

Analysis of microplastic load and material composition in the Danube and at a wastewater treatment plant effluent

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Introduction

MICROPLASTIC TRANSPORT IN RIVERS

- Microplastics exert adverse impacts on the environment
- Rivers play a fundamental role as conduits for the dispersion of microplastic particles into the environment
- Microplastics have similar dynamics to sediments: remobilize, transport, deposit
- Hydrological regime strongly determines microplastic transport

GOALS

- **Methodological development:**
 - adaptation and further development of good practices
 - comparative test and analysis
- **Quantification of microplastic load:**
 - concentration and load
 - statistical analysis of material composition
- **Description of spatio-temporal distribution:**
 - expeditionary measurement campaigns
 - monitoring-like sampling
 - coupling with flow parameters

Sampling methodology

DANUBE AND TRIBUTARIES

Multi-level net from pontoon (500 μm)



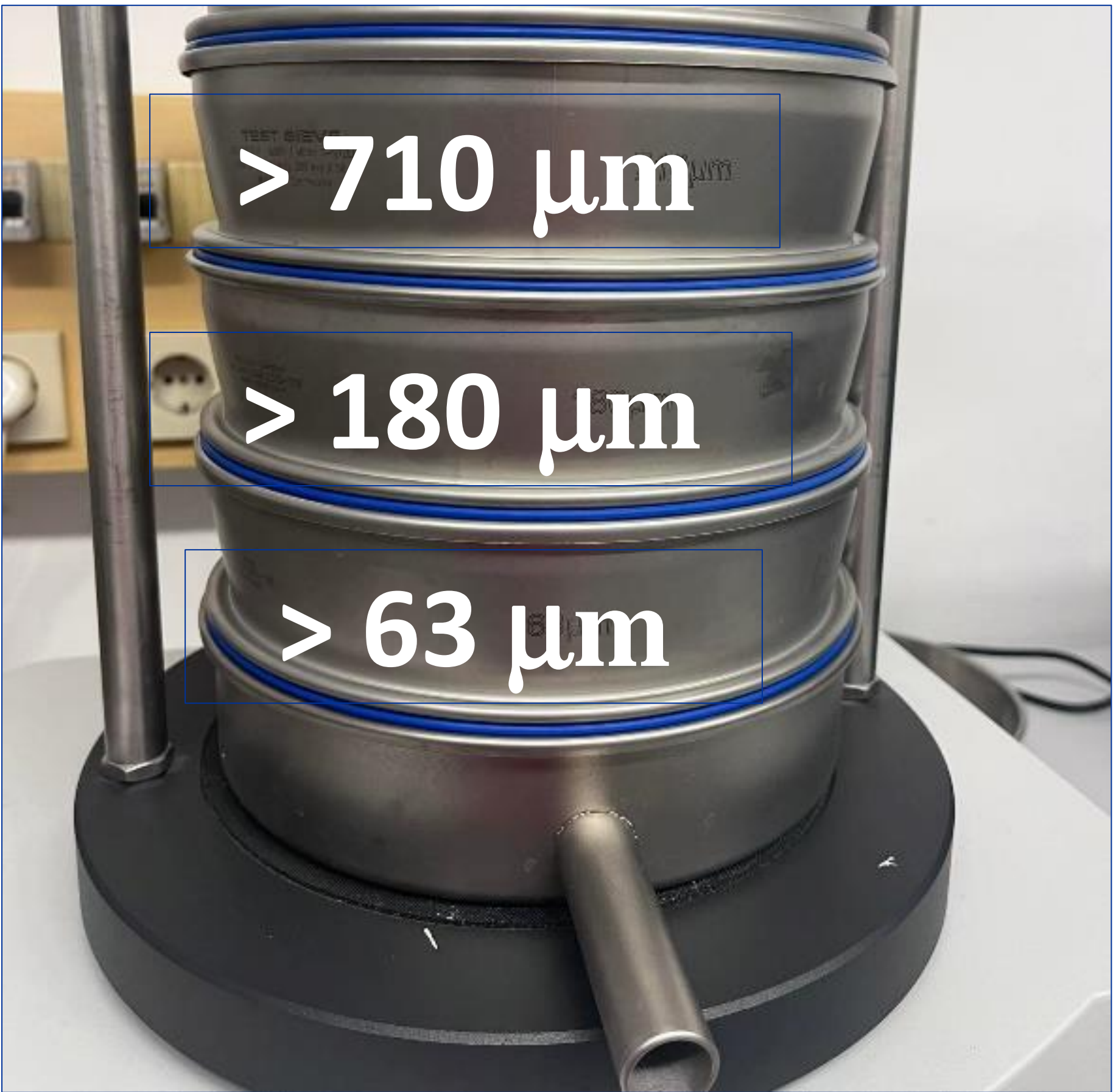
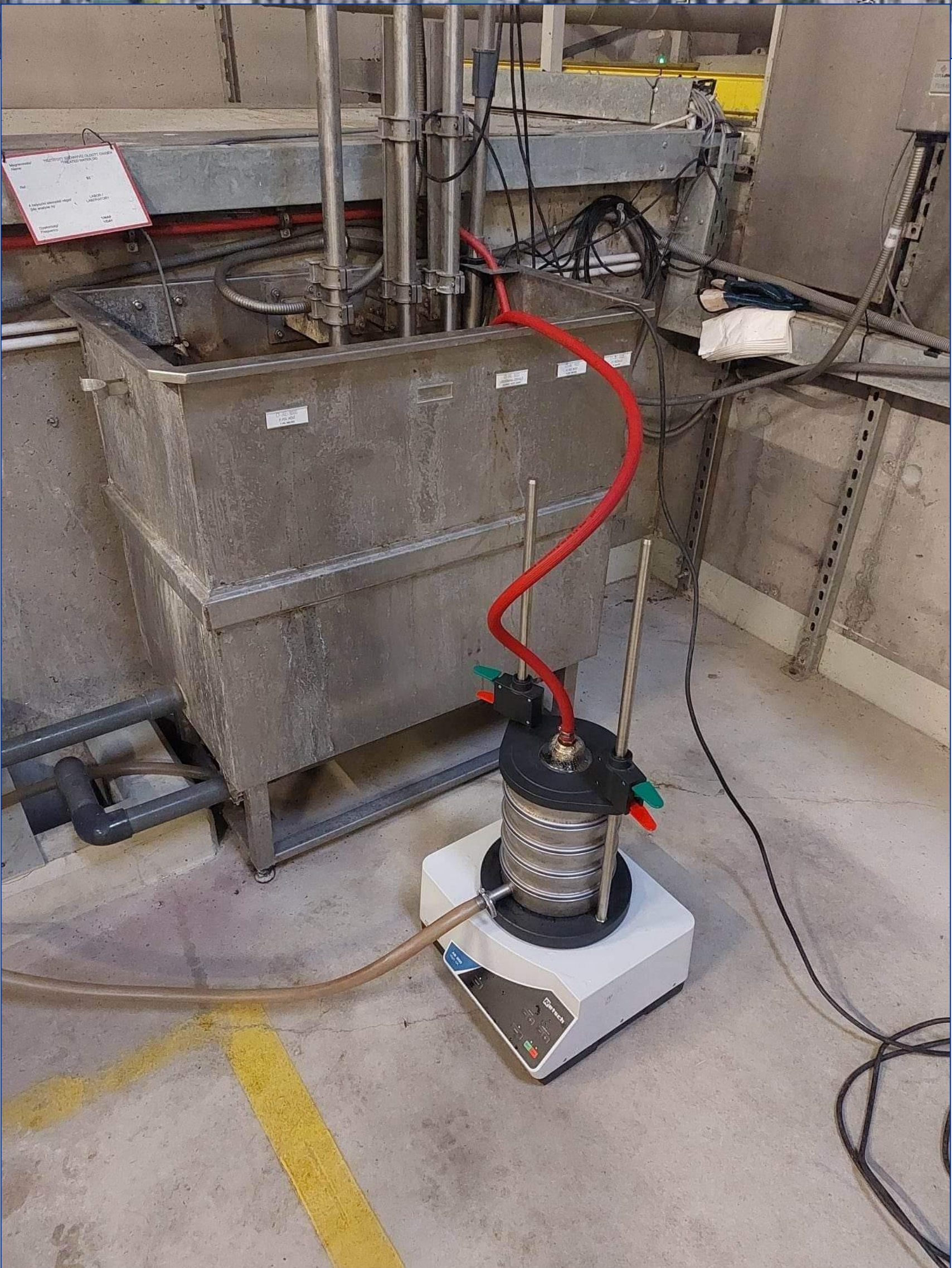
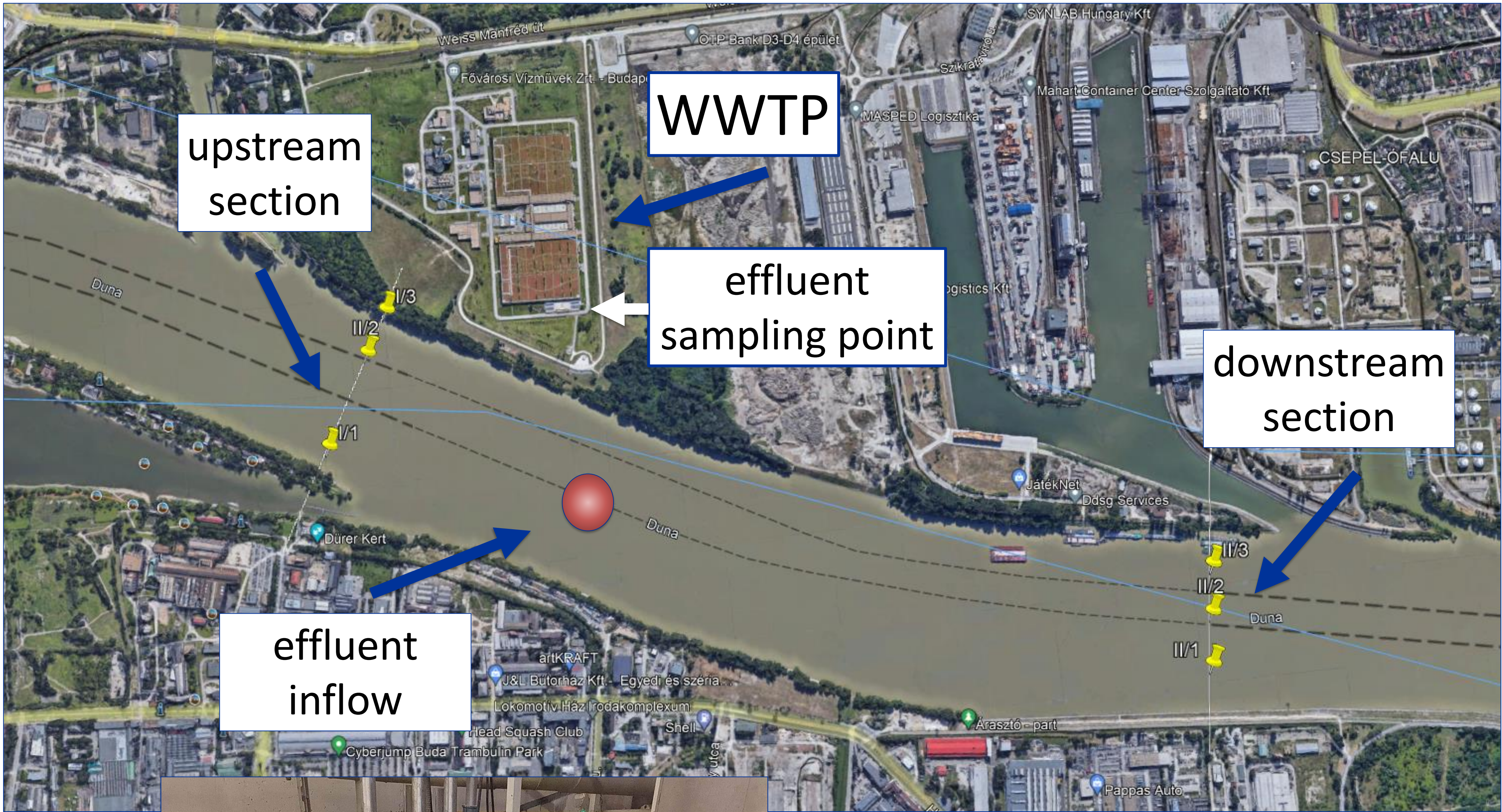
Pump (70+150+500 μm)



