

Monitoring and Modeling Microplastic in the Greater Paris Catchment and the Seine River

Where?

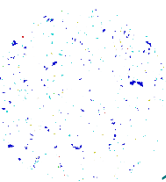


Sources and fate of microplastic in the Seine:

- Upstream vs. downstream
- Agricultural influence (Petit Morin / Orgeval)

How?

Modelling (source-flux / deterministic)



RECEIVING WATERS **PLASTICS** **URBAN AREAS**

PHDS

**Sédi-Plast
(2020-23)**



Nadya

**ITN LimnoPlast
(2020-23)**



Trang Cleo


**Micro-Plast
(2015-20)**



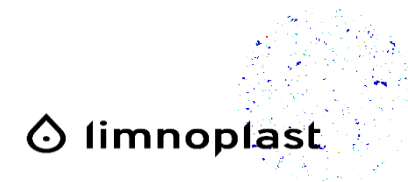
Max



SUPERVISION



Johnny GASPARI Rachid DRIS Bruno TASSIN



Microplastics in rivers

Microplastics (MPs) = plastic particles ≤ 5 mm

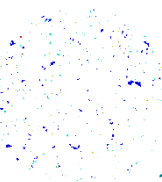
Ref: Li et al., (2020)

- 24% Polyethylene (PE)
- 24% Polypropylene (PP)
- 13% Polystyrene (PS)
- 11% Polyethylene Terephthalate (PET)
- 6% Polyamide (PA)
- 1% Polyvinyl chloride (PVC)



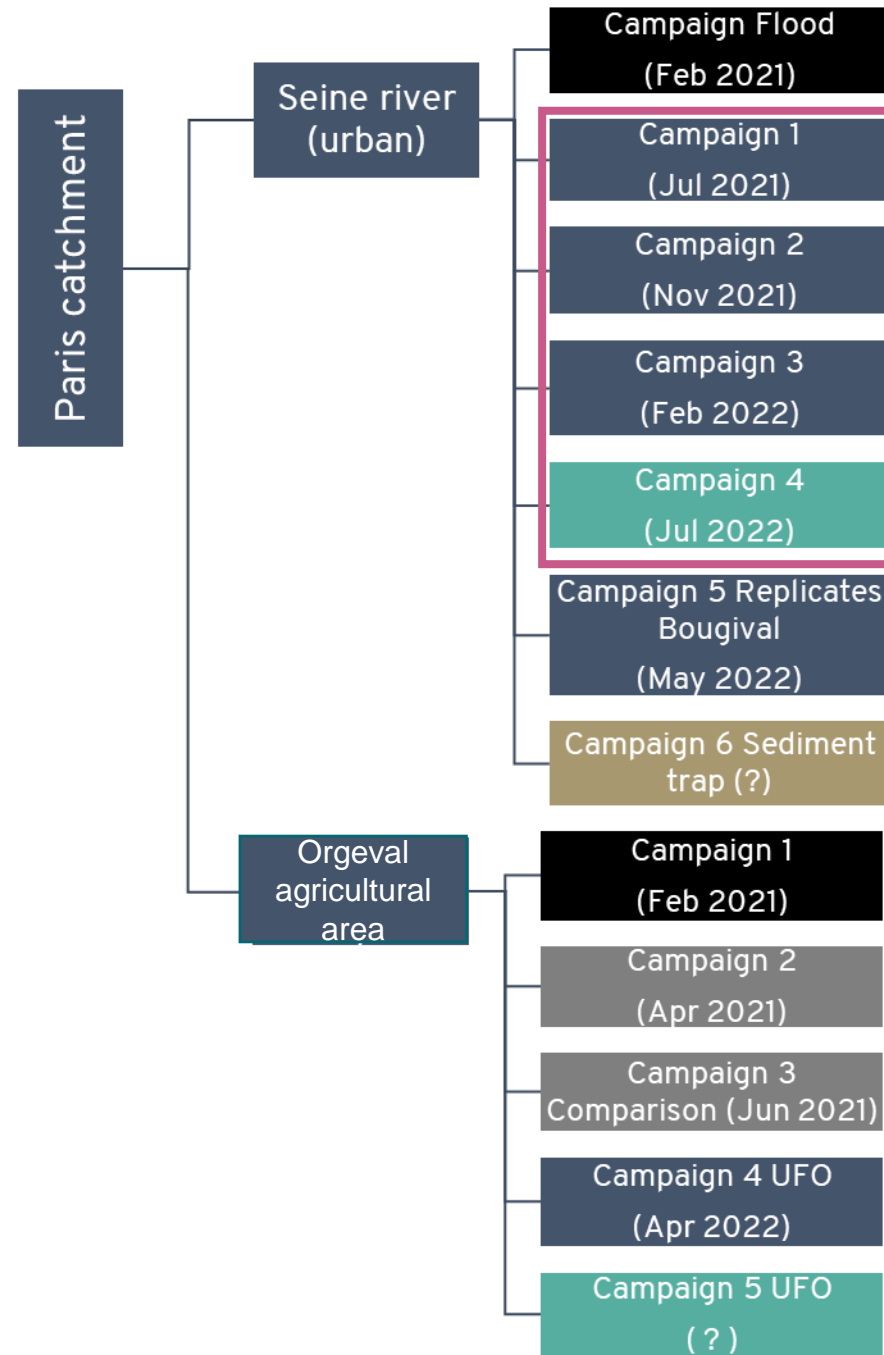
Knowledge gaps:

- Spatial & temporal scale
- Impact of urban areas
- Impact of agricultural areas
- Smaller MP sizes ($< 300 \mu\text{m}$)
- Fate of MPs



Sampling to assess MP concentrations in the environment

Sampling campaigns



Sampling microplastics

Two size-fractions:

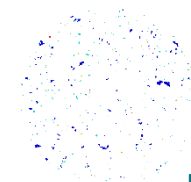
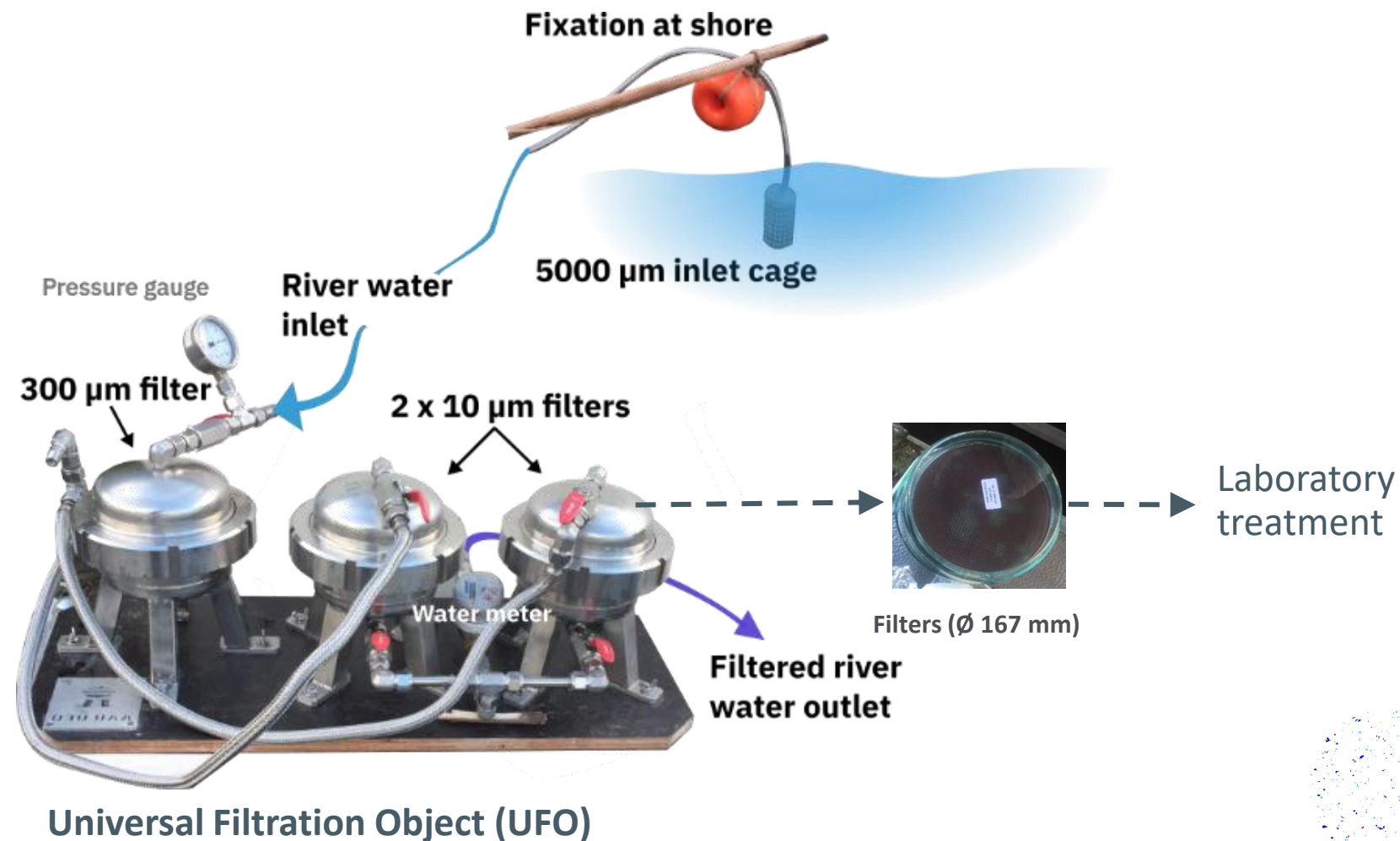
10-300 μm & 300-5000 μm

Volume:

1m³ for >300 μm
until 2 · 2 x 10 μm filters clog

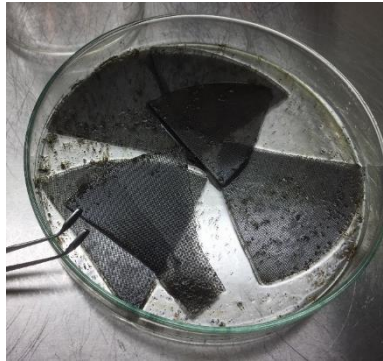
Water flow:

~ 7 L min⁻¹



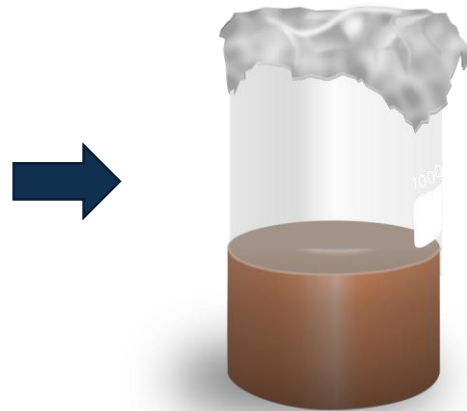
Laboratory treatment 10-300 μm fraction

1. Filter preparation



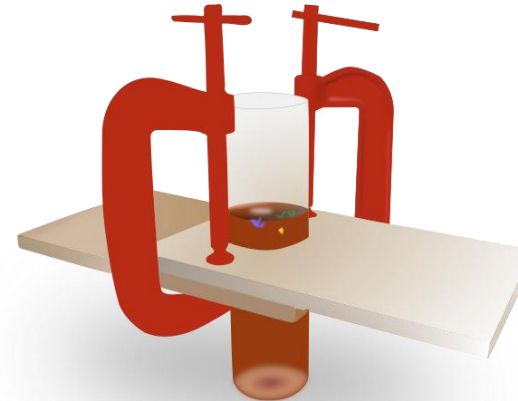
\varnothing 16.7 cm

2. H₂O₂ wet oxidation



H₂O₂ 10 vol-%, 30°C, 24h

3. NaI density separation



JAMSTEC with NaI solution
 $\delta \sim 1.65 \text{ g cm}^{-3}$, 24h

4. Anodisc filtration



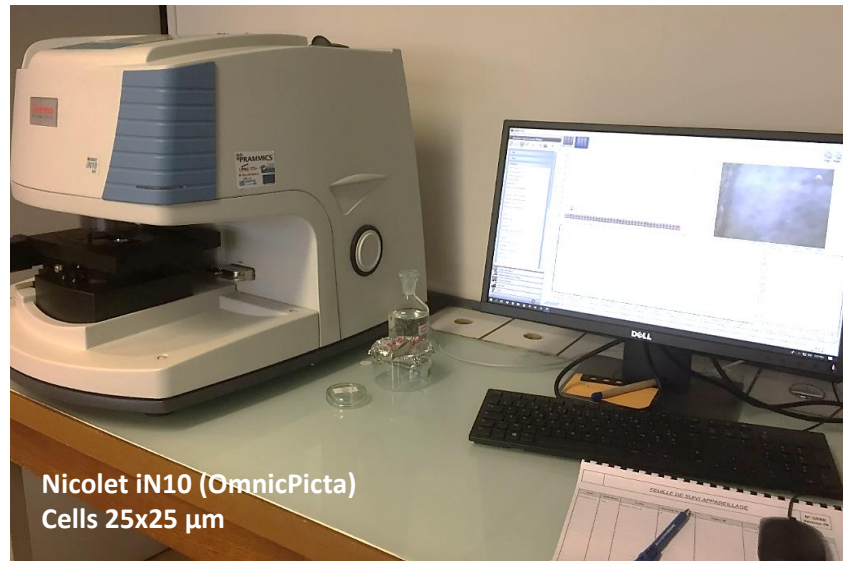
0.2 μm alumin filter



Resuspension: filtration on steel mesh, 2 min ultrasonication
Procedural blanks for each batch of samples
All solutions are 2.7 μm -pre-filtered

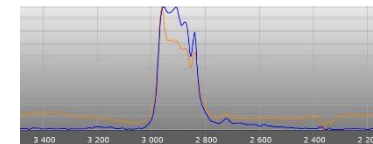
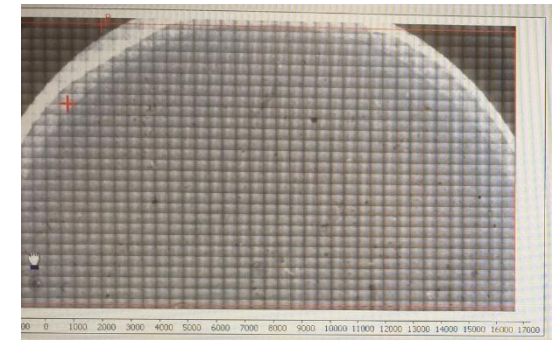


Polymer identification with μ FTIR & siMPle



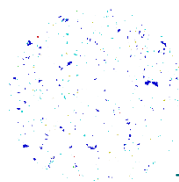
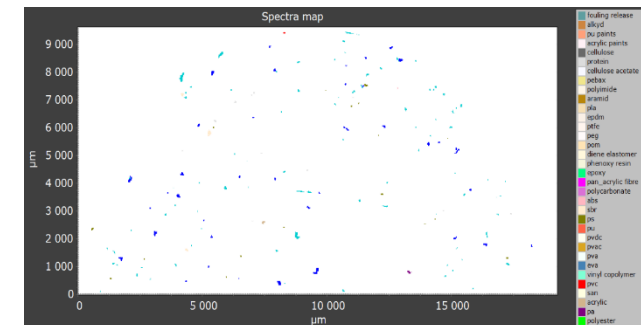
- Full filter mapping
- 100% of sample

