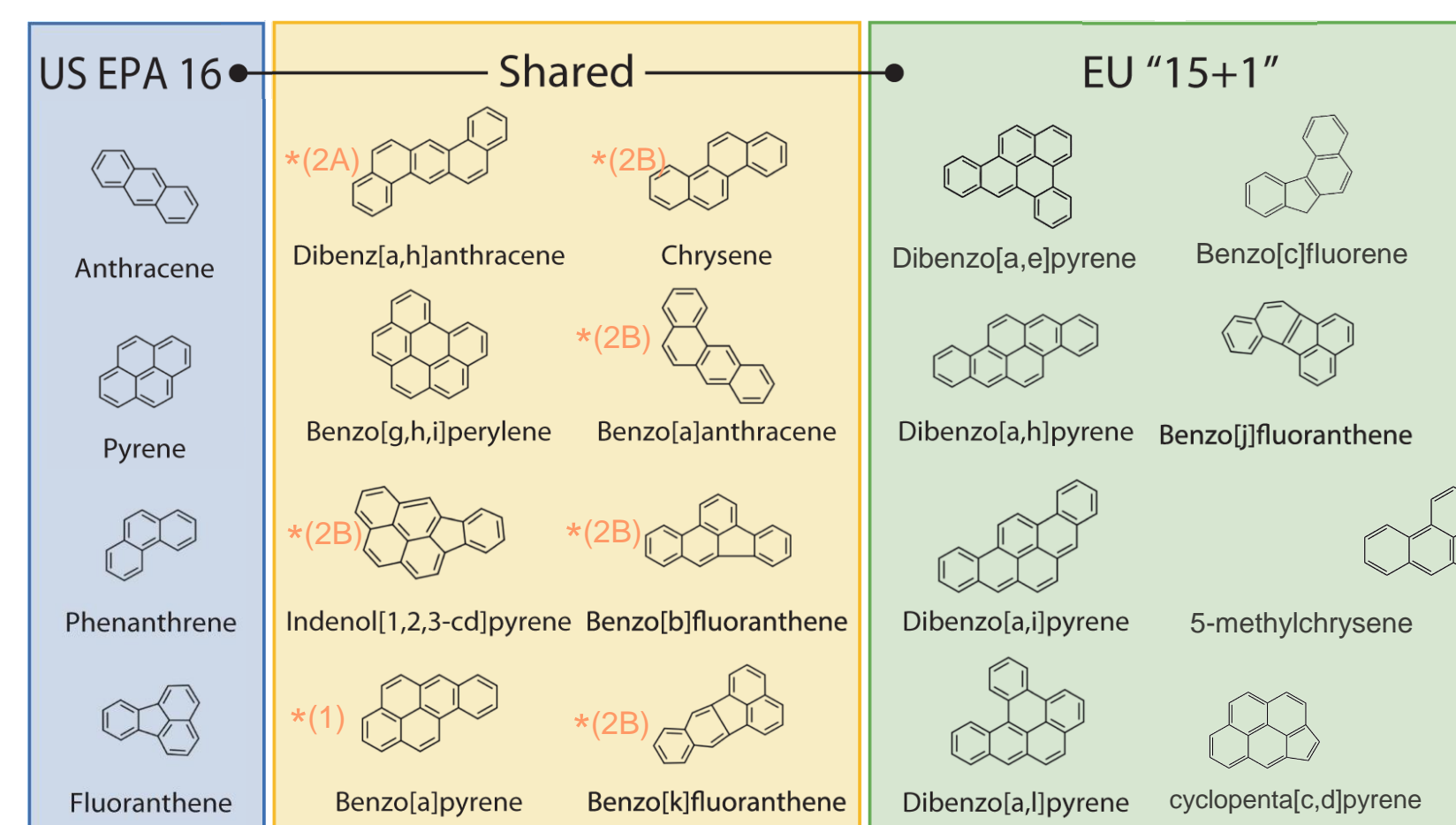
PAH Analysis

- 1) **Sampling** filters with PM-bound PAHs
- 2) **Extraction** of PAHs from filters  
Ultrasonic bath, 30 min  
hexane:dichloromethane = 3:1 (v:v)
- 3) **Analysis** by Chromatography coupled to tandem mass spectrometry in electron ionization (GC-EI-MS/MS)