Portable net (1000 μm)

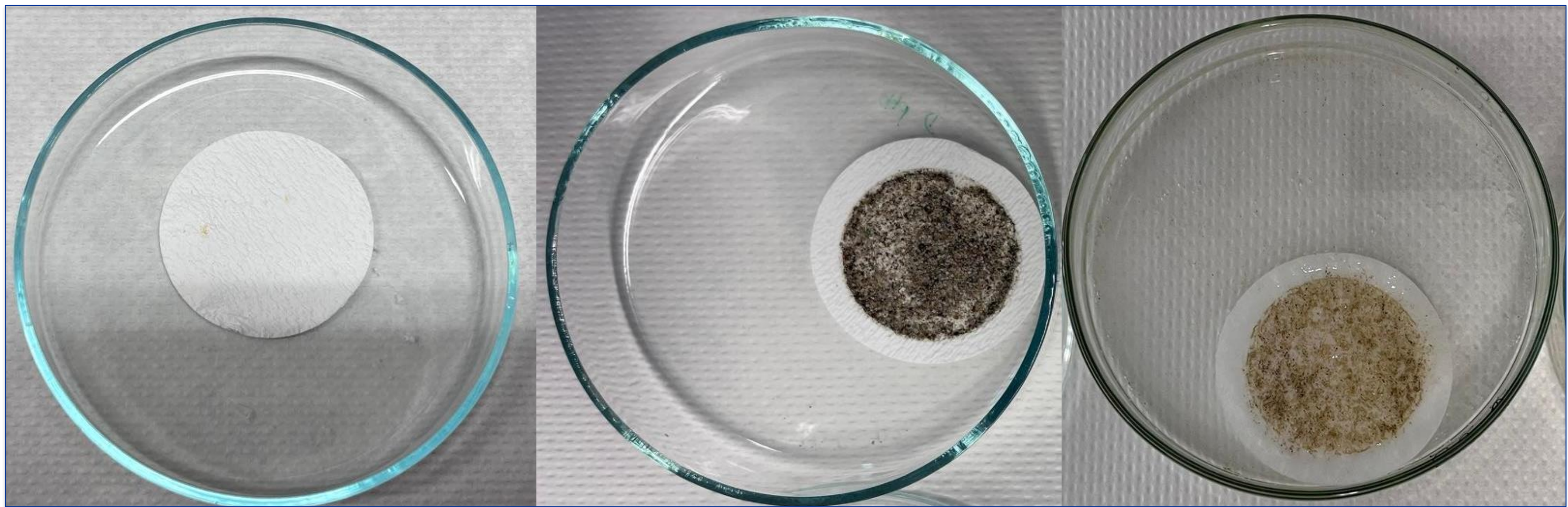


EFFECT OF WWTP EFFLUENT



Laboratory analysis

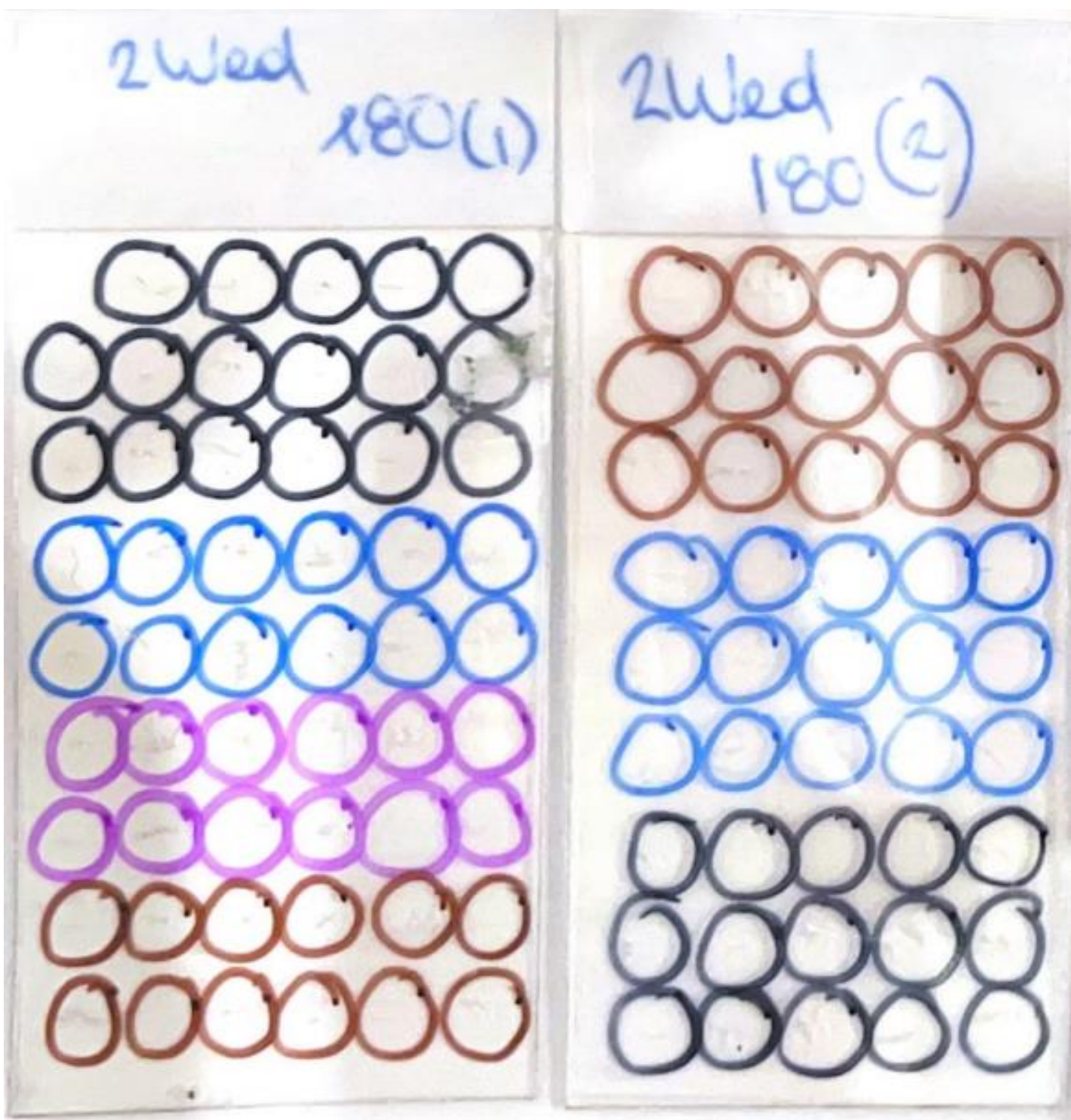
