Microplastic dynamics within turbulence for improved modelling and monitoring strategies

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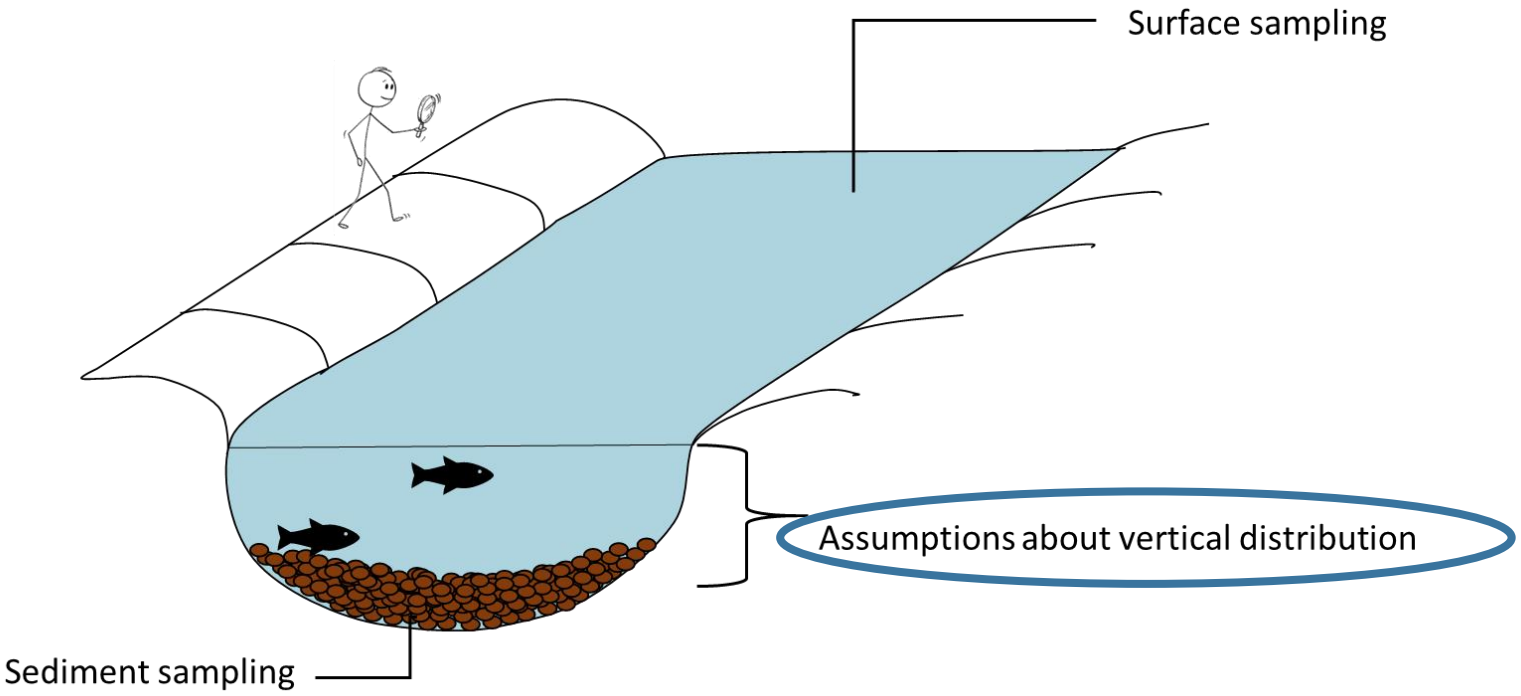
How do we estimate microplastic in rivers?



