Following the tiniest: How to track Microplastic particles in (sub-) surface water flow [334407]

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CRC 1357 Microplastics

MICROPLASTIC (MP) IN FLUVIAL SYSTEMS

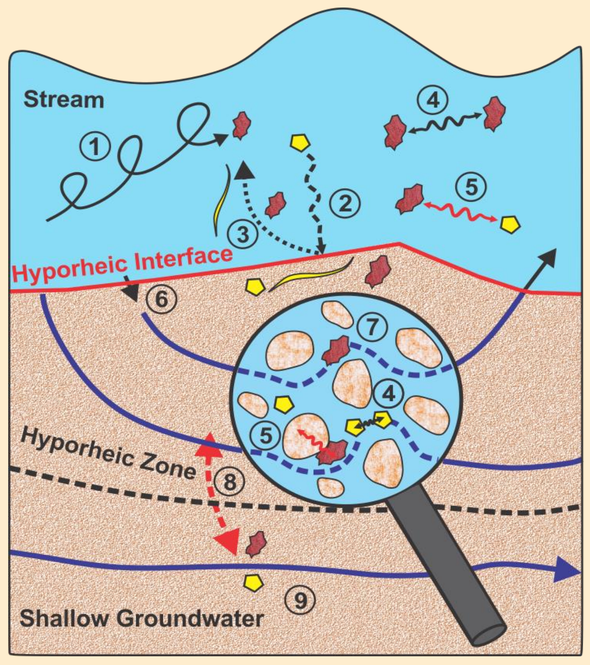
Rivers and streams are the **dominant pathway** for MP input into marine ecosystems.

Pore-scale MP are found in river sediments, but transport mechanisms are unclear: **River ≠ pipe**:

- Sedimentation and Resuspension in stream
- Transfer across hyporheic interface with infiltrating stream water
- Physicochemical interactions with water and sediments

Common analysis methods are often destructive and static:

→ To investigate MP transport mechanisms, we need spatio-temporal and quantitative information on MP abundances in i) open channel flow and ii) porous media



Frei, S. et al: *Scientific Reports* 9, 15256 (2019)

METHODS

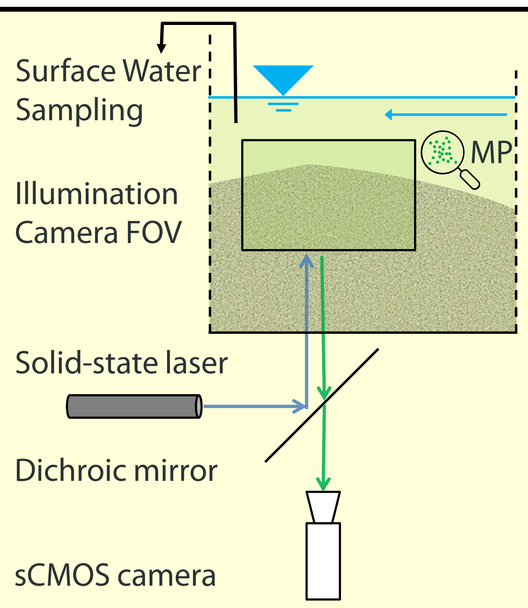
Microplastic detection

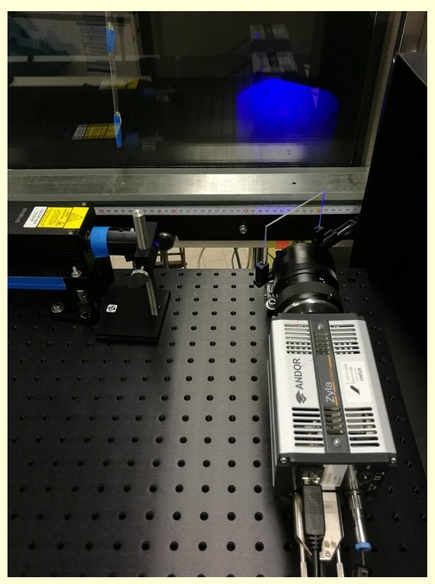
Spatially averaged measurement (concentration) for small particles (1 – 10 µm) with a fluorescence coating:

- Planar measurement (Fluorescence-Camera-System)
- Selective measurements (Fluorometer)