1. Sample preparation



2. Sorting and IDing

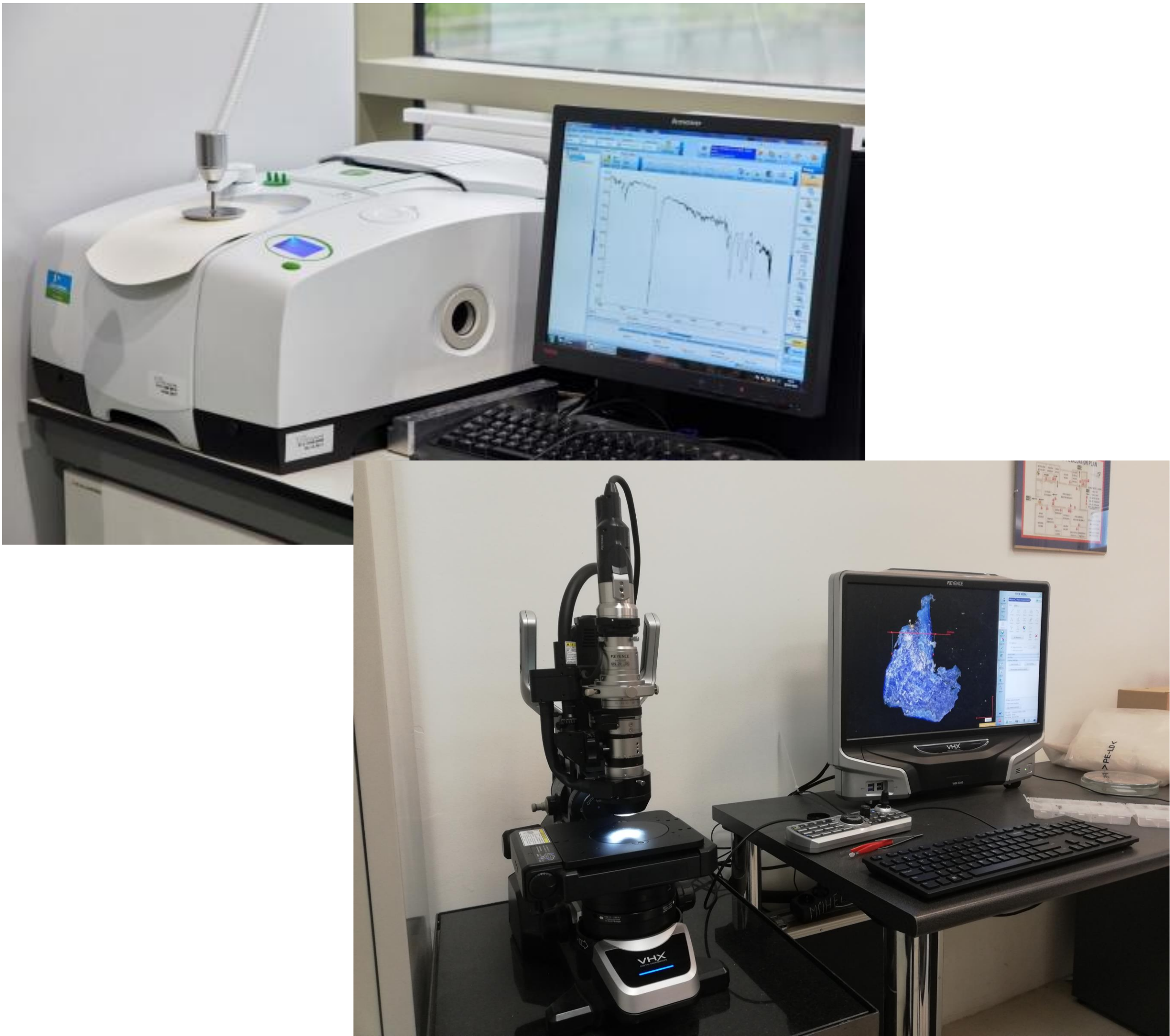
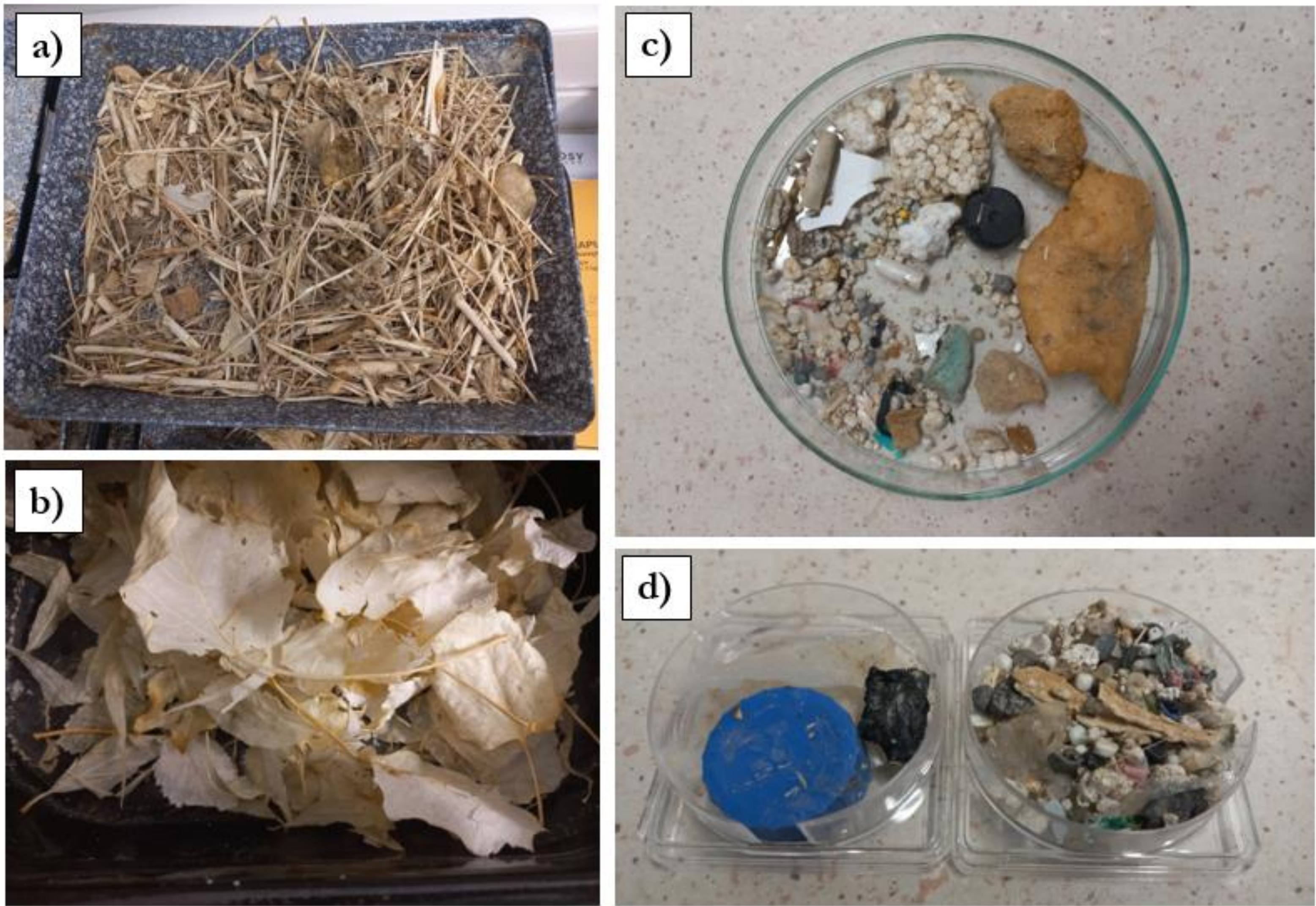
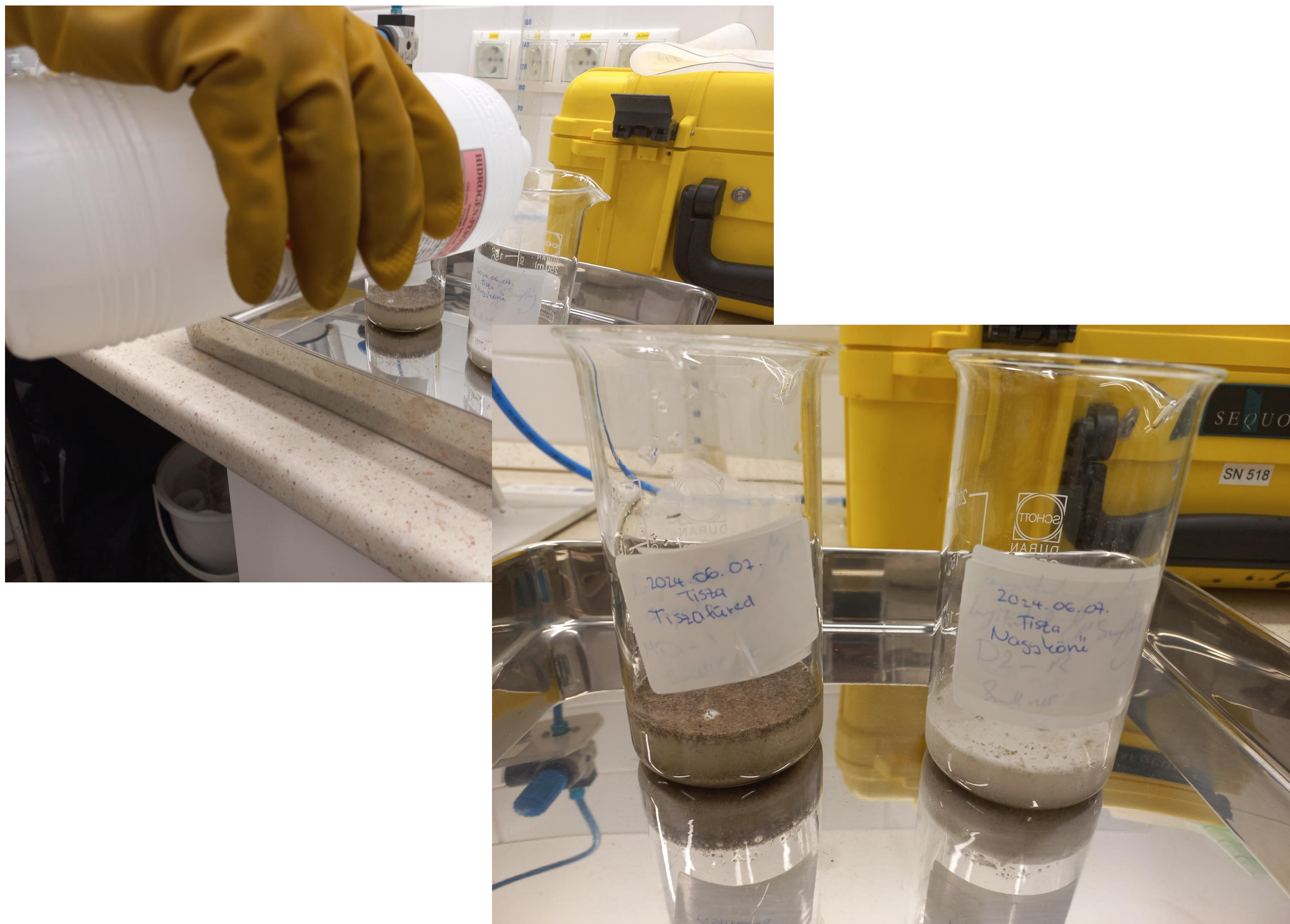