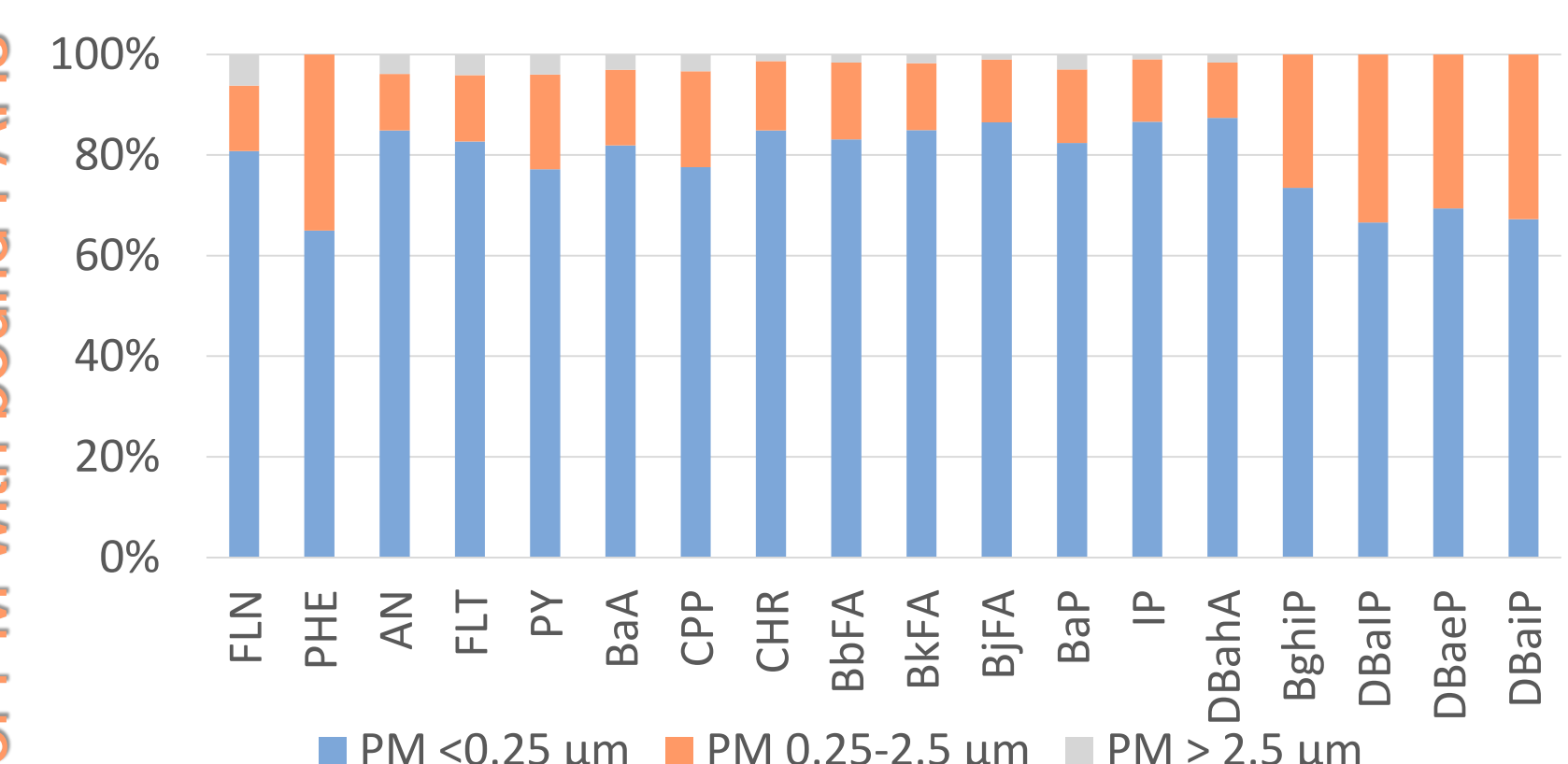


Agilent 7000 CQqQ

16 analyzed PAHs