1. Spectra acquisition



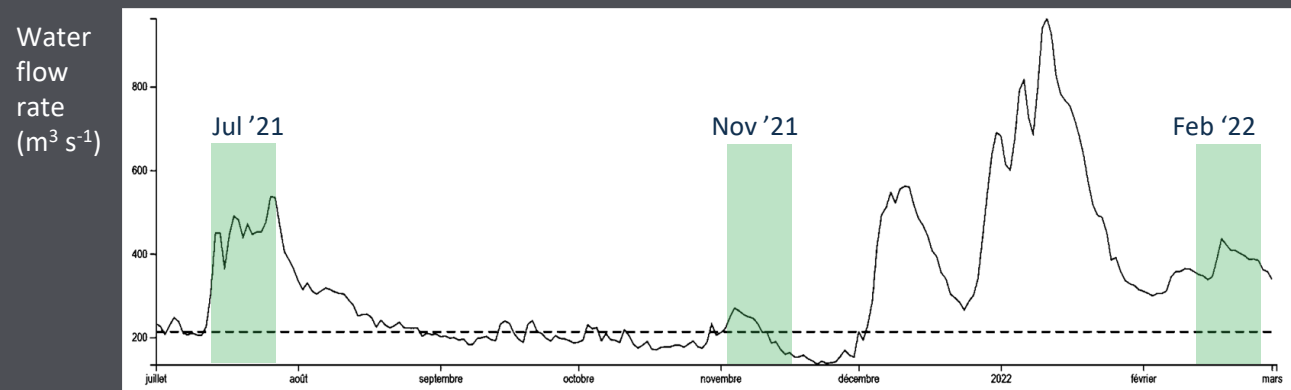
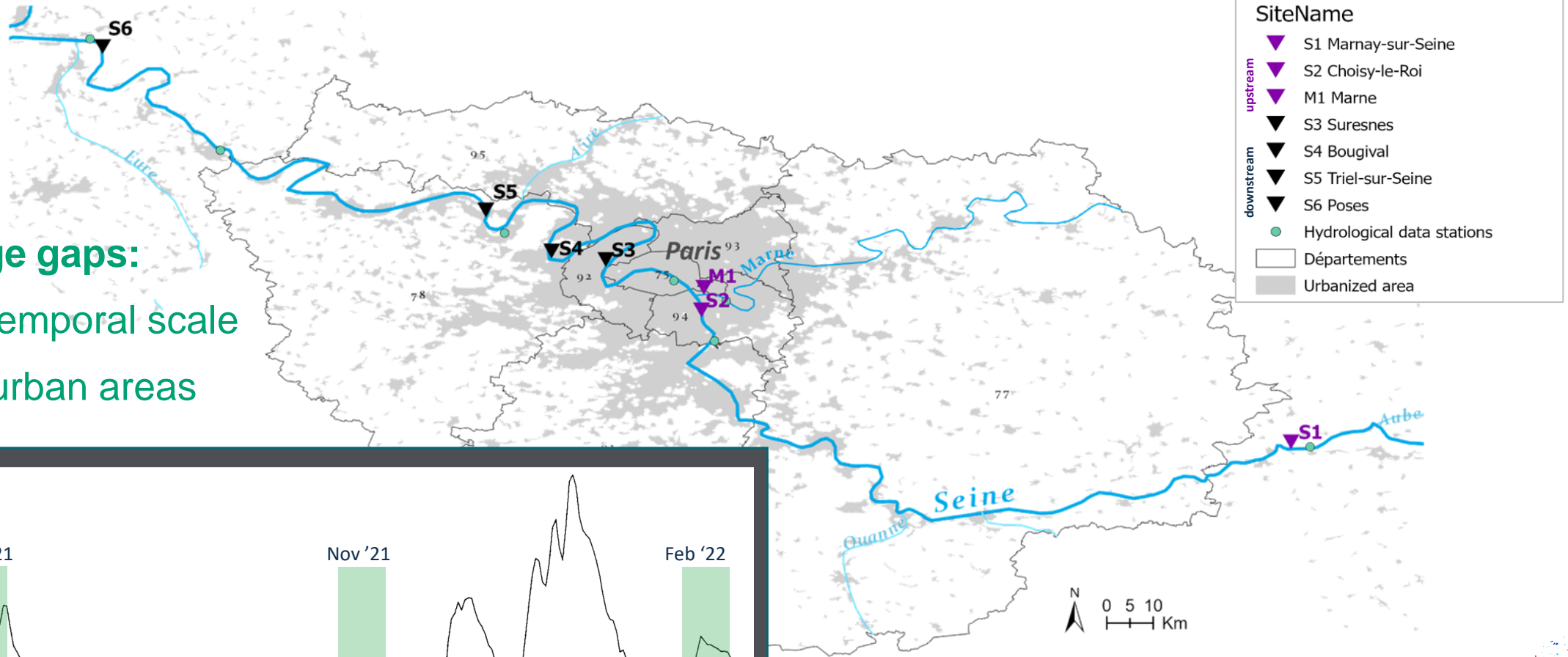
Spectra matching
via a library