3. Compositional analysis and Imaging

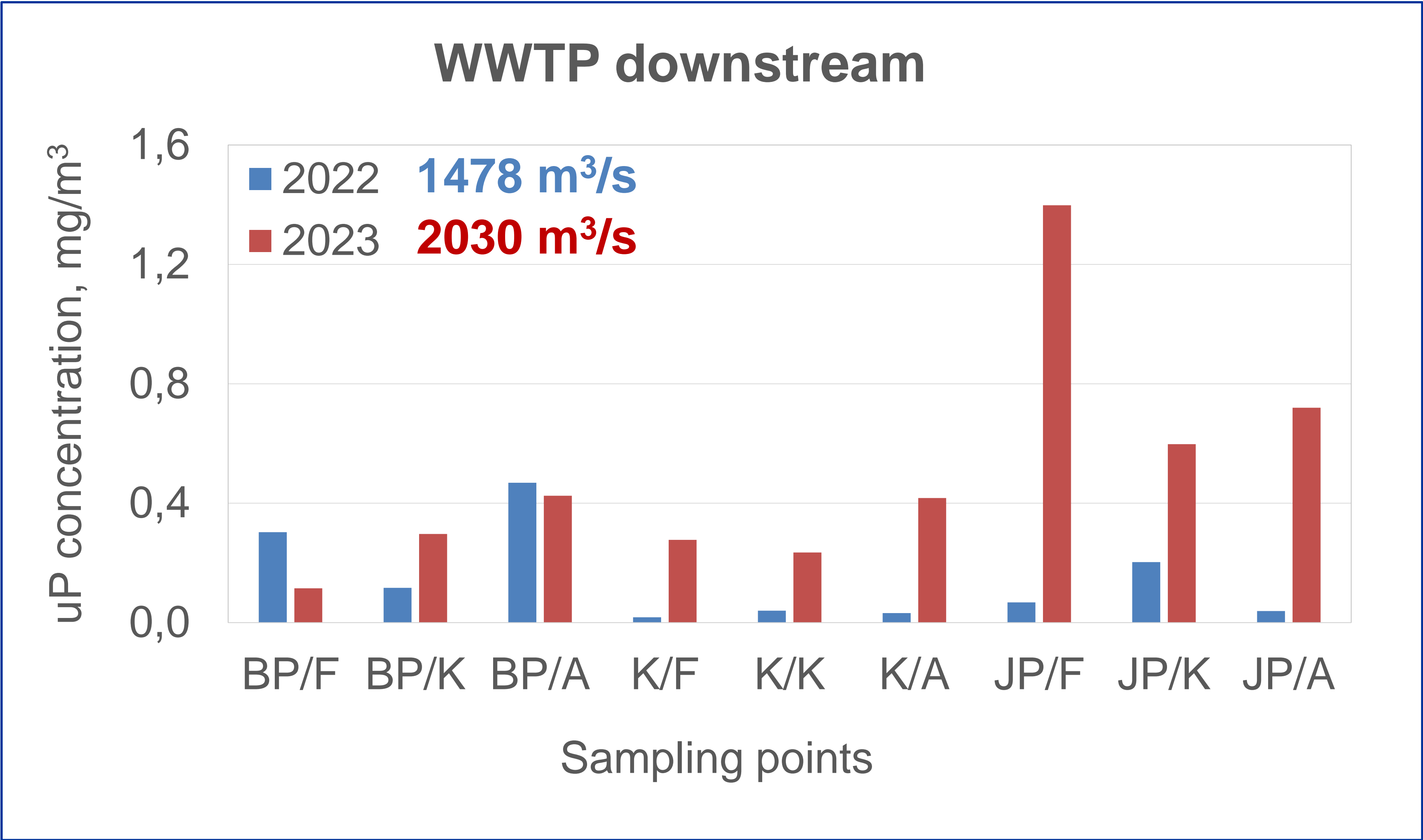


Pump samples (<500 μm)

Net samples (>500 μm)