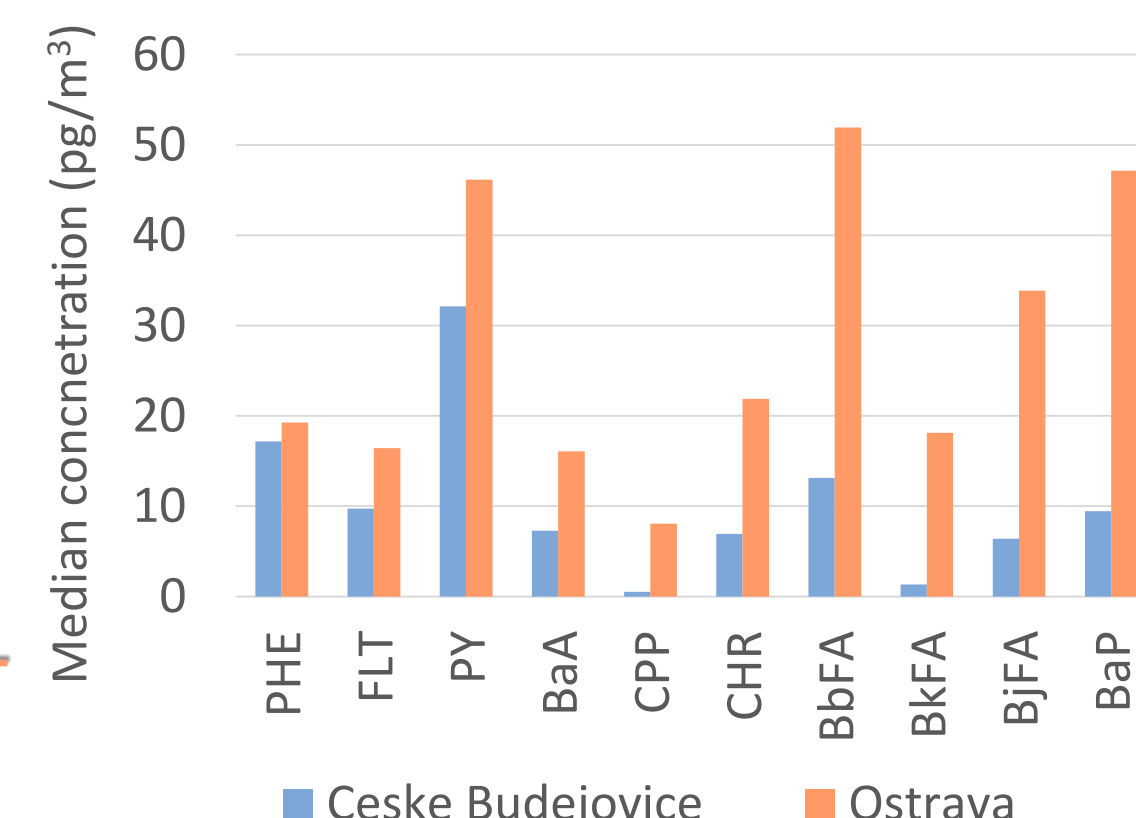
\* IARC  
classification of  
carcinogens

