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Fate factors for microplastics in the marine environment

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UQAM

EPFL

Hes-so



MarILCA
MARINE IMPACTS IN LCA



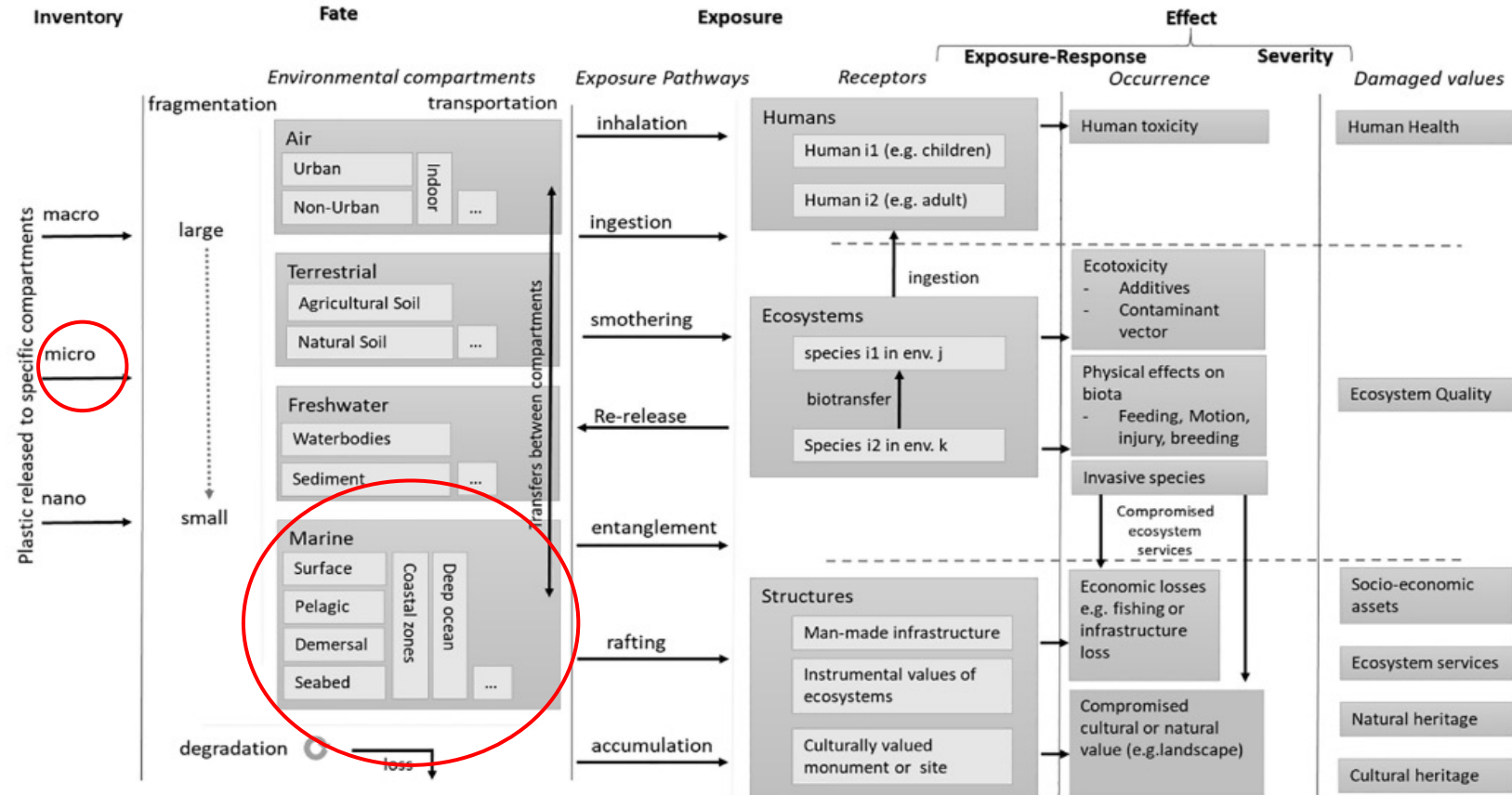
Introduction and fate framework



Introduction

Objective

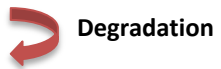
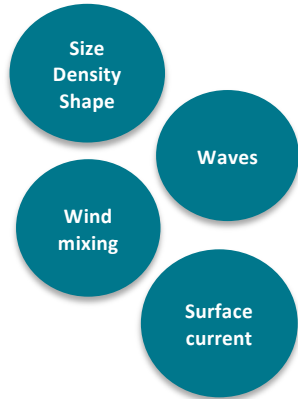
Objective: Develop fate factors for microplastics emitted to the marine environment



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(Woods et al., 2021)



Fate framework for microplastics emitted to the marine environment



Degradation

Mechanisms of:



Removal



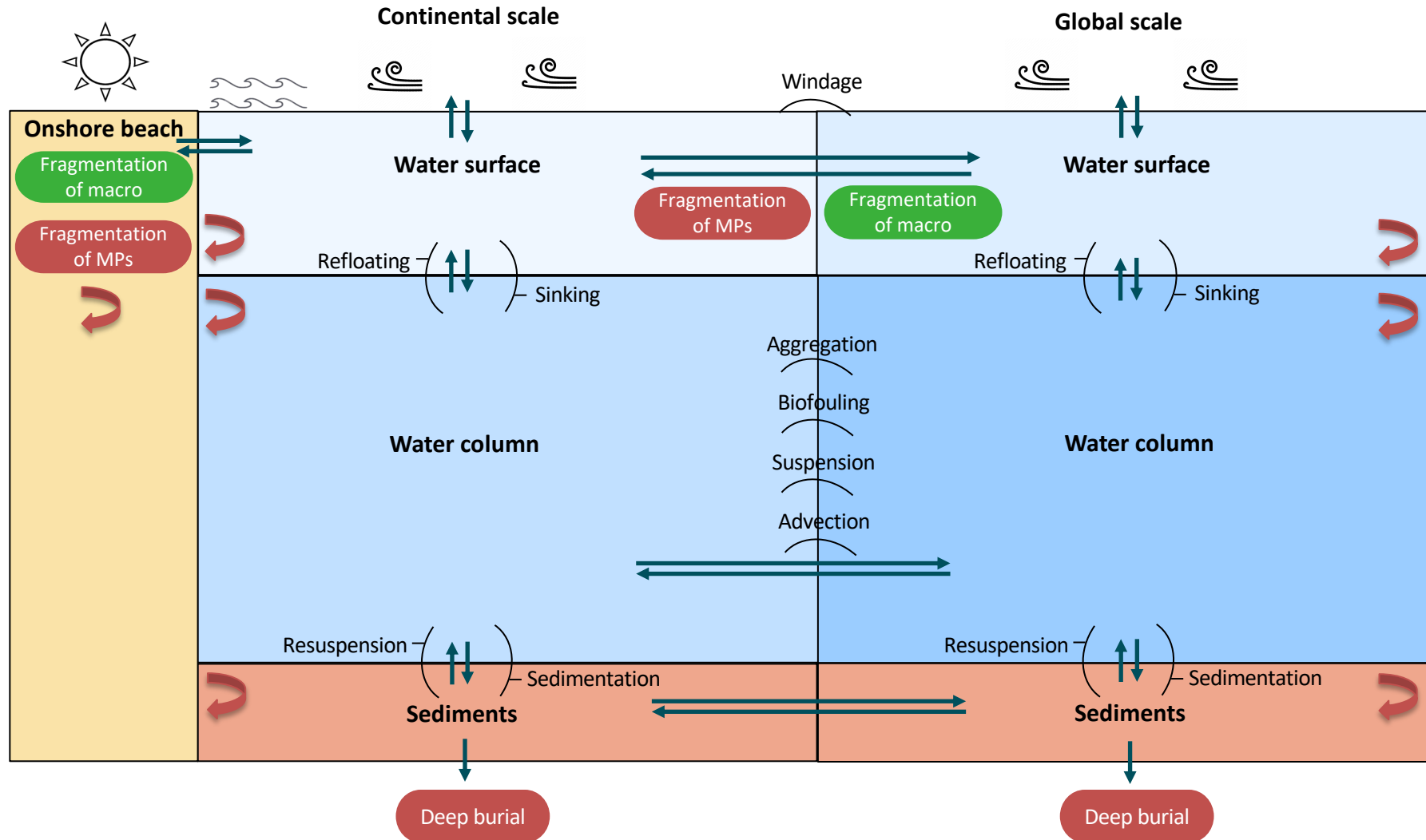
Formation



Transport



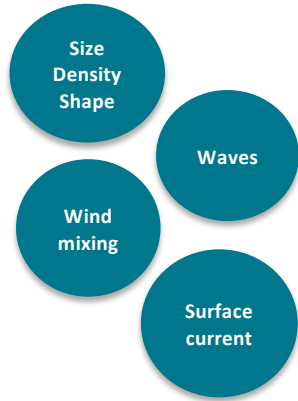
External factors



(Hajjar et al., in preparation)



Fate framework for microplastics emitted to the marine environment



Degradation

Mechanisms of:



Removal



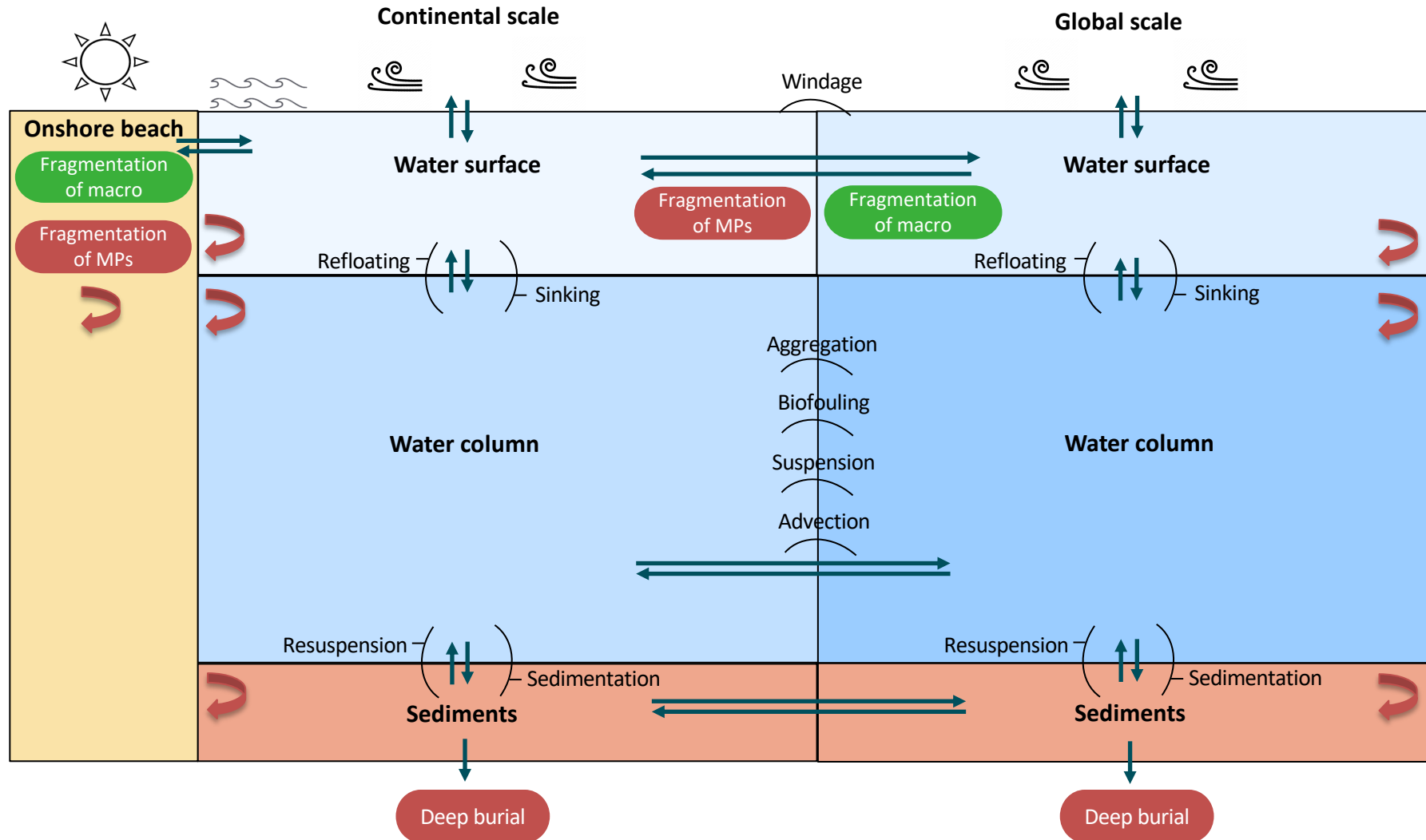
Formation



Transport



External factors



(Hajjar et al., in preparation)