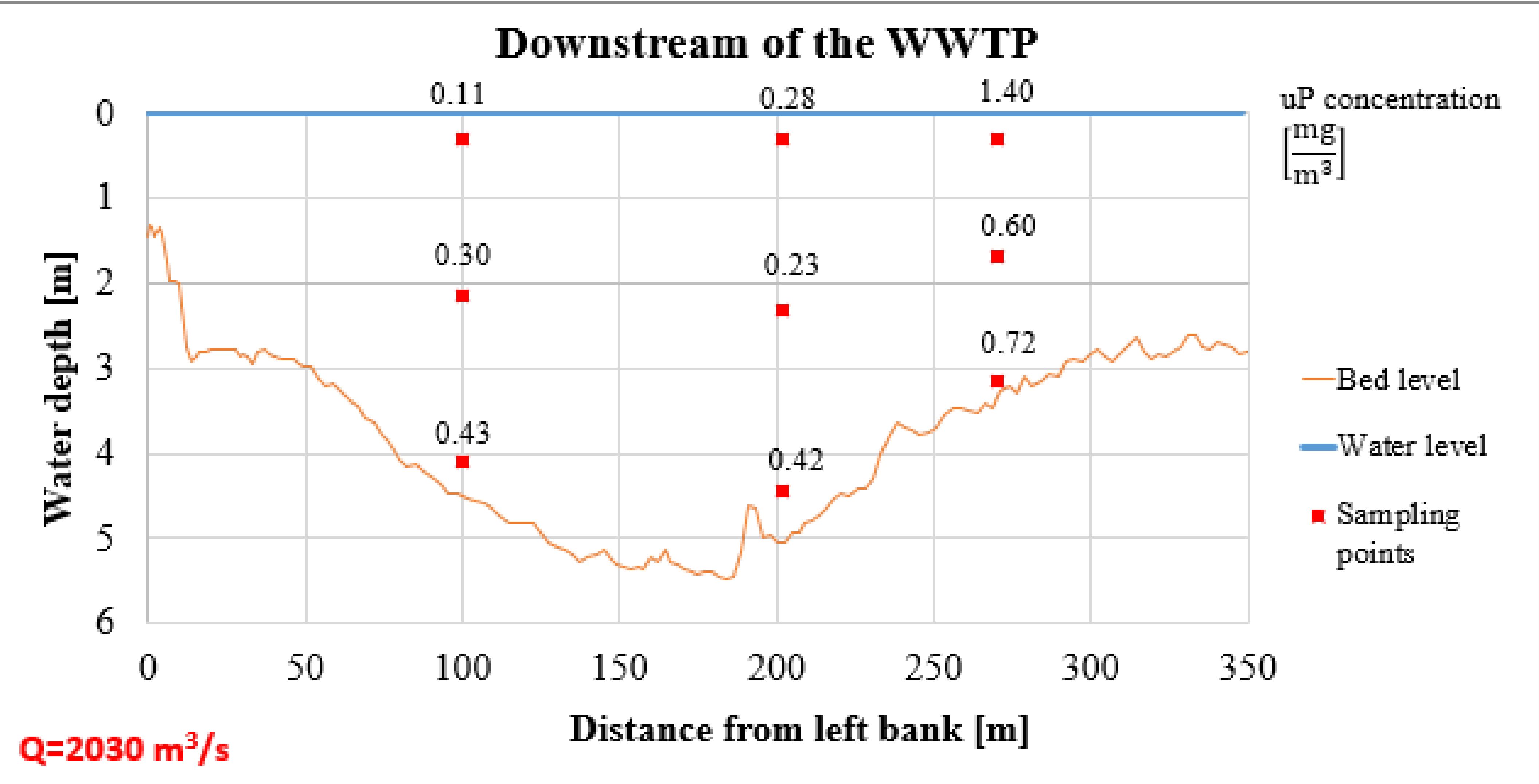
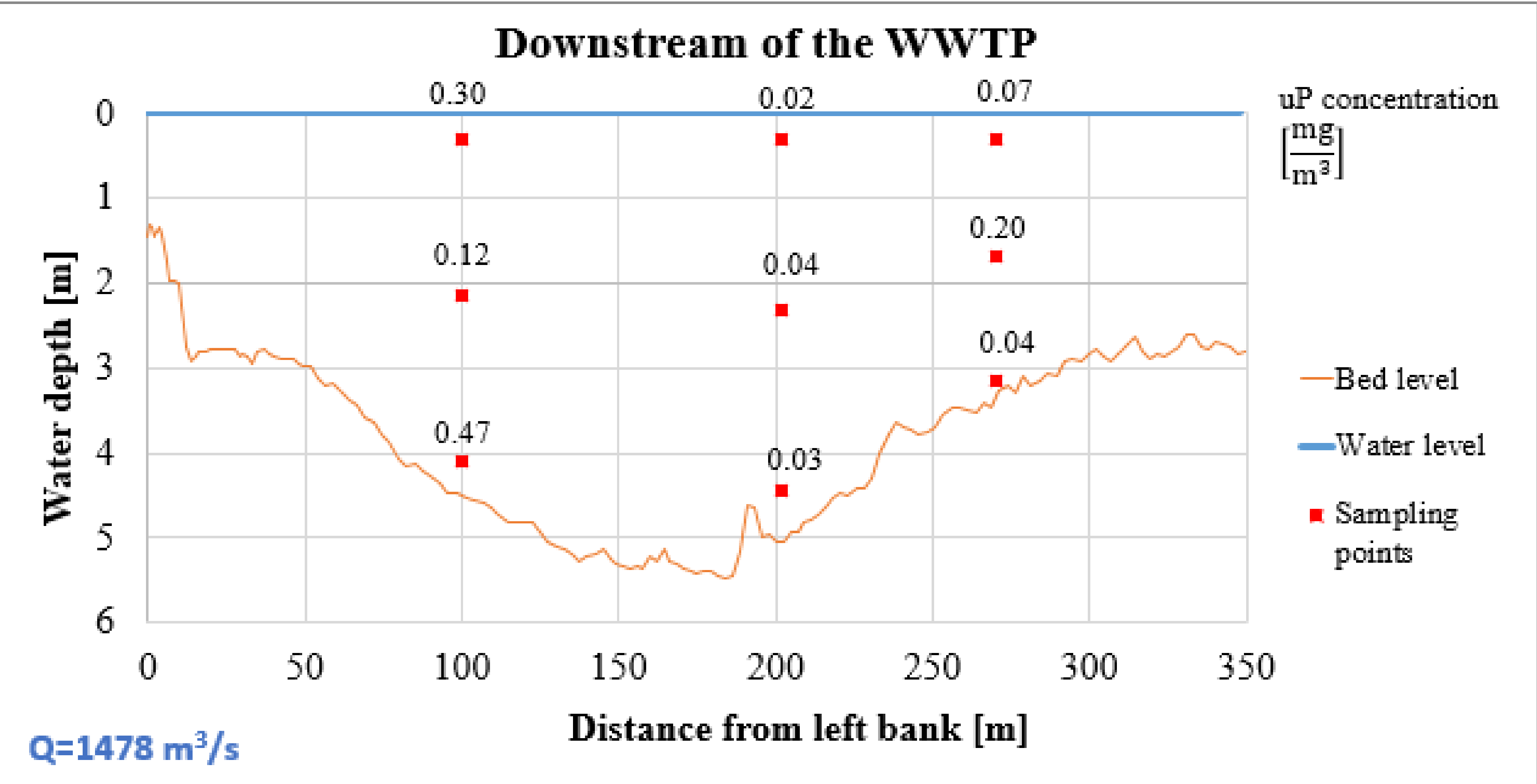


