Passive sampling for measuring contaminant fluxes in sediment

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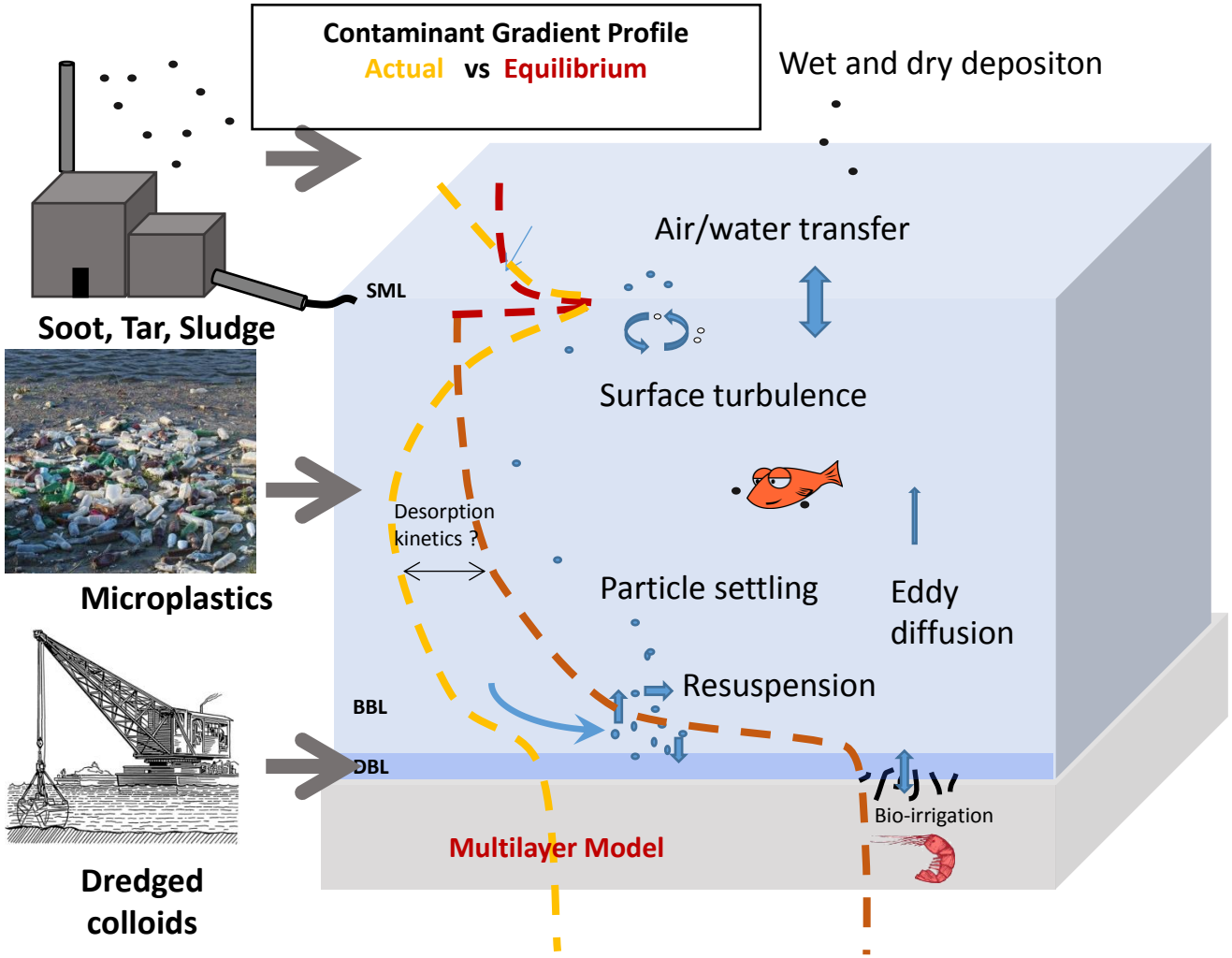