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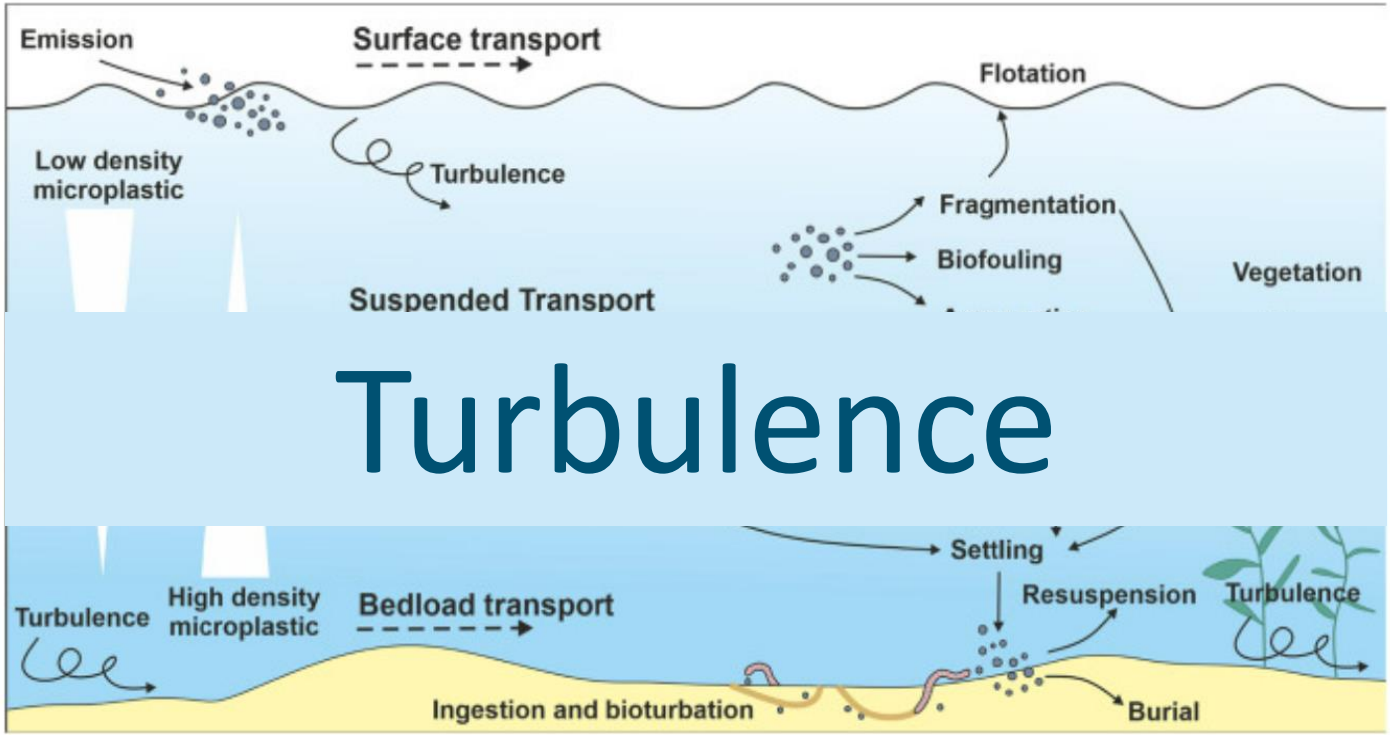
Water column is a puzzle



Processes acting on and impacting microplastics transport in aquatic systems (Waldschläger et al., 2022).

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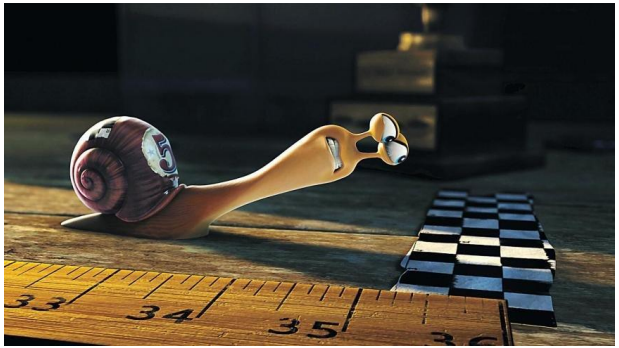
"We are not students of some subject matter, but students of problems. And problems may cut right across the borders of any subject matter or discipline."

Karl Popper (1963)