2. polymer identification

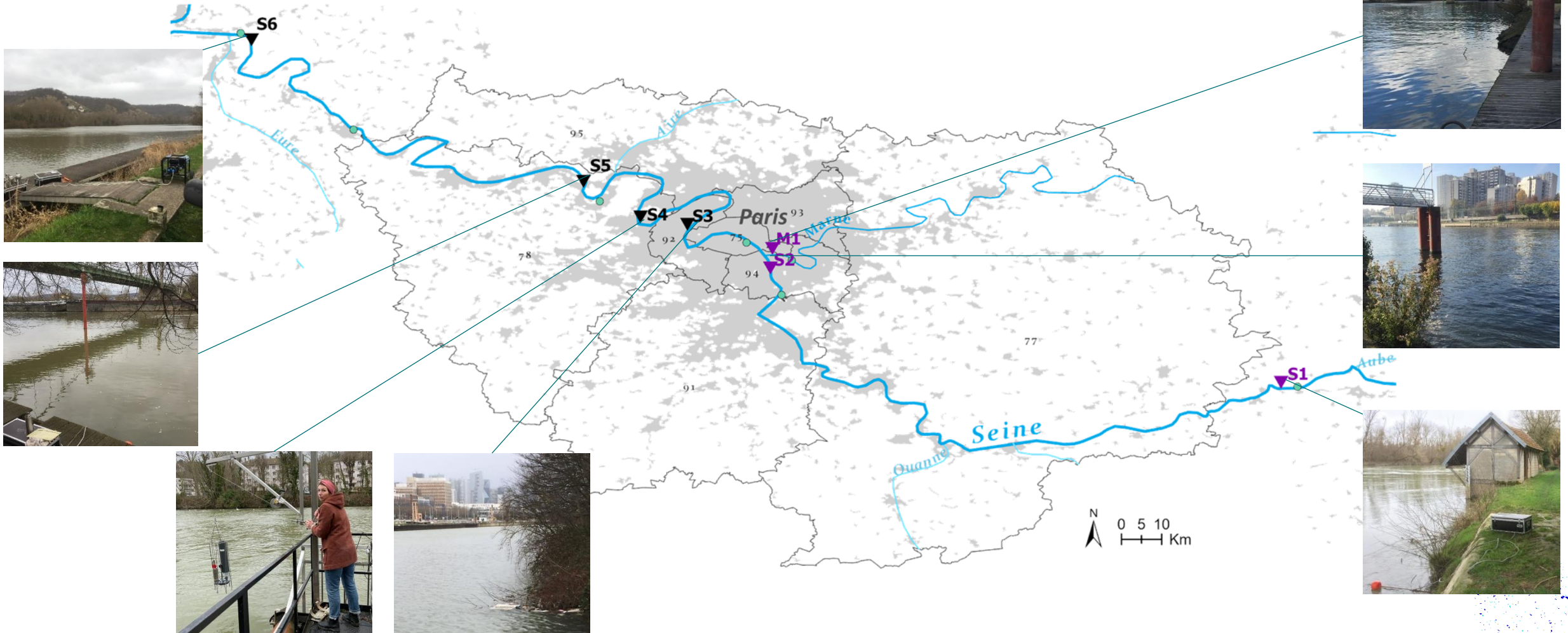


Seine river: Campaigns 1-4

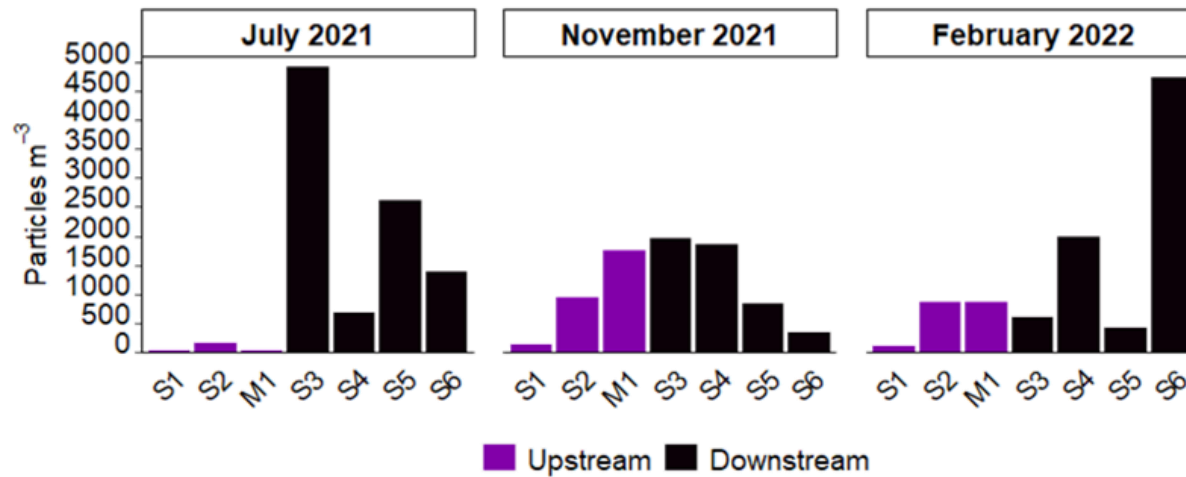
Knowledge gaps:
Spatial & temporal scale
Impact of urban areas