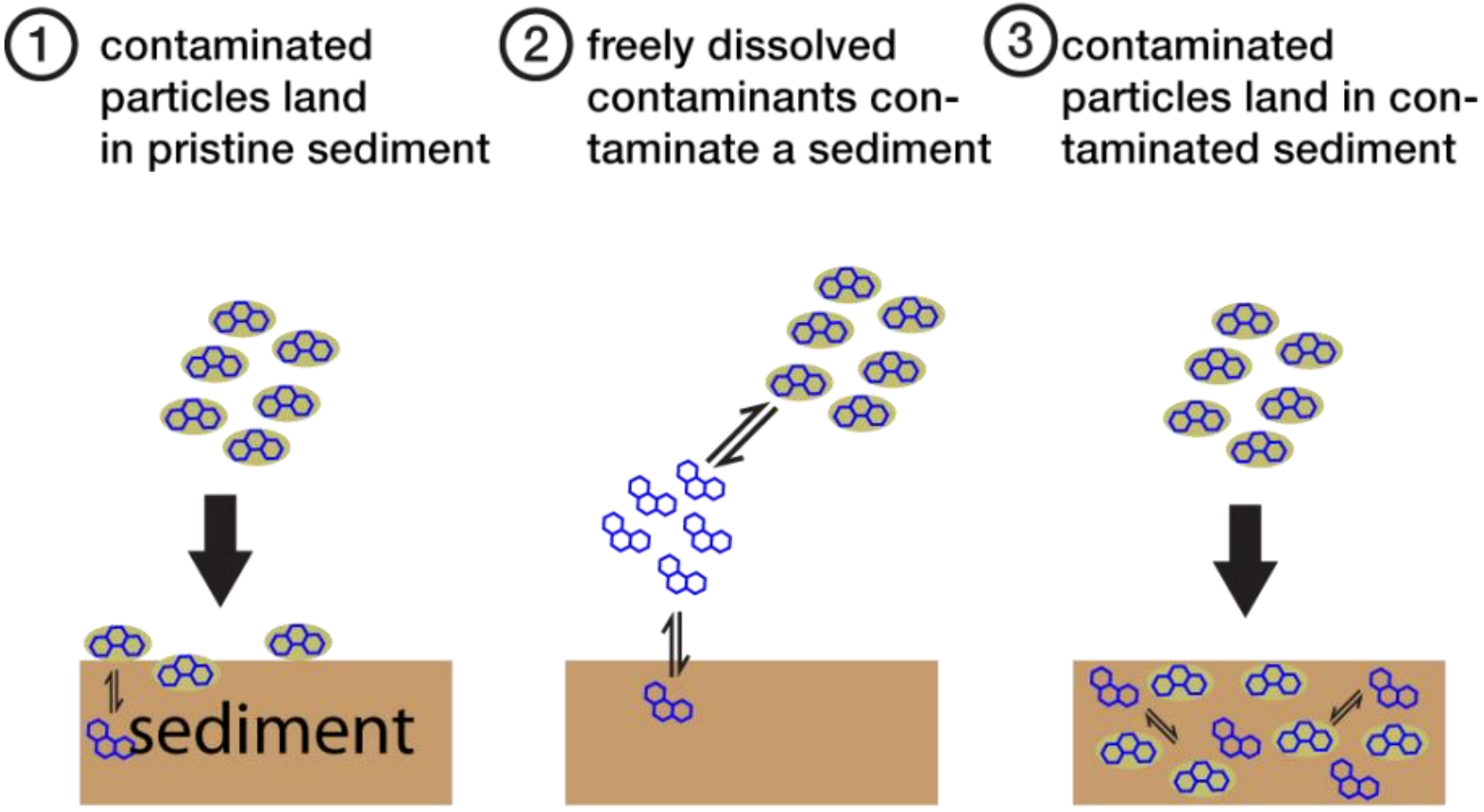
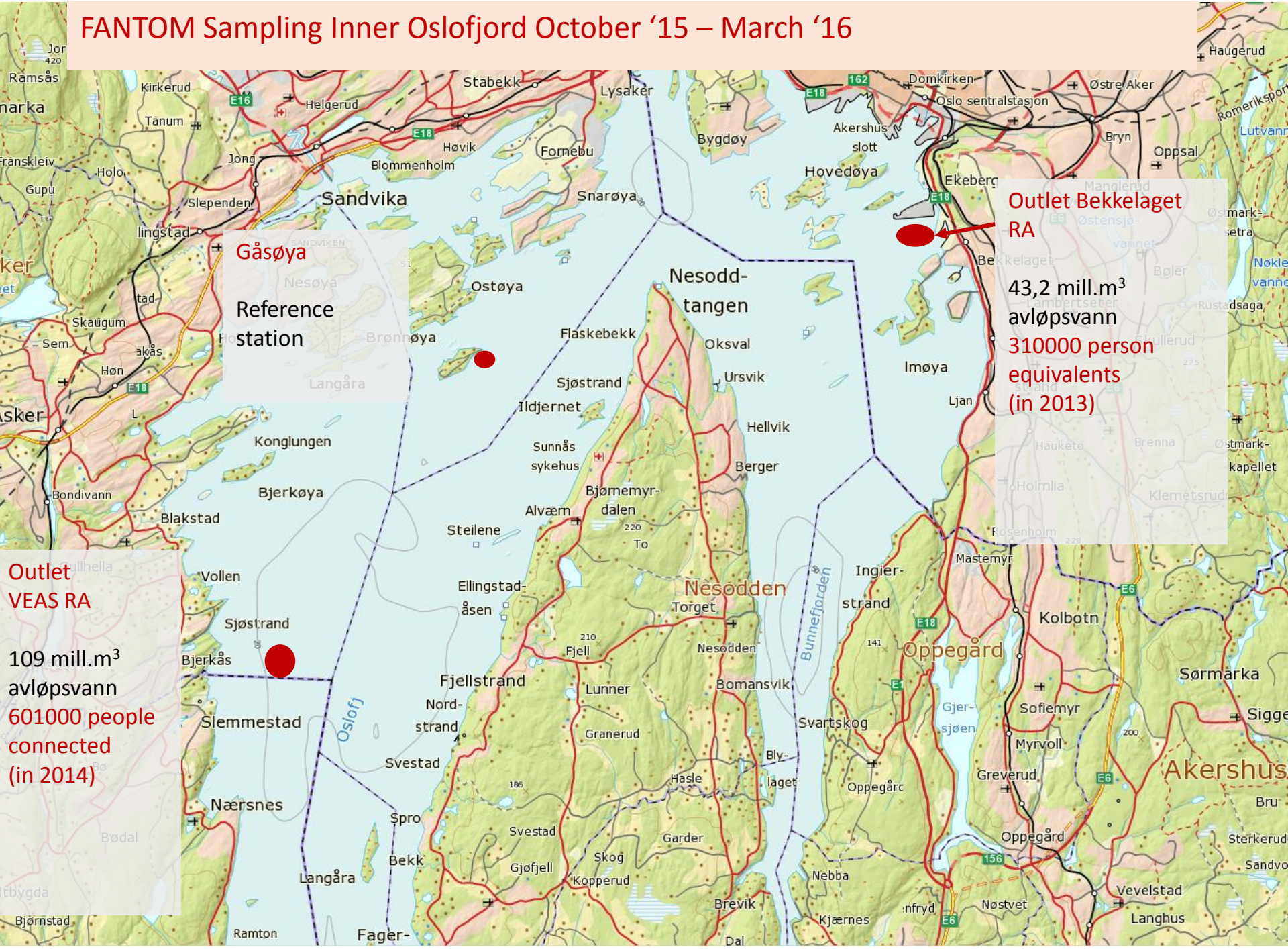
FANTOM: Fate and threat of man-made polluted particles