Microplastic transport research in isolation

With some help from fluid mechanics and sedimentological research

Featuring Turbo from the upcoming movie Turbo

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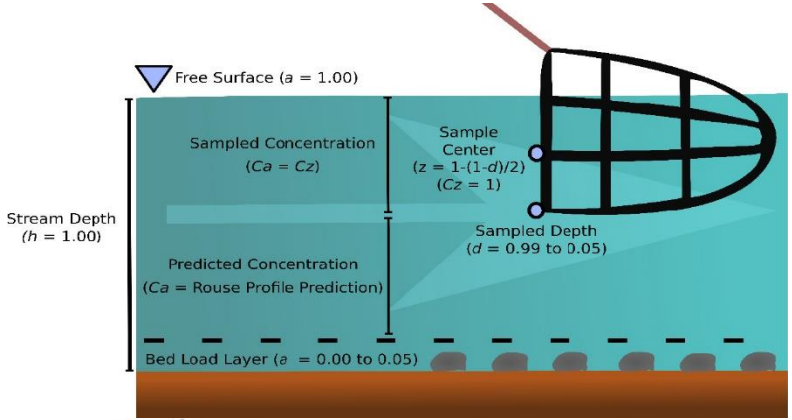
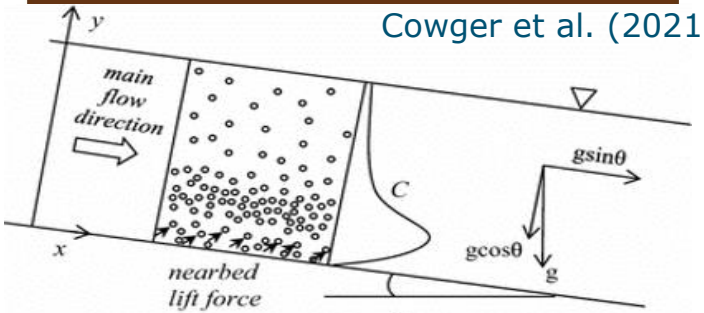
The Rouse turbulent mixing model can describe microplastics vertical distribution



Cowger et al. (2021)



Kundu & Ghoshal (2017)

$$\frac{C_a}{C_z} = \left(\frac{(h-a)}{a} \times \frac{z}{(h-a)} \right)^{P}$$

P: **T**he Rouse number describing the ratio between settling forces and turbulent mixing.

$$P = \frac{w_s}{\beta k u_*}$$

β: The ratio between microplastics diffusivity and eddy diffusivity (Dimensionless), also known as Prandtl-Schmidt number)

(Assumed to equal 1 like sediment)

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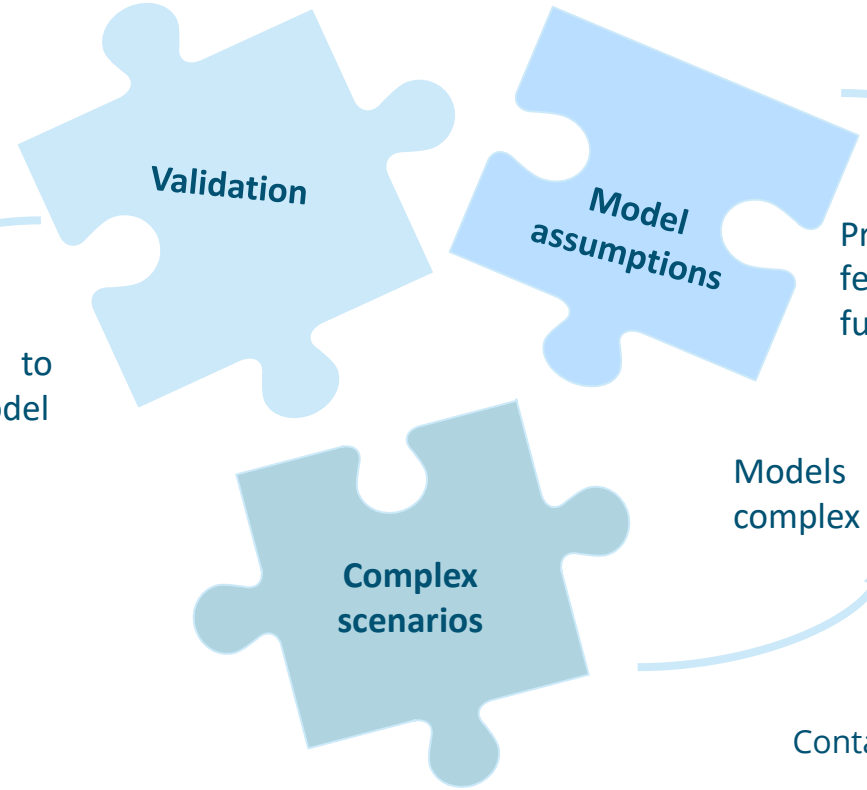
Turbulent mixing impact on microplastic transport is still not fully resolved