Results: Cross-sectional analysis

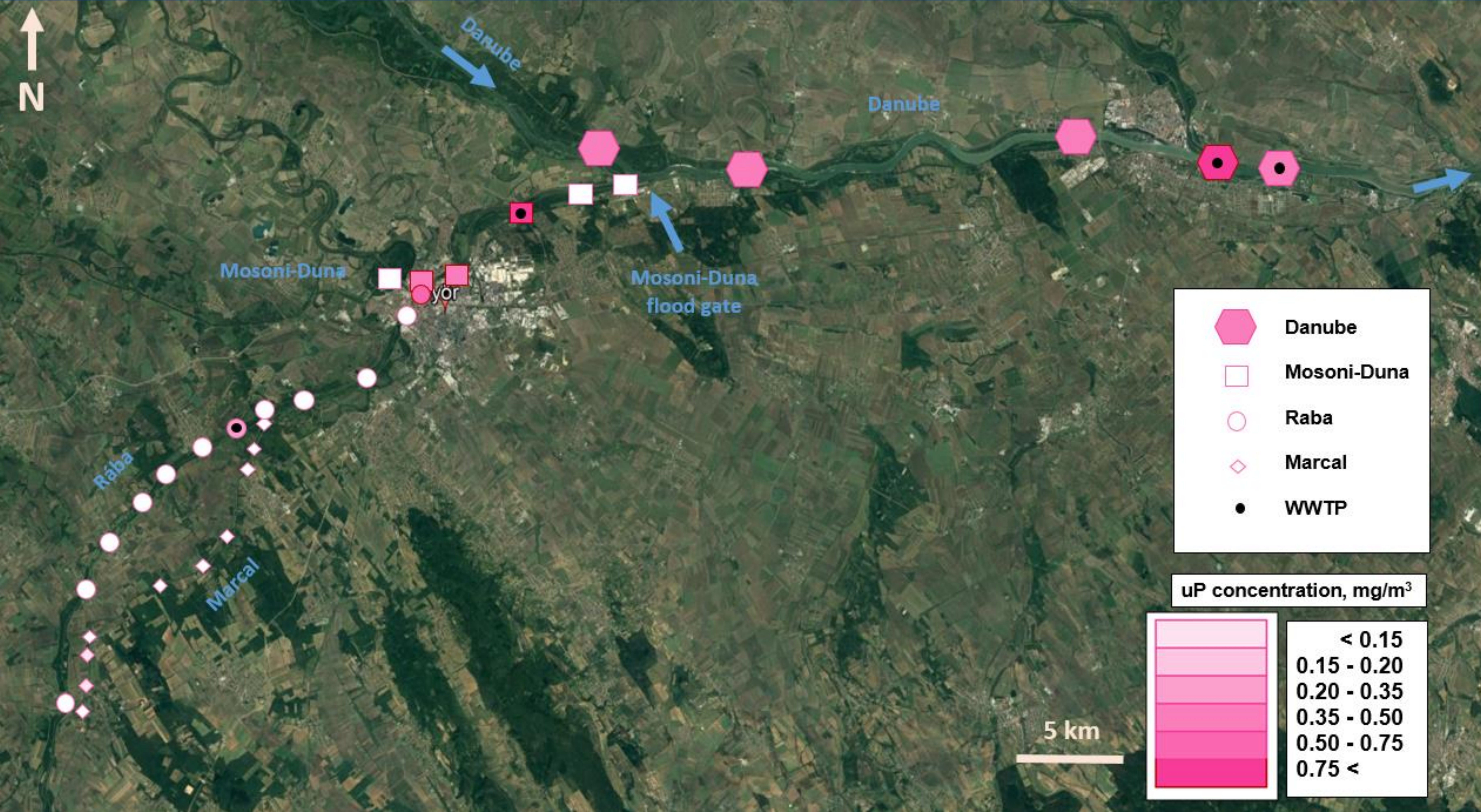


(BP: left bank, K: middle, JP: right bank vertical;
F: top, K: middle, A: bottom sampling point).