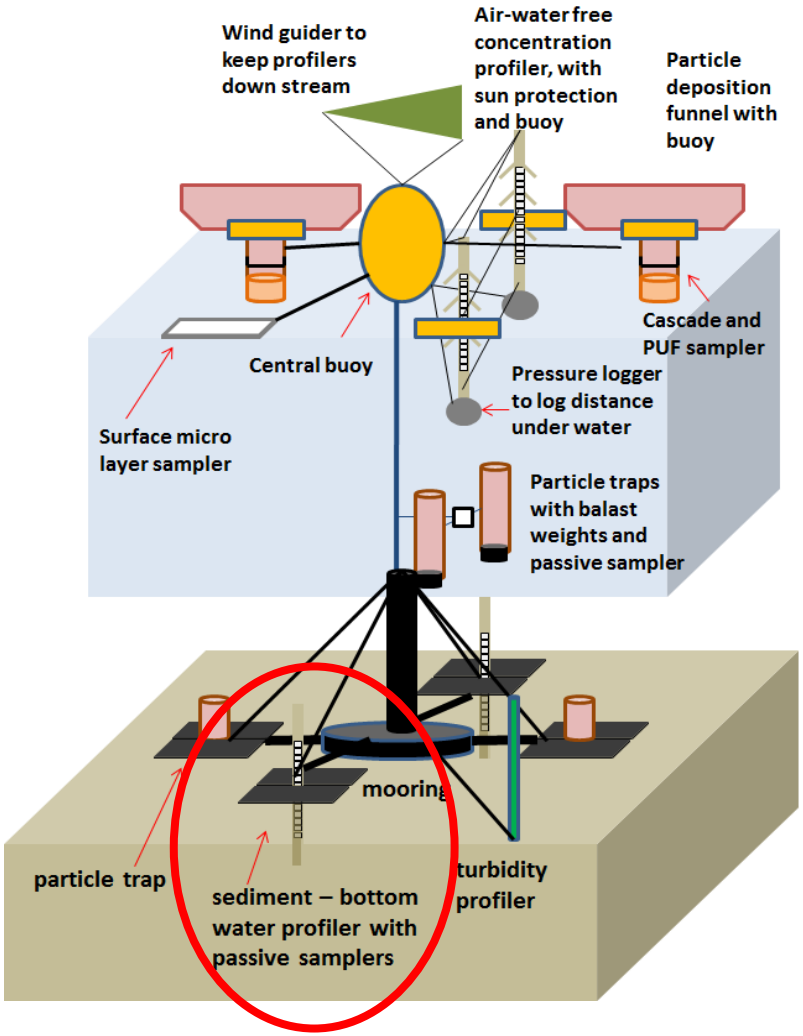
The transport of hydrophobic organic contaminants in polluted environments is often controlled by the man-made particles that introduce them, rather than natural sorbing phases.