Datasets are needed to validate the turbulence model

Prandtl-Schmidt number (β) feed to the model needs to be further investigated

Models are needed for complex scenarios

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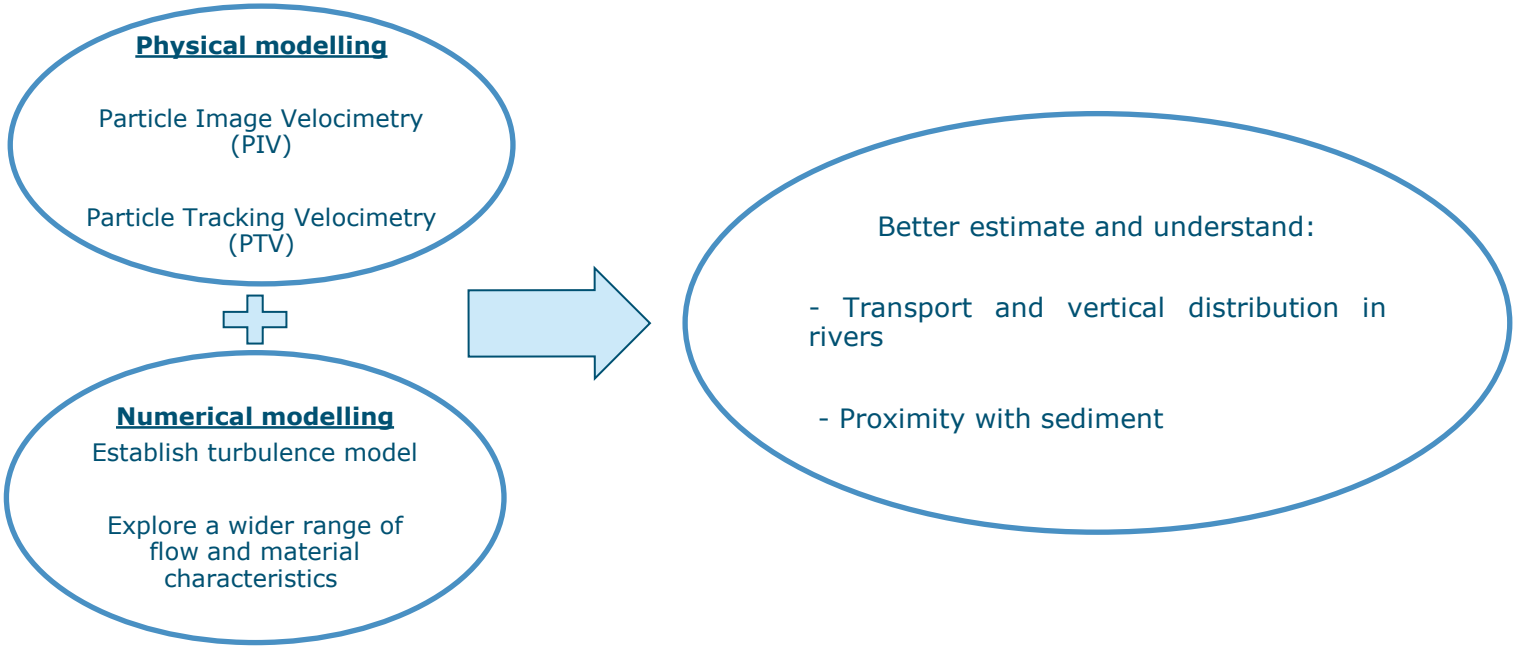
Way forward to tackle microplastics vertical distribution

A 4 years mission…



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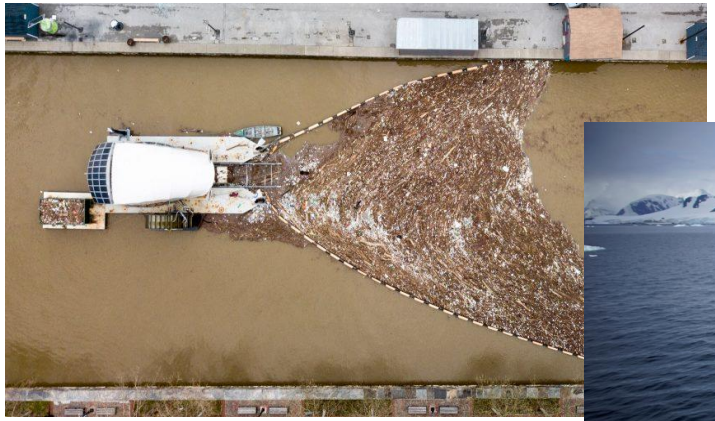
Is it really important to understand the water column?

Mitigations measures



Mr Trash Wheel collects river plastic in Baltimore
Source: Four technologies tackling the problem of river plastic pollution (c

Sampling practices

Water sampling at Neko Harbour, Antarctica, February 16, 2018.
Source: *Plastic waste in Antarctica reveals scale of global pollution*

Toxicology

Microplastic uptake of a mackerel fish in Thailand
Source: Microplastics found in stomachs of mackerel caught by Thai fishermen a concern - Mothership.SG - News from Singapore, Asia and around the world

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End of presentation!