

Effects of contemporary subsurface microplastic pollution on ocean carbon export

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1 The impact of microplastics on carbon export to deep ocean

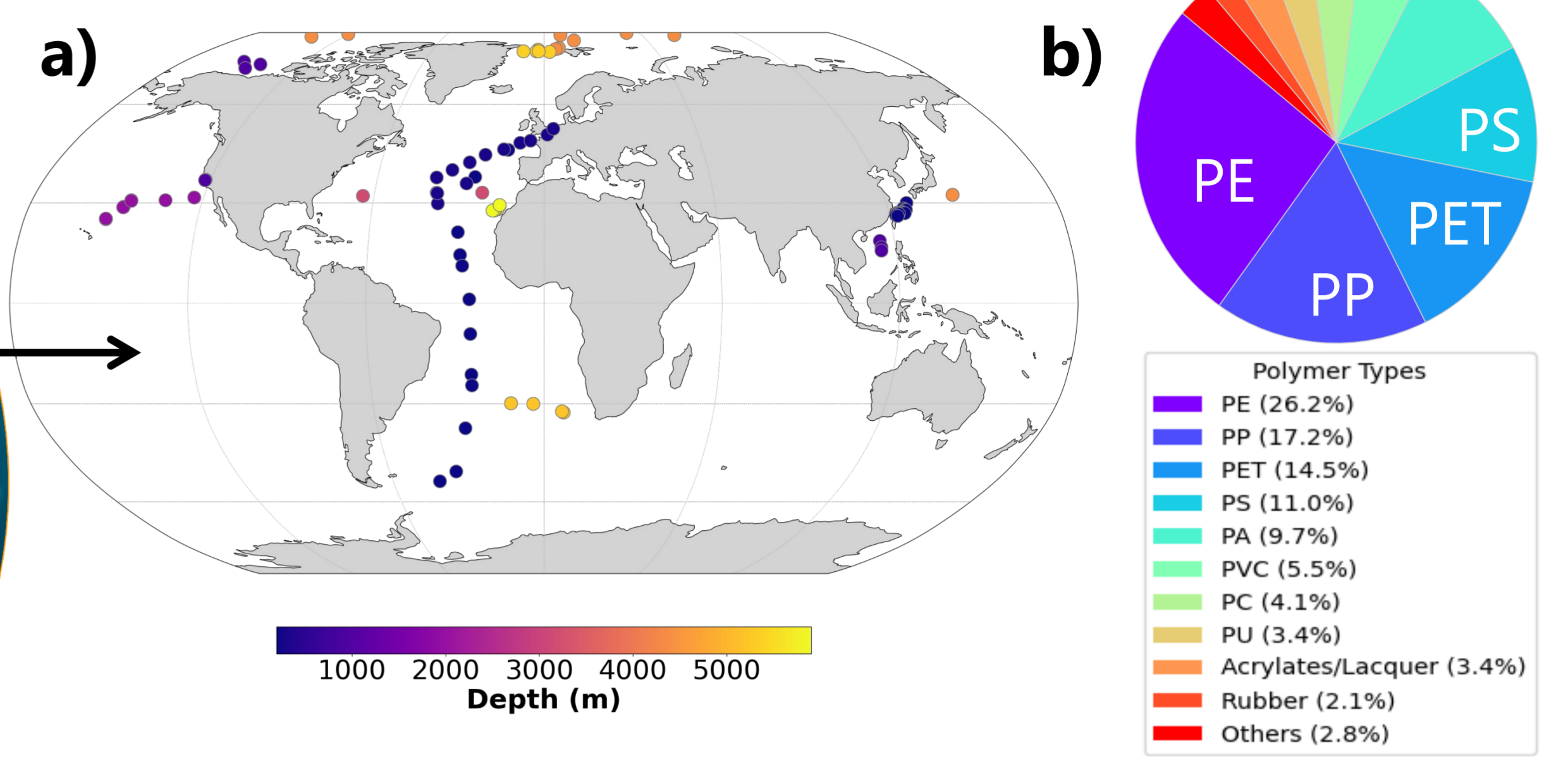
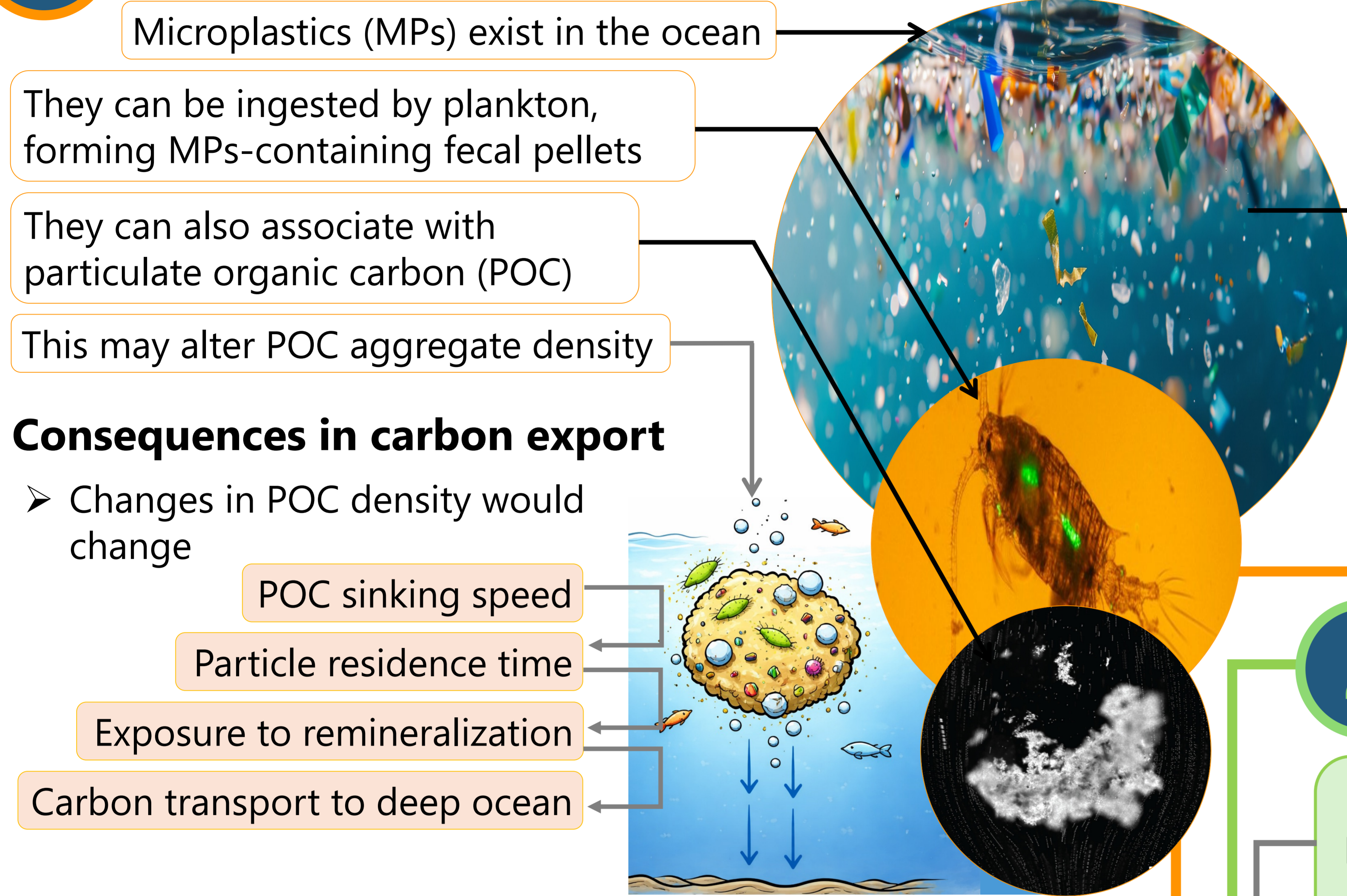
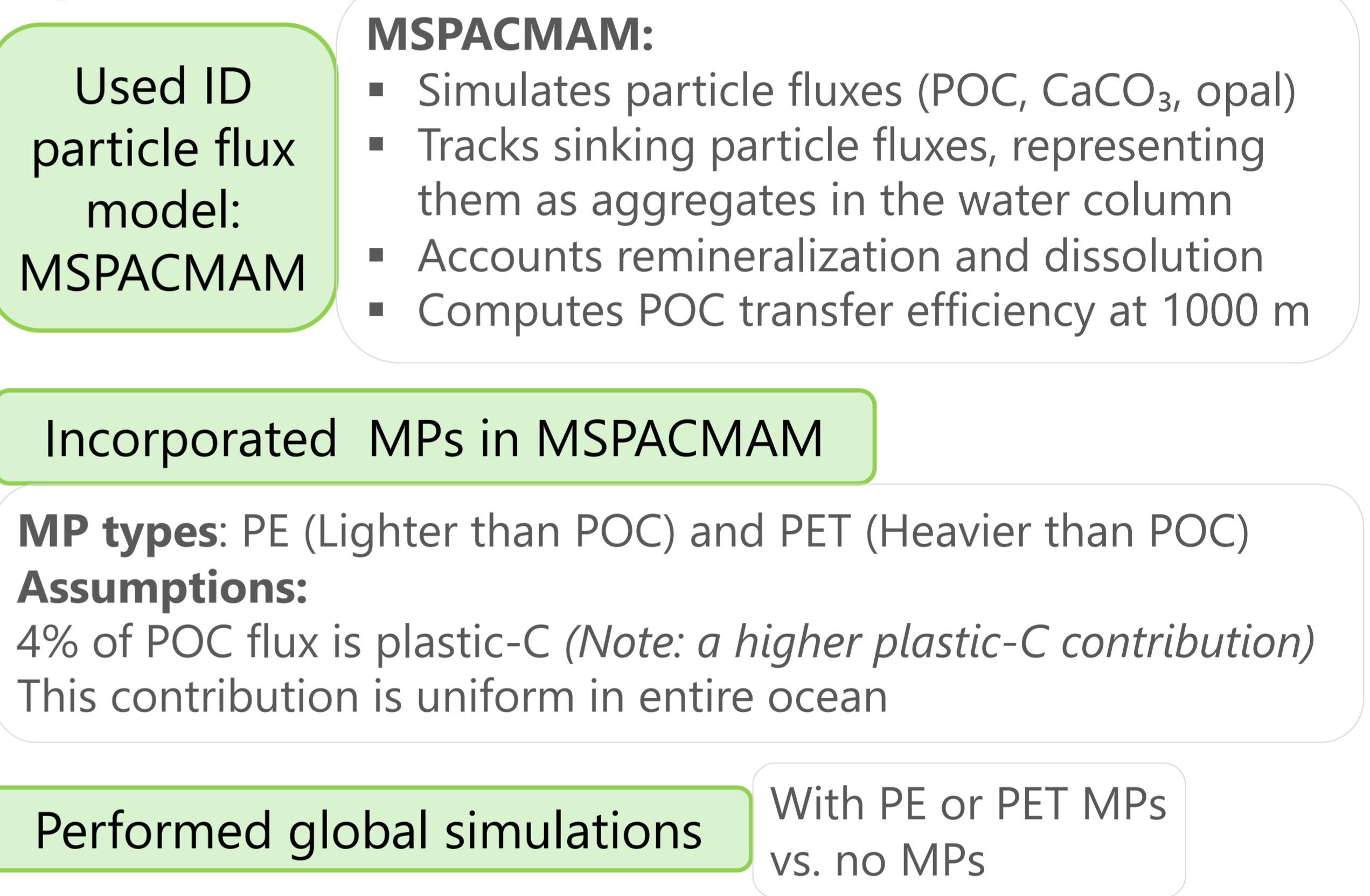