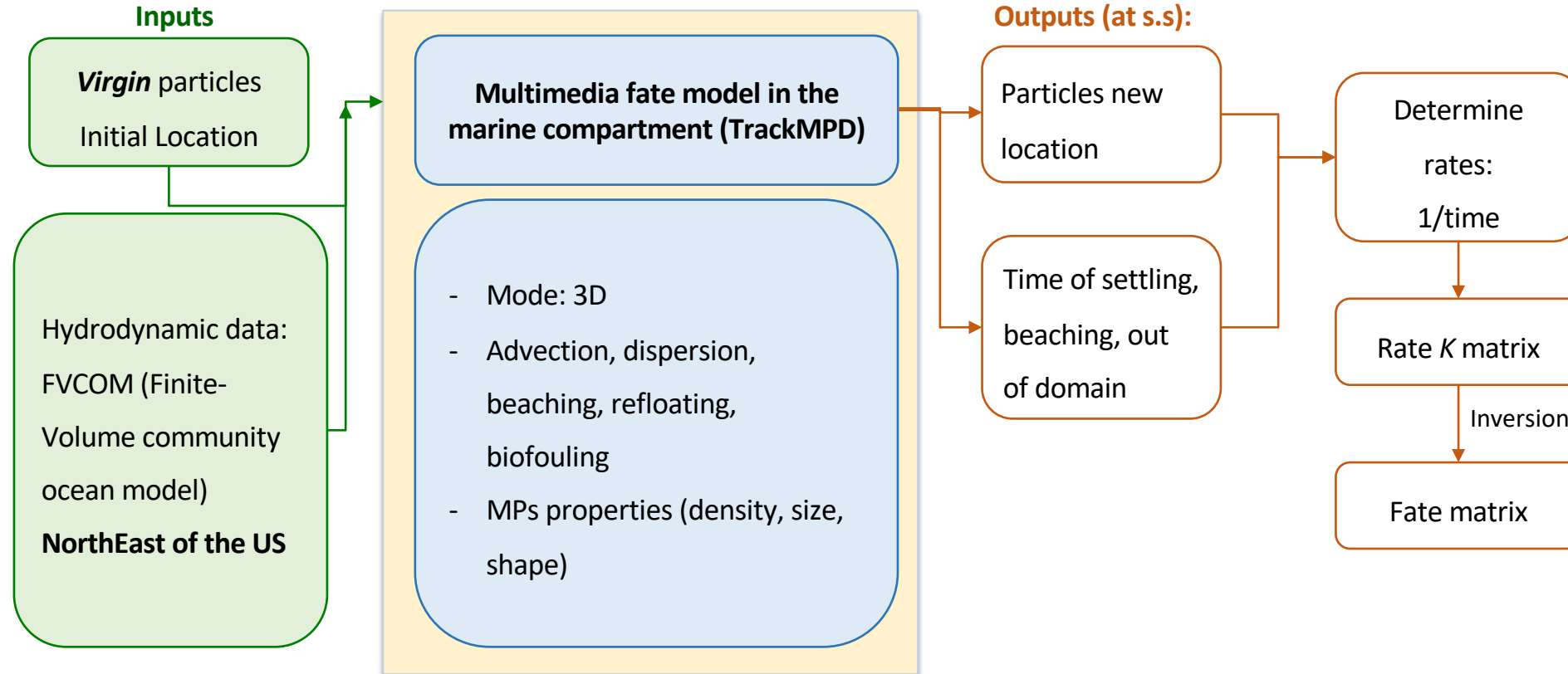
Methodology

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Methodology:

Quantifying the fate of microplastics emitted in the marine environment







Methodology:

Quantifying the fate of microplastics emitted in the marine environment

8 variables are tested to determine main parameters and interactions influencing the fate of MPs in the ocean

- 1- Horizontal dispersion
- 2- Vertical dispersion
- 3- Biofouling density
- 4- Biofouling rate
- 5- Water density
- 6- Particle density
- 7- Particle shape
- 8 - Particle size

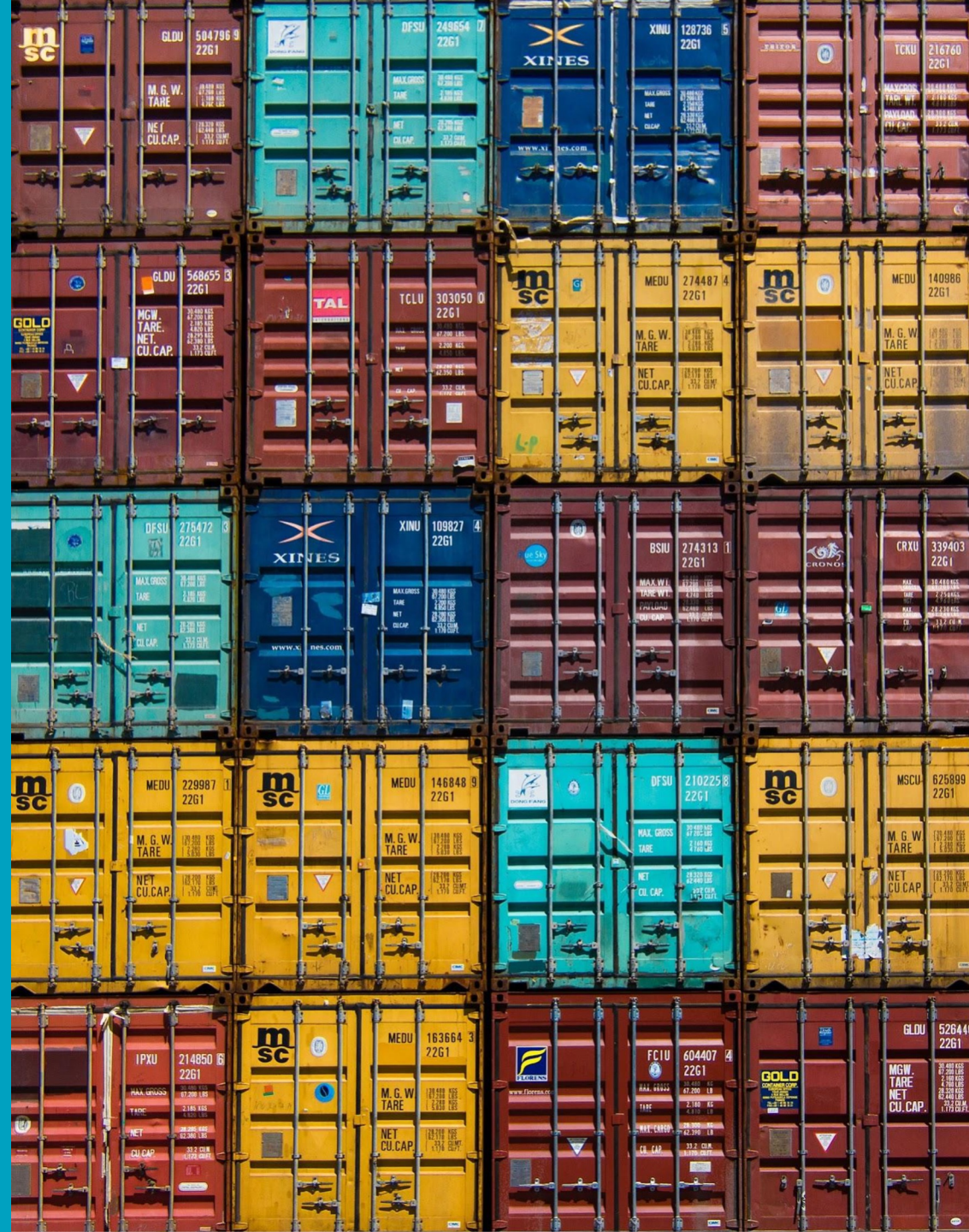
	0.85 g/cm ³	1.51 g/cm ³
	Sphere 	Cylinder 
	1 μm	5 mm