Annual average uP load:
~0.50 mg/m³ → ~31 t/yr

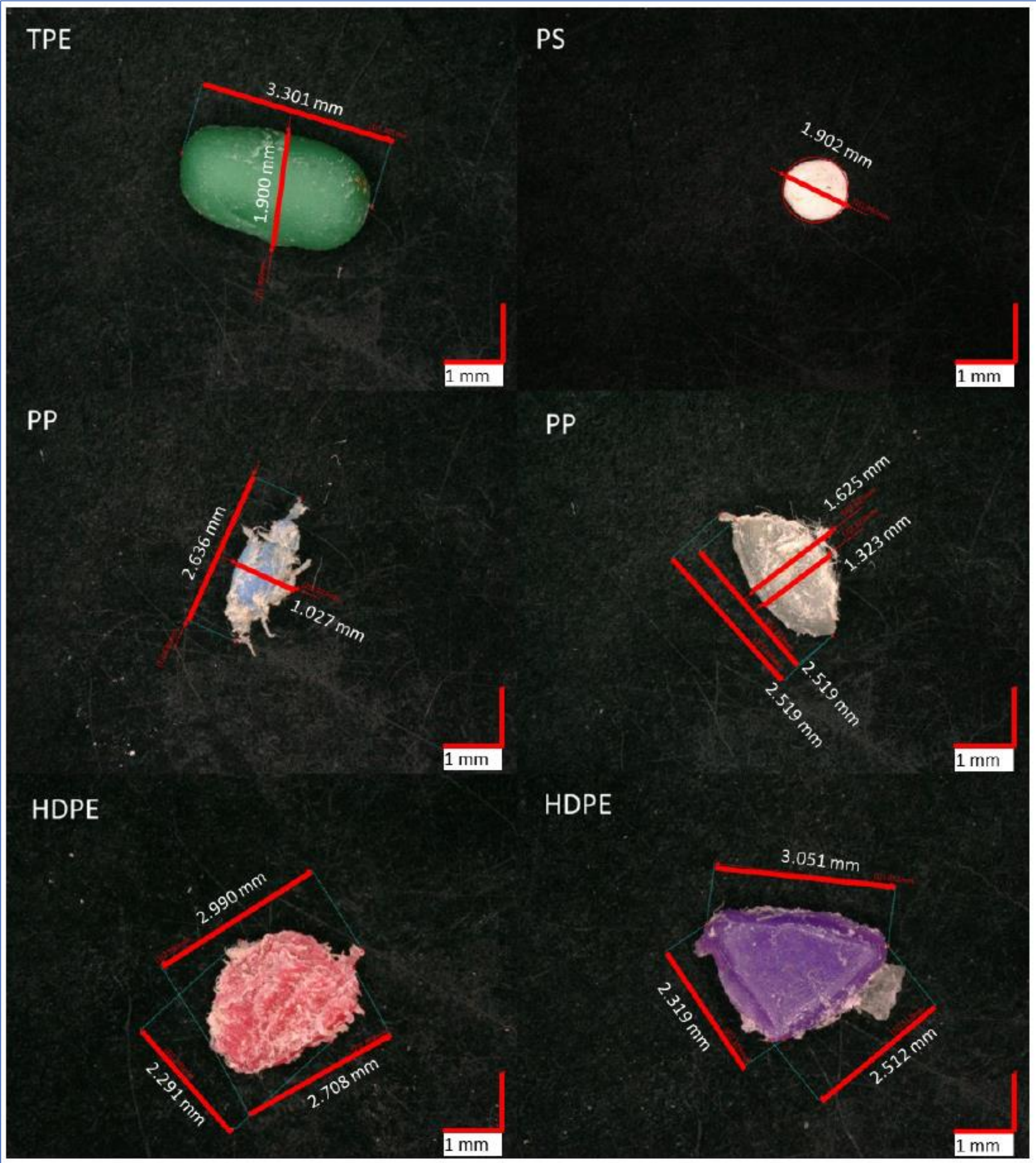


Results: Multiriver-system analysis

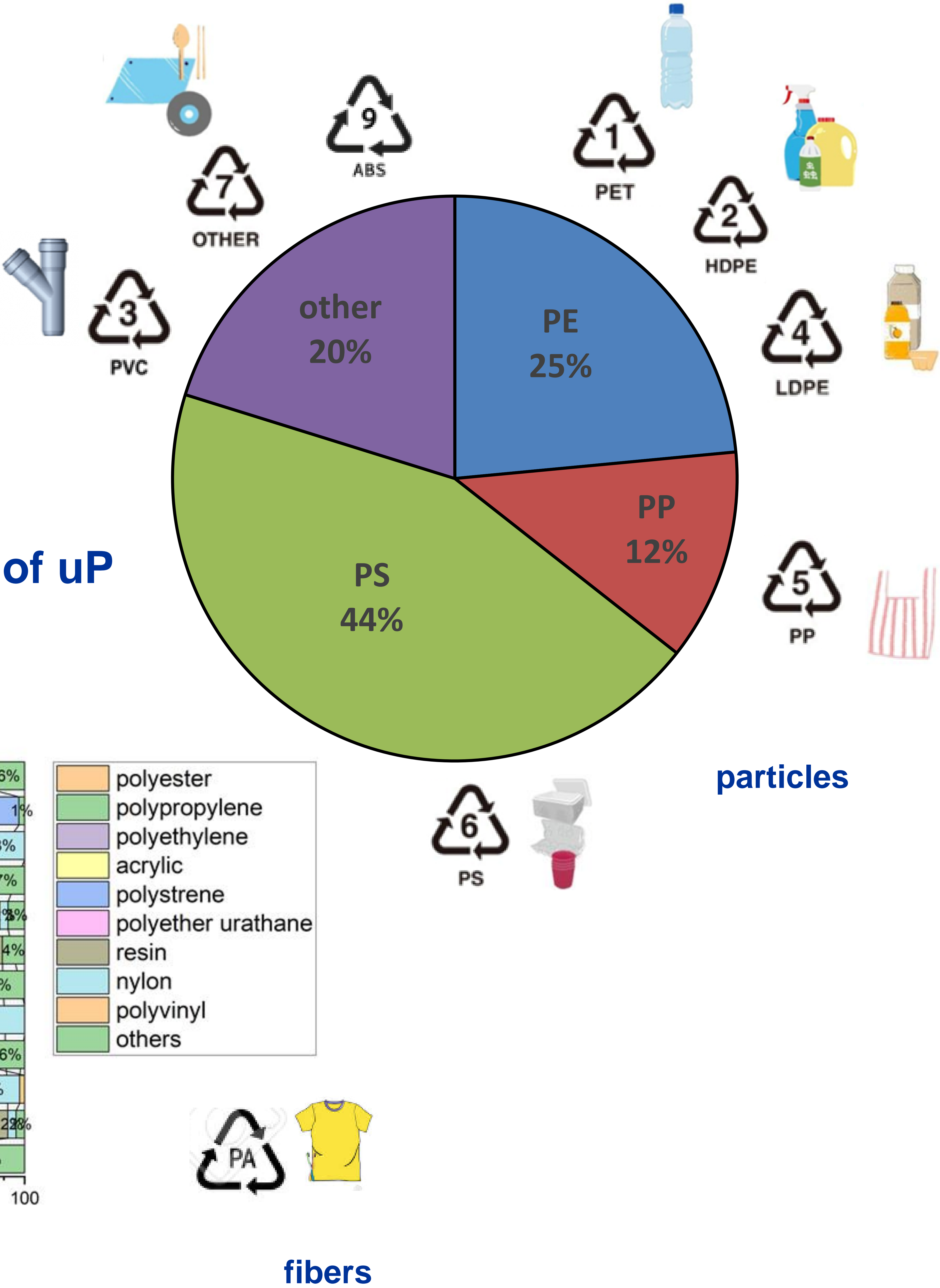
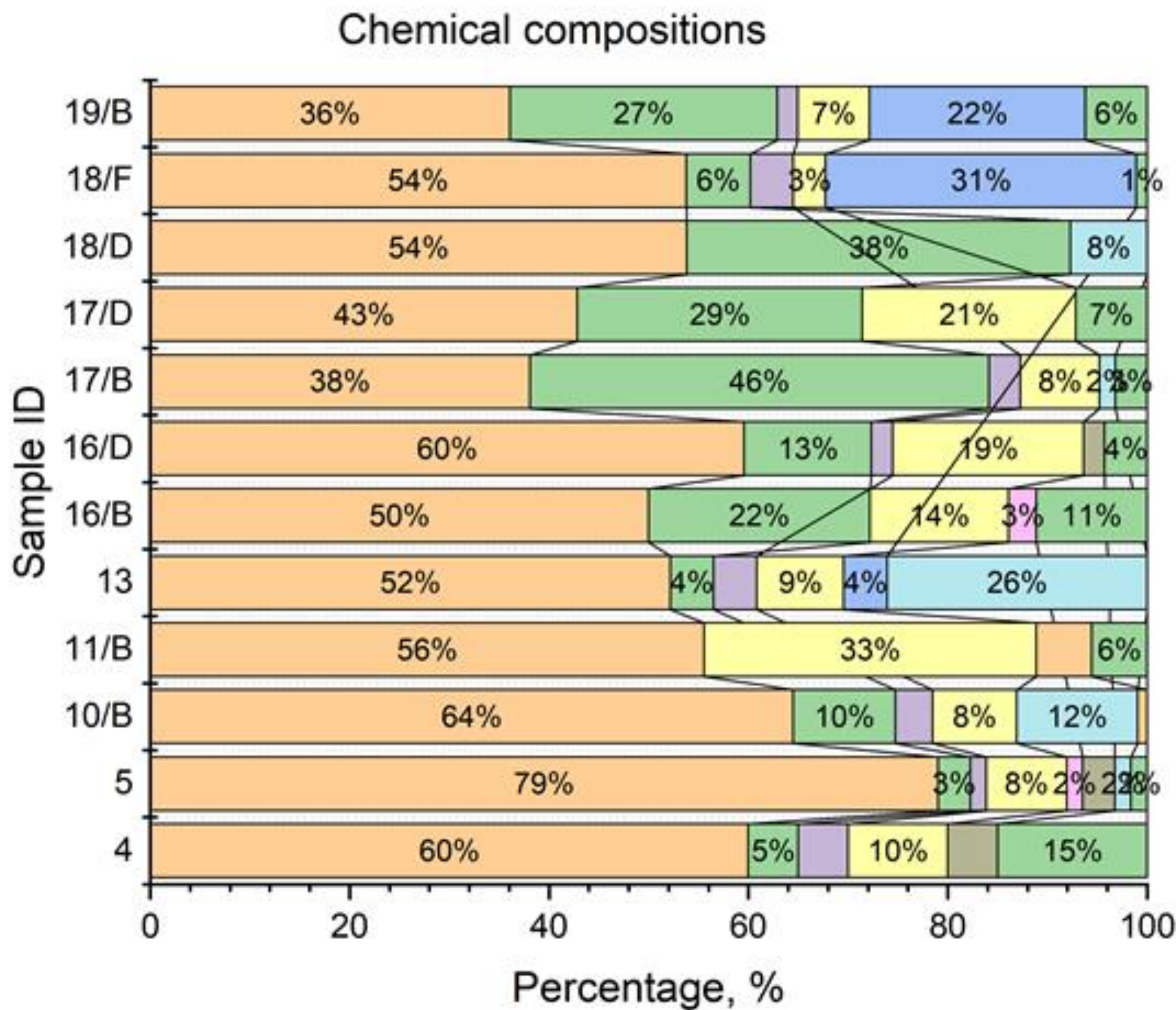


Results: Composition and Imaging

Microscopic images
of typical uP particles



Material composition of uP
in the Danube



Conclusions

RESULTS SO FAR:

- **Methodological** adaptation and enhancement
- **Rating curve** of flow discharge and microplastic concentration
- Statistical analysis of **material composition**
- Analysis of **spatial distribution**
 - cross-sectional
 - multi-river system

NEXT STEPS:

- **Bed material sampling**
 - Accumulation of particles and fibers from the WWTP
- **3D numerical model**
 - Plastic transport
 - More detailed distribution
 - Identifying hotspots for microplastic trapping
 - Analysis of mixing phenomena



Thank you for your attention

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