## Results

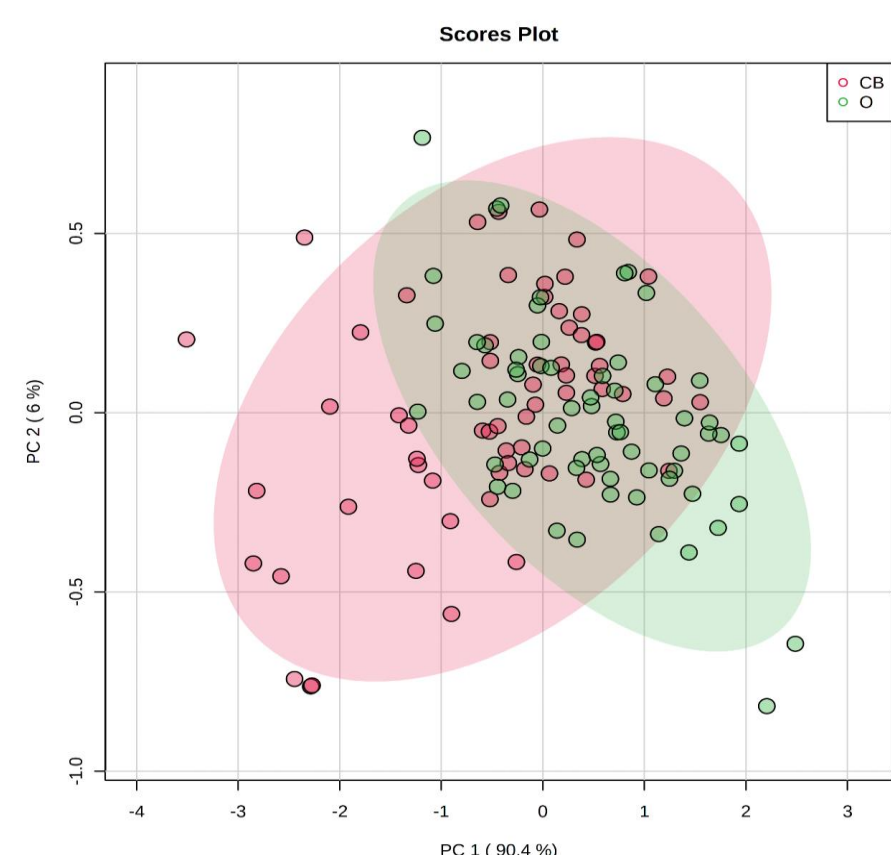