- [Average degradation rates \(slow, fast\)](#)
- [Sediment burial rates \(literature\)](#)



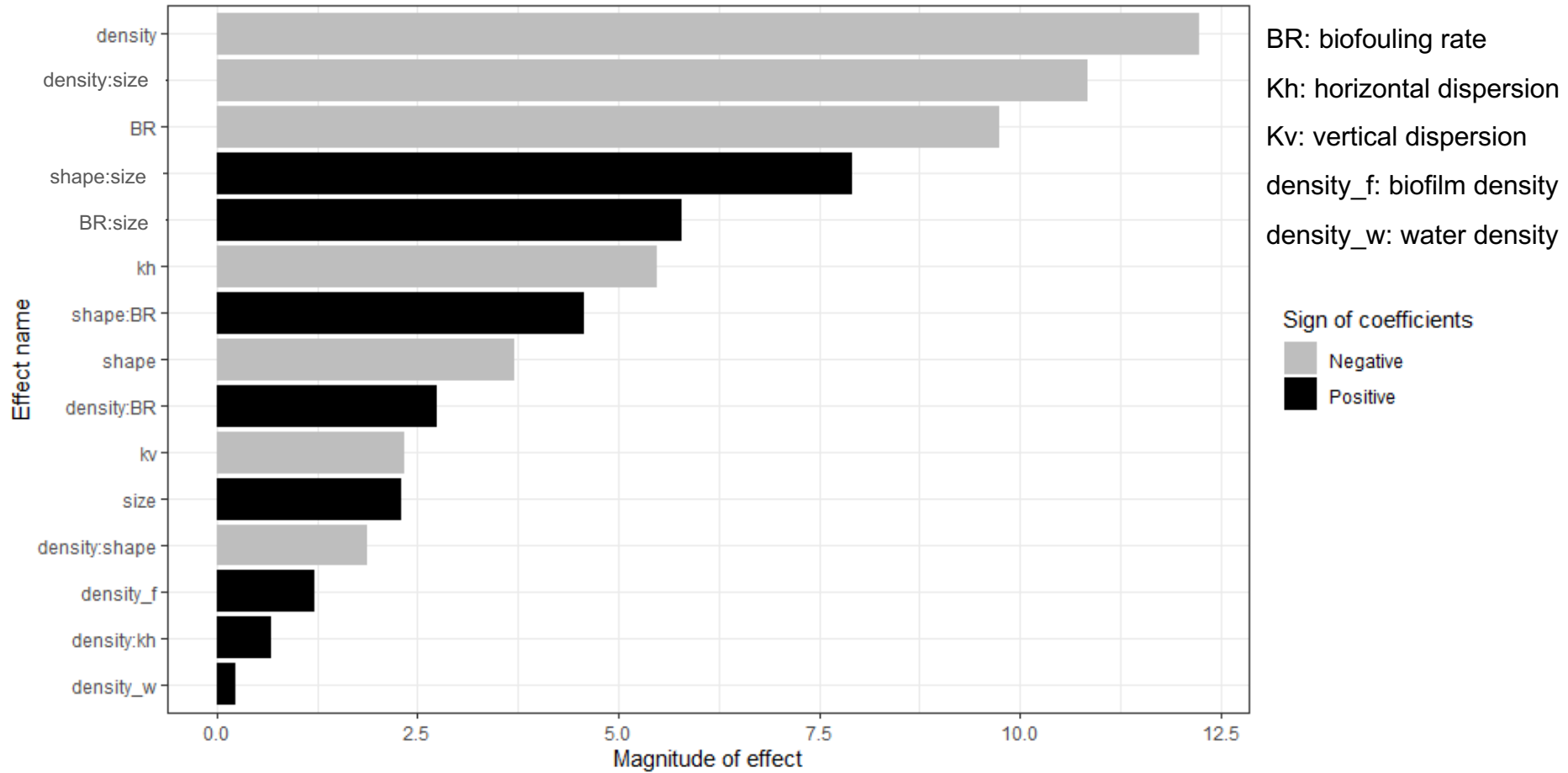
Preliminary Results

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Results:

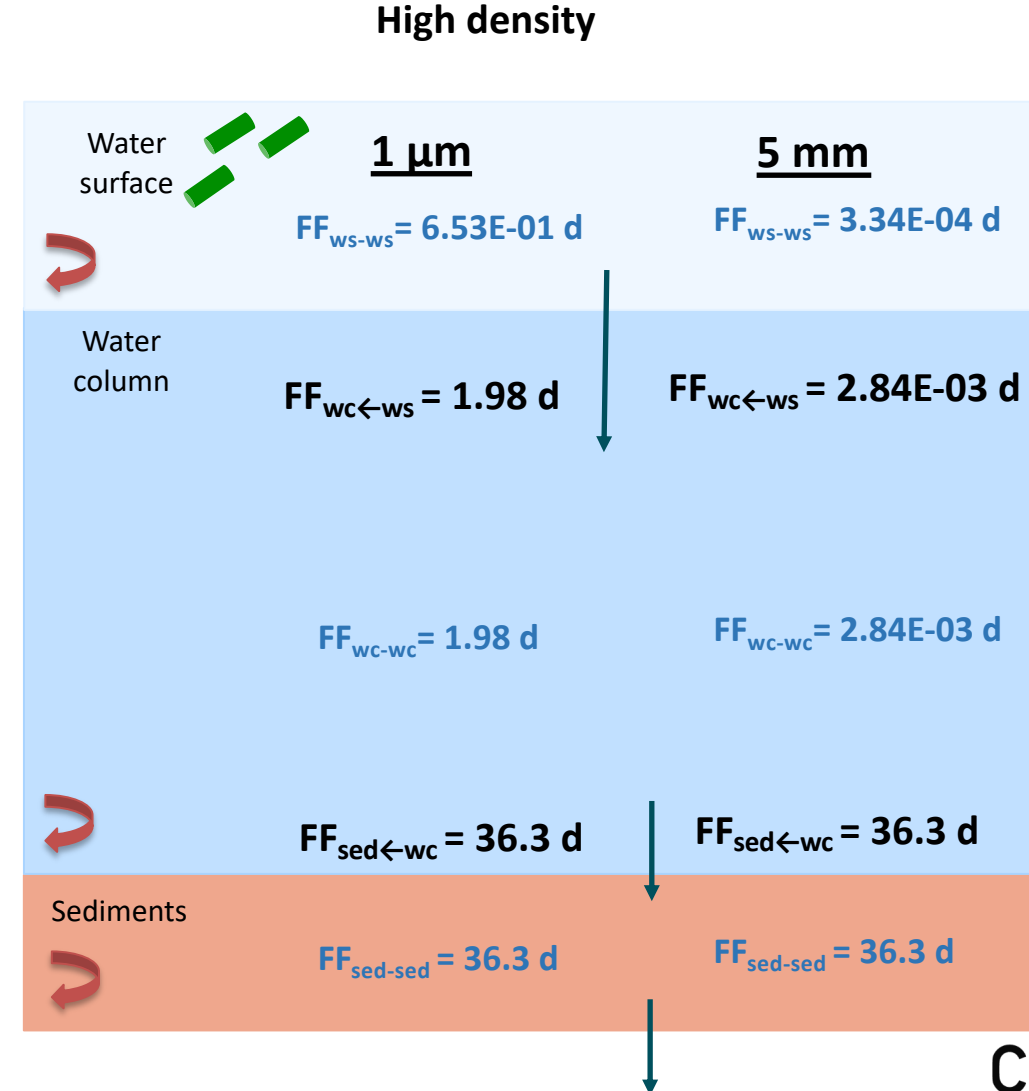
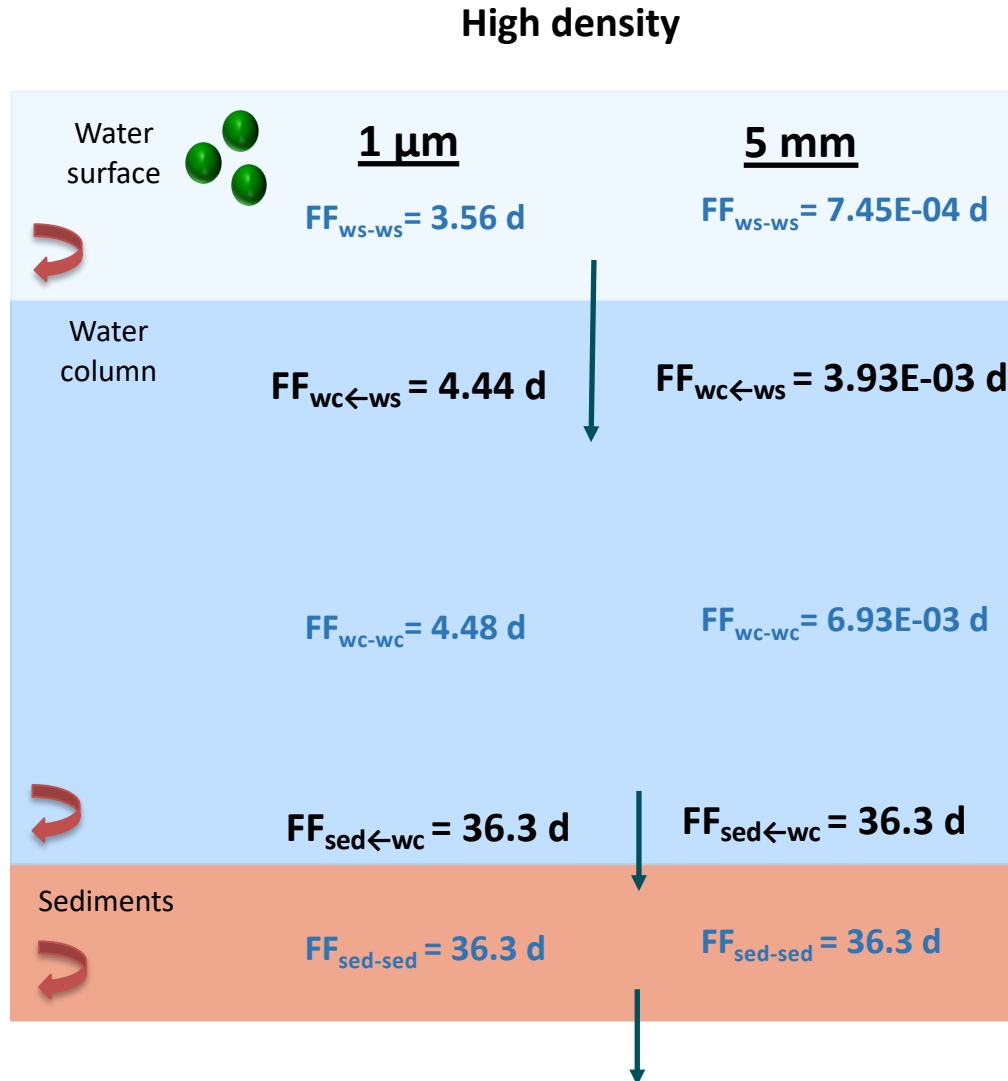
Parameters and interactions mostly influencing the fate of microplastics