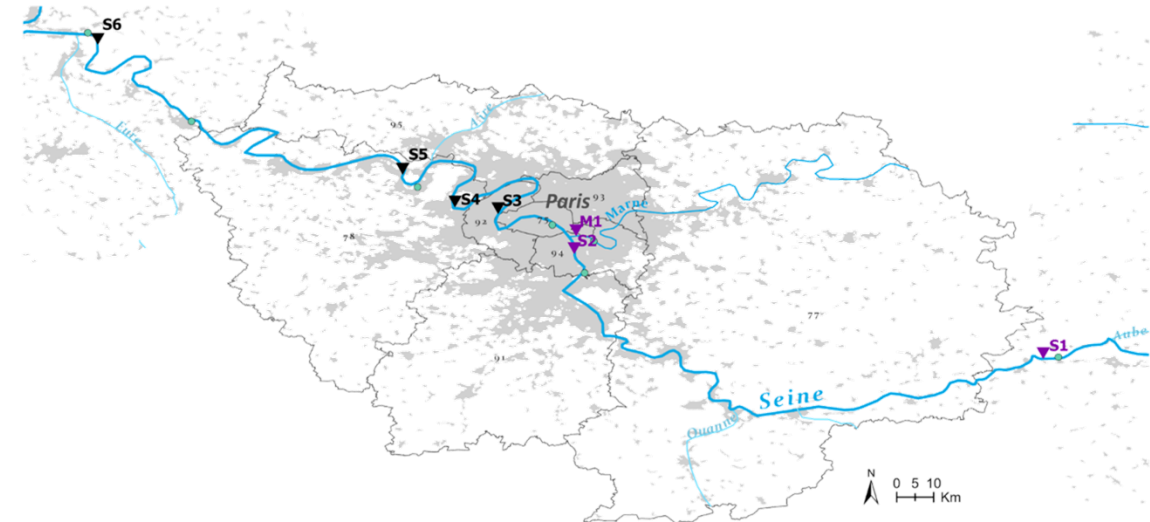
Seine river: Campaigns 1-4



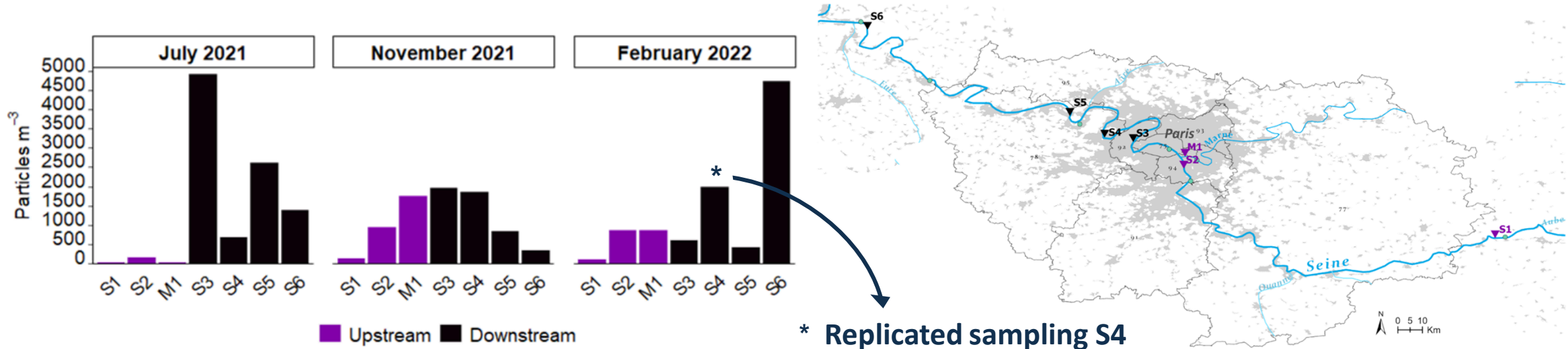
Microplastics along the urban gradient



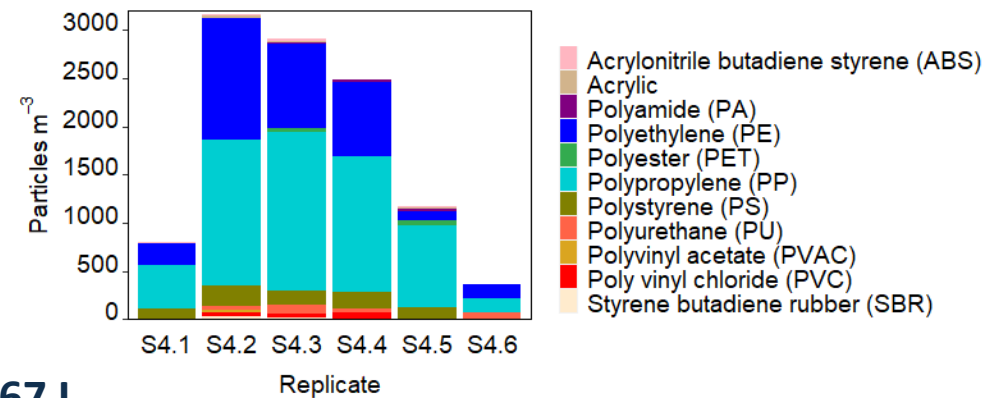
Sample volume: 73 L - 930 L



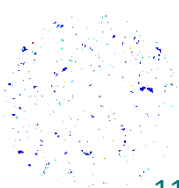
Microplastics along the urban gradient



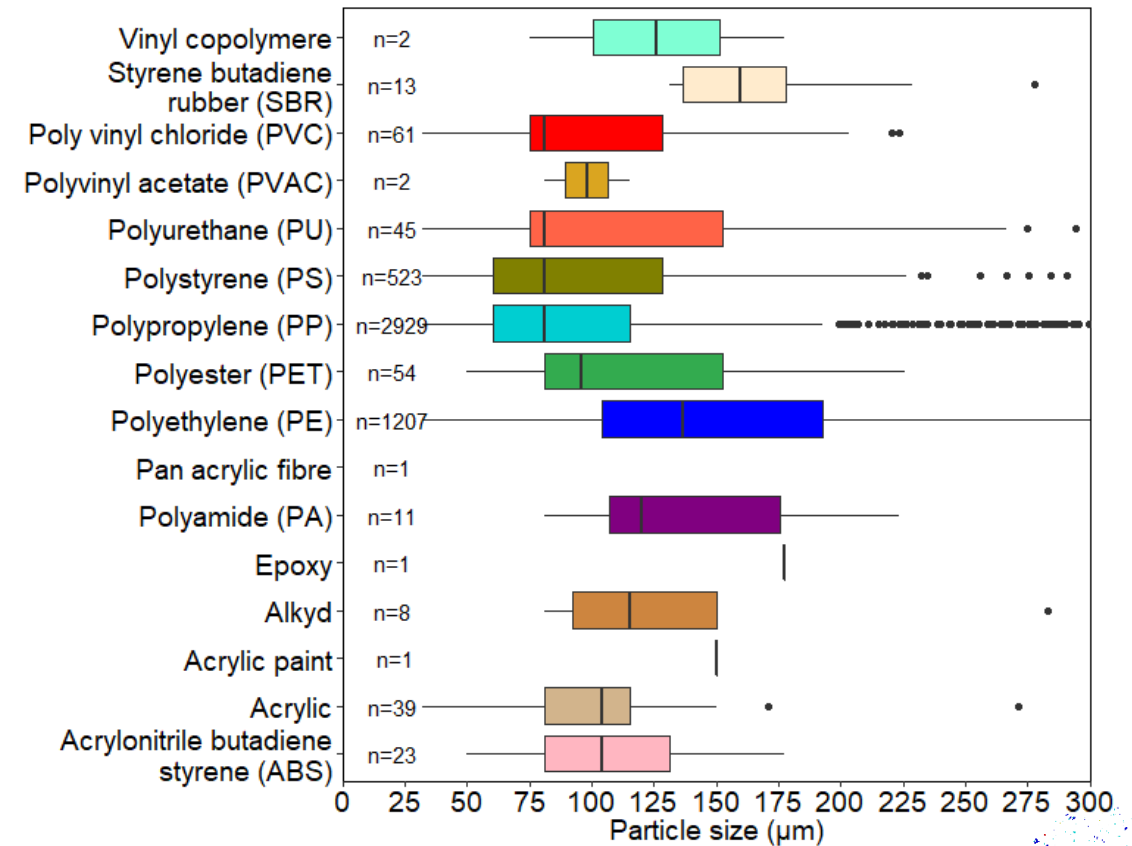
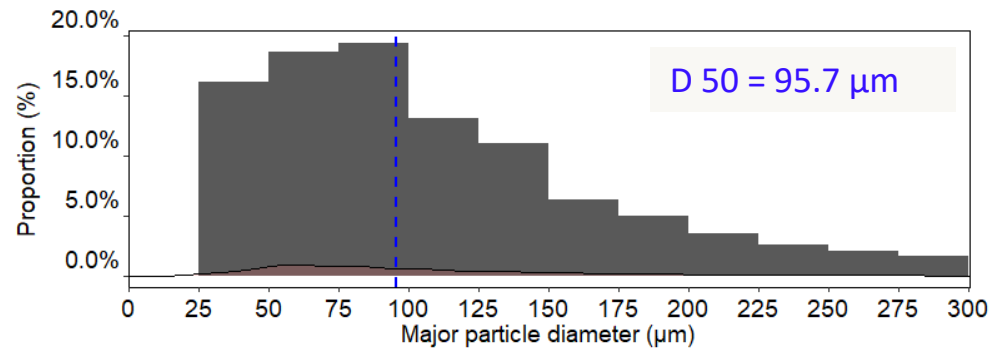
Sample volume: 73 L - 930 L