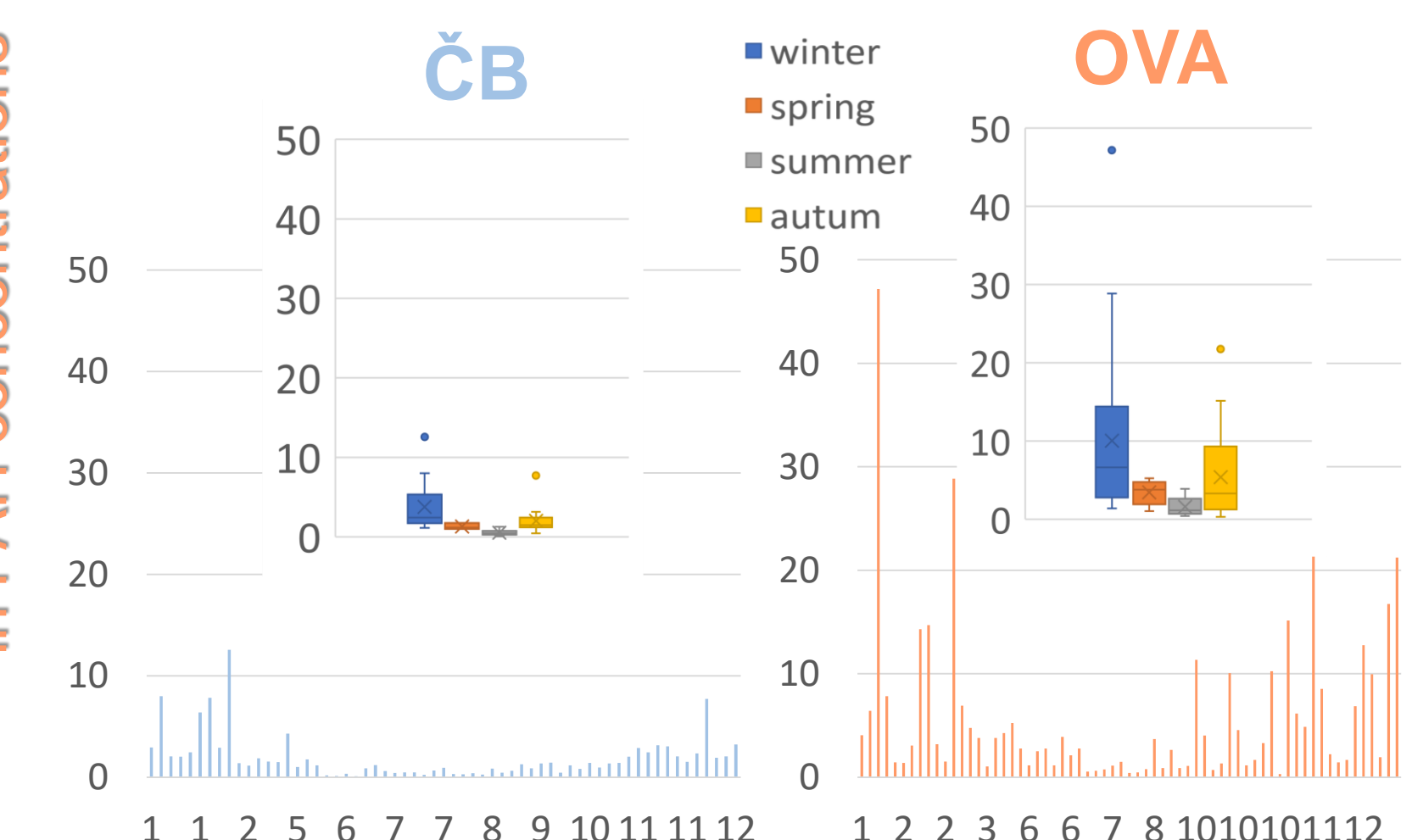
Size distribution  
of PM with bound PAHs