Results: Fate factors for microplastics emitted in the marine environment



High density

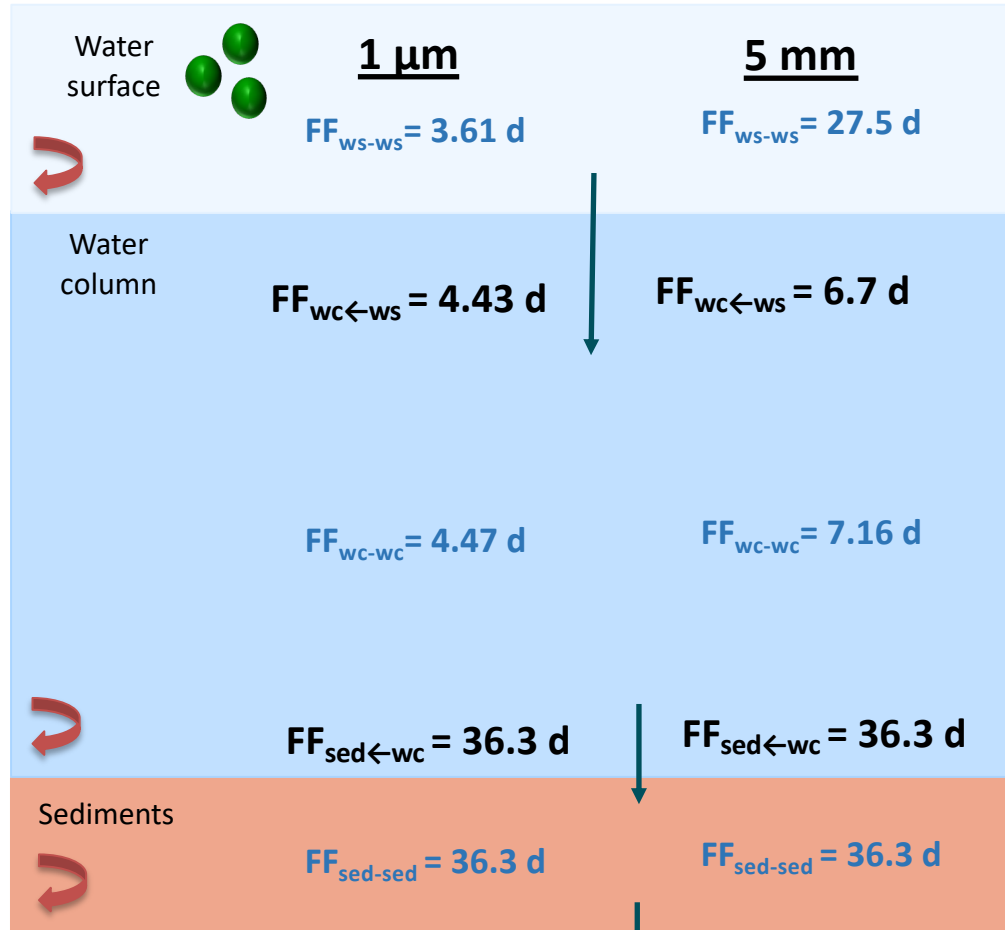


Results: Fate factors for microplastics emitted in the marine environment

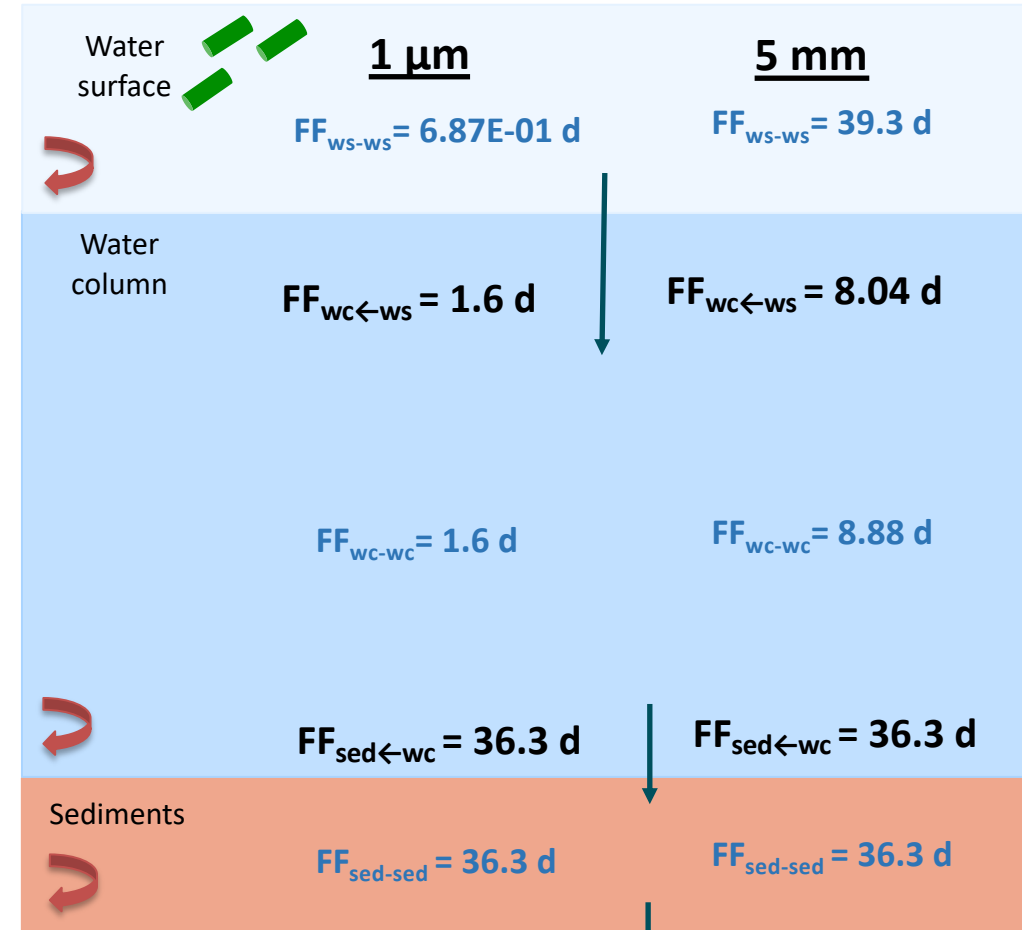


Low density

Low density

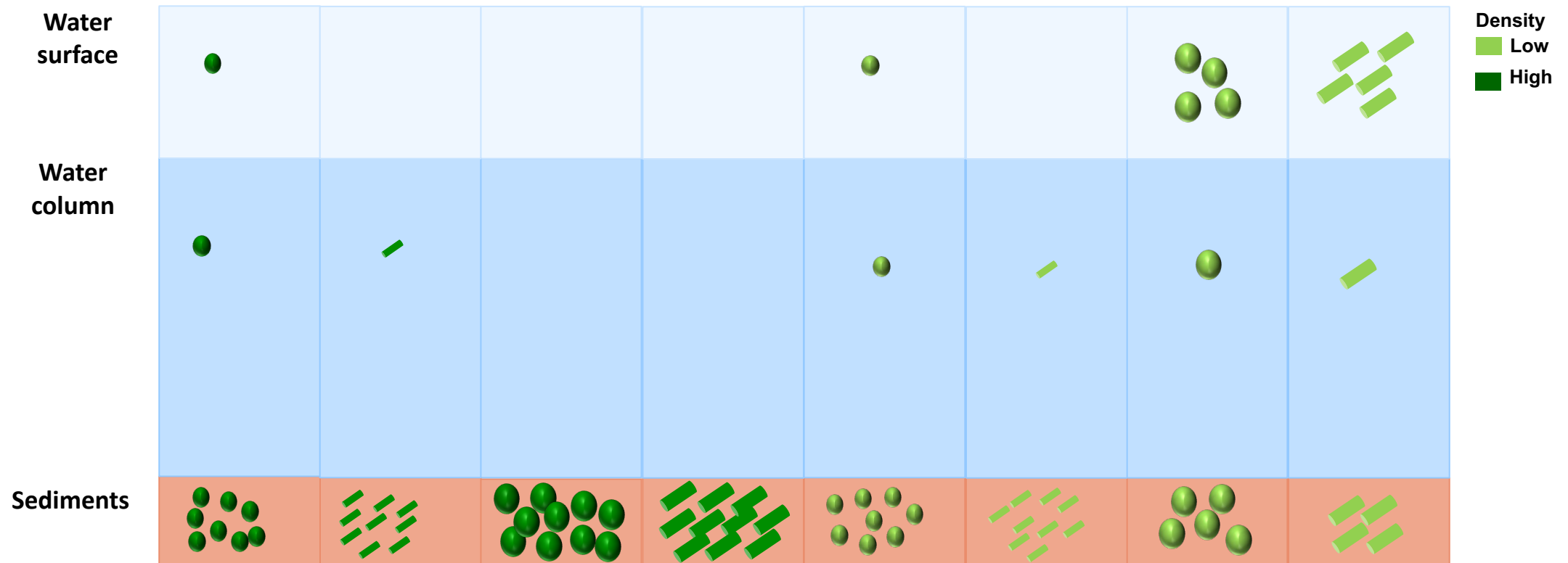


Low density



Results: Mass repartition

MPs emissions



(Hajjar et al., in preparation)



Conclusion and future steps



Conclusion

- Marine properties (water currents, BR, etc.) influence the fate of MPs
- Final fate is mostly in the sediments (FF=36.3d)
- Dominant removal mechanism is the deep burial in sediments
- Physical properties of MPs have great influence on their fate

Future steps

- Refining some of the rates used to develop fate factors
- Sensitivity analysis to test which rate has the most influence on the fate
- Testing in new region to understand the difference of marine hydrodynamics on the fate



Thank you!
Questions?

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