Sample volume: 59 L - 67 L



Microplastic sizes and types

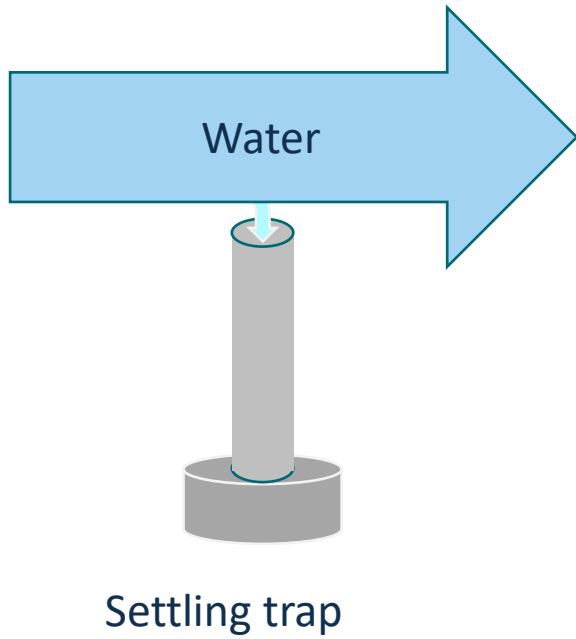


Settling trap experiments

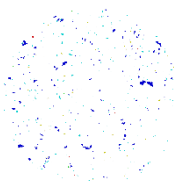
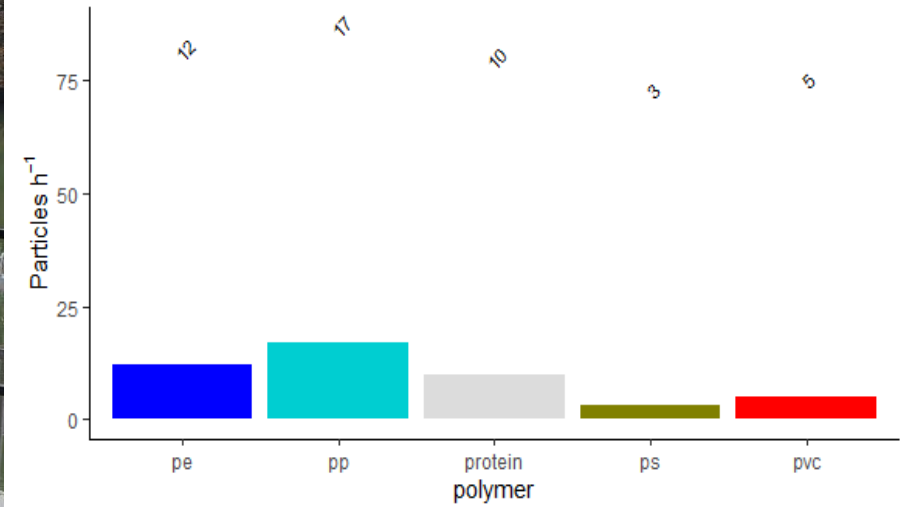
Knowledge gaps:

Spatial & temporal scale

Fate of MPs



Test (35 minutes)



Knowledge gaps:

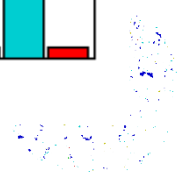
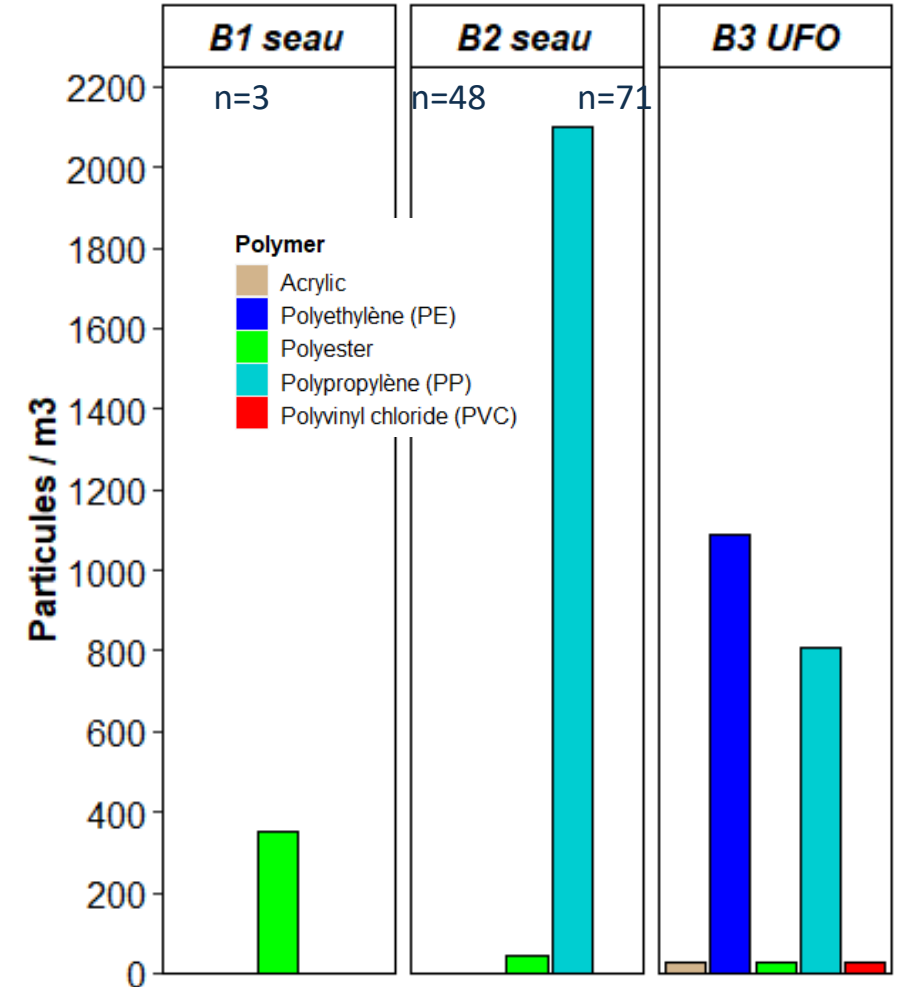
Spatial & temporal scale