- 87% of the total amount of PAHs is bound to the fraction lower than 0.25 µm, 12% of PM-bound PAHs were in the fraction 0.25-2.5 µm
- only 1% in the fraction larger than 2.5 µm.

Comparison of localities



Sum 16 PAU (ng/m³)		
	ČB	OVA
min	0.088	0.318
max	12.6	47.2
Mean*	1.90	5.59
median*	1.32	2.78

\* p<0.05  
OVA concentrations higher for all PAHsSeasonal differences  
in PAH concentrations

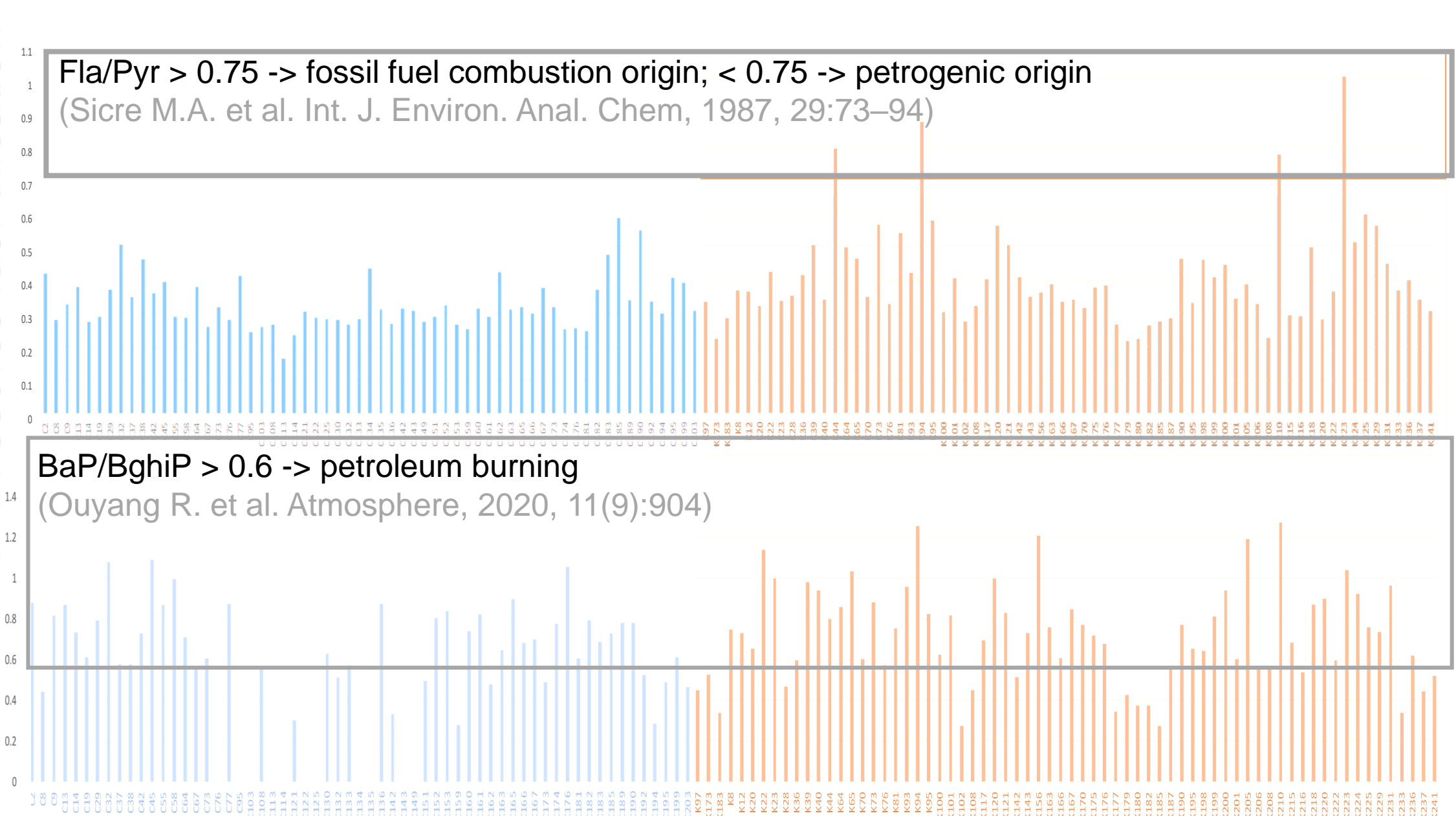
- Highest concentrations detected in winter months

Filter PAH vs. Urine PAH  
metabolites concentrations

	ČB	OVA	ČB+ OVA
Sum PAH	0.16	-0.15	0.04
Sum PHEN	0.04	0.06	-0.01
Sum PYR	0.07	-0.12	0.02

No correlation

PAH source identification



## Conclusions

The air in **Ostrava** has **twice as higher mean concentrations of PAHs** compared to České Budějovice, which is related to the **industrial activities** in this area.

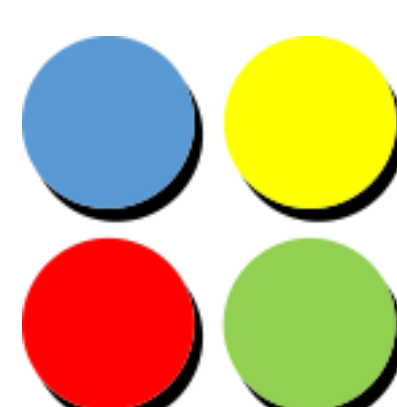
The **highest inhalation exposures** to all monitored PAHs were observed in the months of **January and February** for both sampling seasons, indicating the contribution of **local heating** and **unfavorable metrological conditions**.

The results of personnel monitoring allow to obtain more **detailed and accurate information on the sources** of air pollution in a given area as well as on the **exposure history** of the monitored individual, thus contributing to the **implementation of more effective measures** to mitigate health impacts.

## Acknowledgement

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