Hydraulics

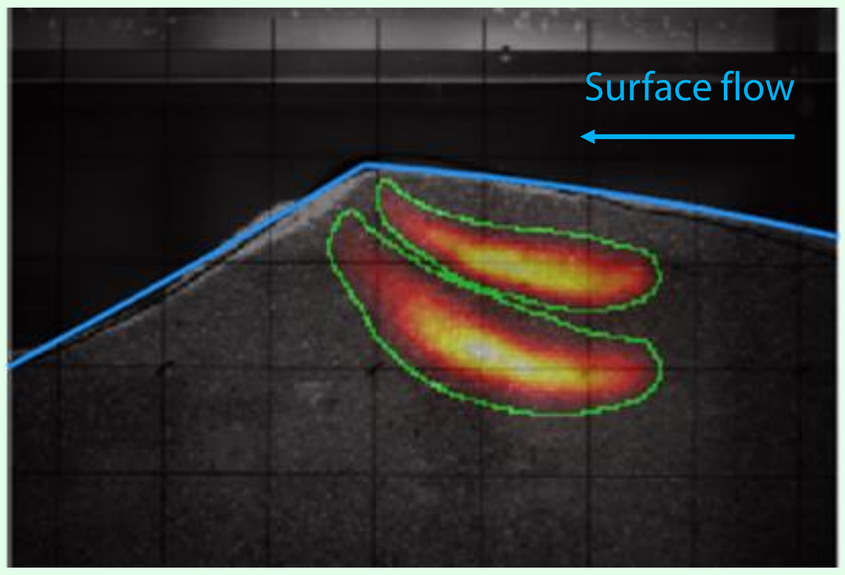
Optical techniques to avoid disturbing the flow





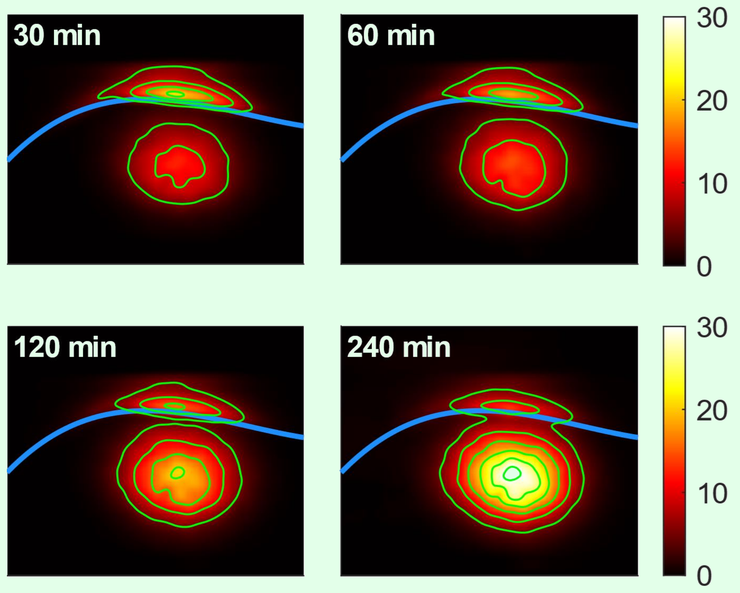
RESULTS: PROOF-OF-CONCEPT

Injection into Sediment



Migration and formation of microplastic plumes (Colorcoded intensity indicates abundance)

Infiltration of Hyporheic Zone



Left: MP concentration in sediment increases and expands over time
Right: Breakthrough curves for MP (in- and outflow) in surface stream show declining concentration (right) in time

DISCUSSION

Mobility of MP in porous media

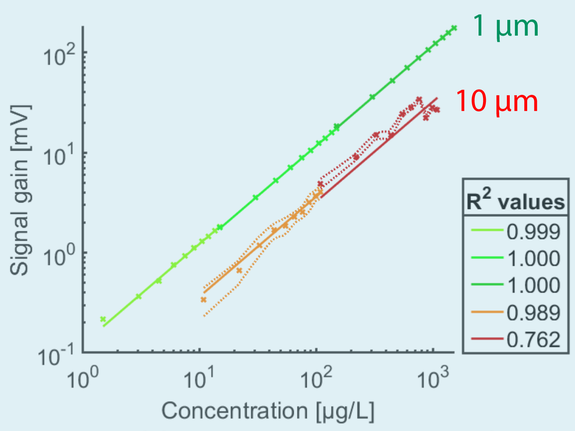
Hyporheic flow paths of MP can be visualized

Infiltration of MP into Hyporheic Zone is shown

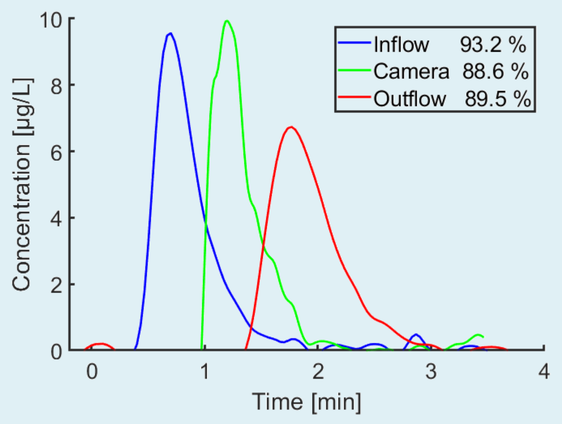
Quantification of exchange processes

Linear response for small particles

System sensibility is high (recovery rates ~ 90 %)



a) Calibration point sampling



b) Recovery rate measurements

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