Impact of agricultural areas

Results Orgeval



	Février 2021	Juin 2021
A	A1 seau (9.2 L)	-
B	B1 seau (8.5 L)	B2 seau (22.3 L) B3 UFO (35.9 L)



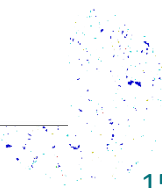
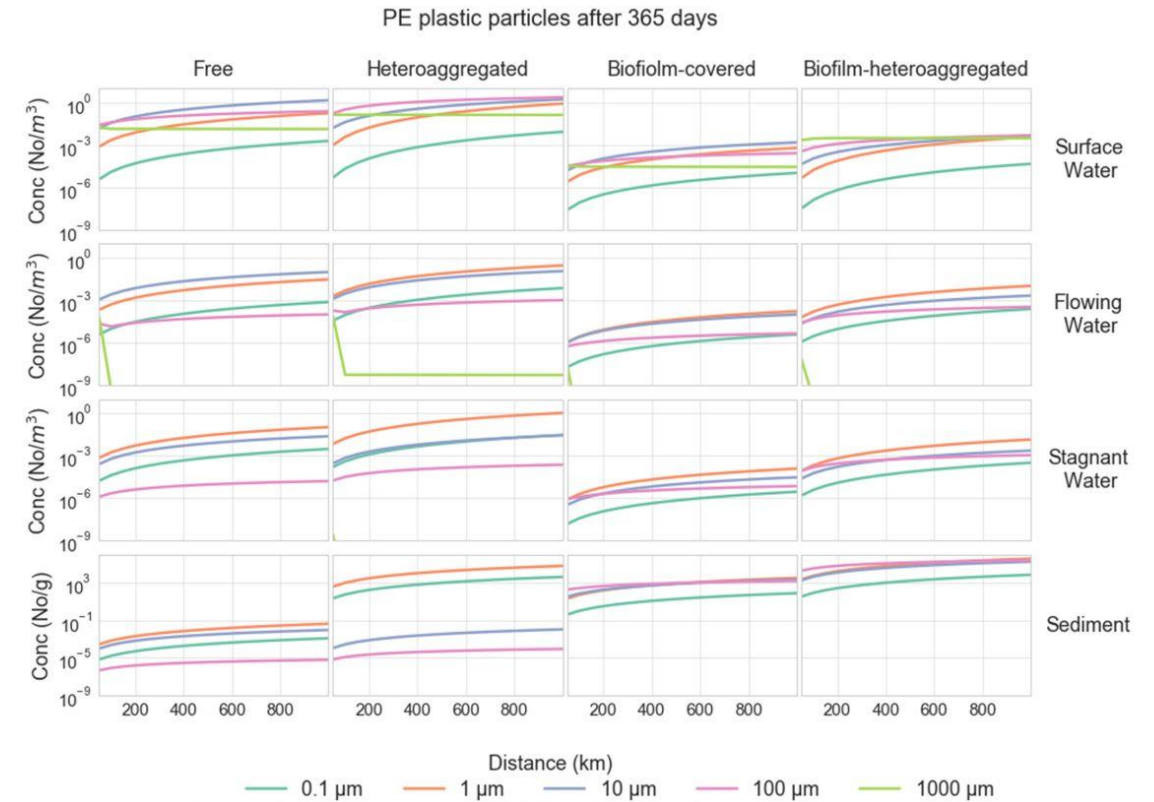
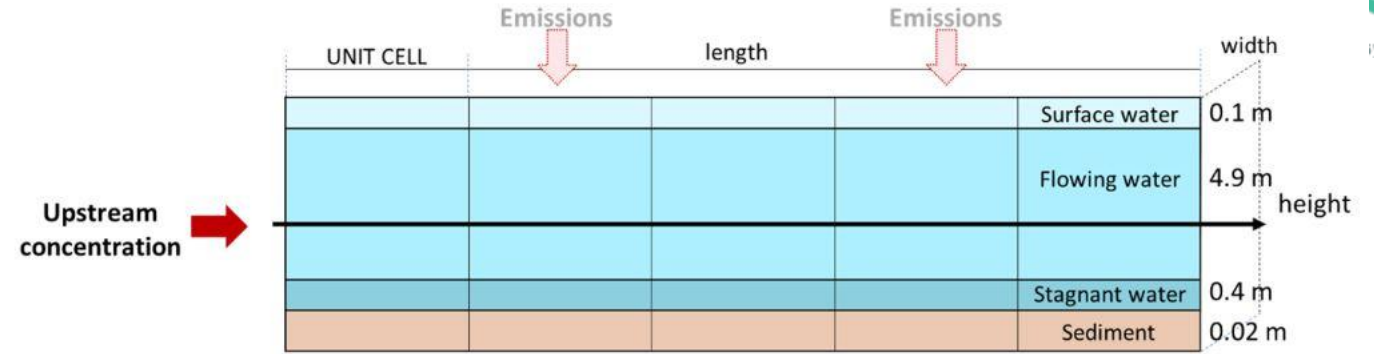
Modeling

Secondment in Delft, The Netherlands – at Deltares

Sept 22- Feb 23

Use data from samplings in hydrodynamic models

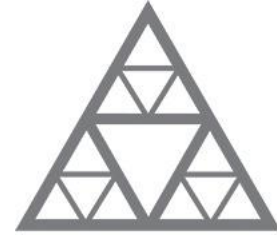
-> model MP in the Seine river



Thank you for listening



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