Figure 1: **a)** Global distribution of MP sampling sites in the ocean interior and corresponding depths (100–6000 m). **b)** Dominant polymer types identified in MP samples from the ocean interior

However, the impact of MP pollution on deep-ocean POC transport and long-term carbon sequestration remains unclear.

MOTIVATION: Assess POC transfer efficiency with MPs

2 Modeling POC export



3 Simulated POC transfer efficiency

Simulated POC transfer efficiencies

Mineral-ballasted POC aggregates: ~5 – 42%

Mineral-ballasted POC + **PET MPs** aggregates : ~4.8 – 41.8%

Mineral-ballasted POC + **PE MPs** aggregates : ~4.4 – 41.5%

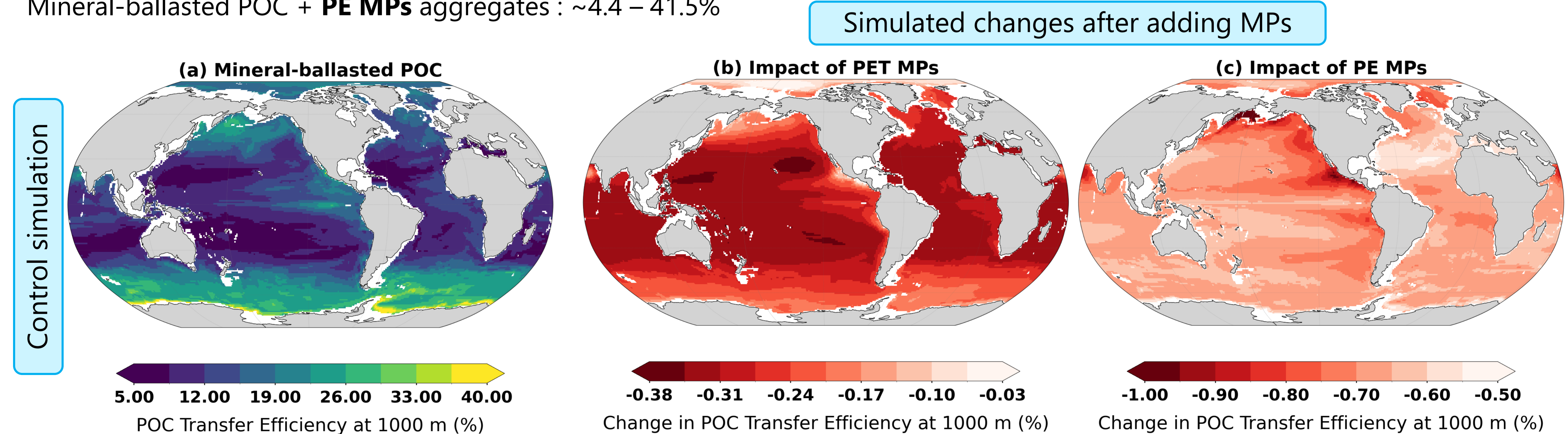


Figure 2: Minor changes in POC transfer efficiencies of mineral ballasted POC aggregates at 1000 m depth after adding PE and PET MPs

After incorporating PET MPs Slightly changed
Maximum decreases by 0.35%
Maximum increases by 0.12%

Global average change in POC transfer efficiency ≈ **-0.12%**

After incorporating PE MPs Slightly changed
Maximum decreases by 3%
Maximum increases by 0.3%

Global average change in POC transfer efficiency ≈ **-1.35%**

4 Key takeaway

Model simulations showed only marginal changes in POC transfer efficiency when MP-C contributed 4% to the total POC flux.

Even at higher plastic-C contributions to POC flux, the impact of MPs on POC export efficiency remains small.

References

- Dinauer, A., and others. 2022. What Controls the Large-Scale Efficiency of Carbon Transfer Through the Ocean's Mesopelagic Zone? Insights From a New, Mechanistic Model (MSPACMAM). *Global Biogeochemical Cycles* 36(10), e2021GB007131.
- Galgani, L., and others. 2022. Hitchhiking into the Deep: How Microplastic Particles are Exported through the Biological Carbon Pump in the North Atlantic Ocean. *Environmental Science & Technology* 56(22), 15638-15649.

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