1 contaminated particles land in pristine sediment
2 freely dissolved contaminants contaminate a sediment
3 contaminated particles land in contaminated sediment
sediment

FANTOM Sampling Inner Oslofjord October ‘15 – March ‘16



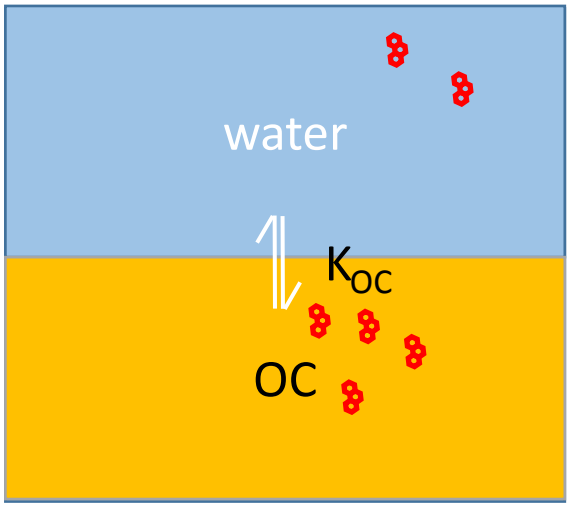
Sampling over the entire sediment-water-air column

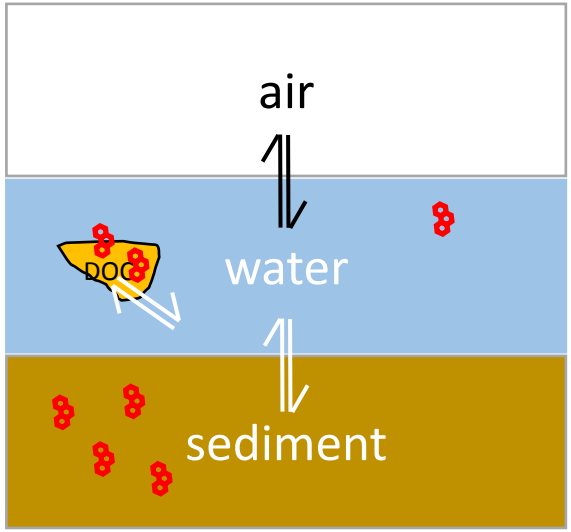


Passive vs. active sampling

Passive sampling is directed at measuring *freely dissolved concentrations - C_{free}*

Only freely dissolved molecules can partition between phases!





OC…organic carbon

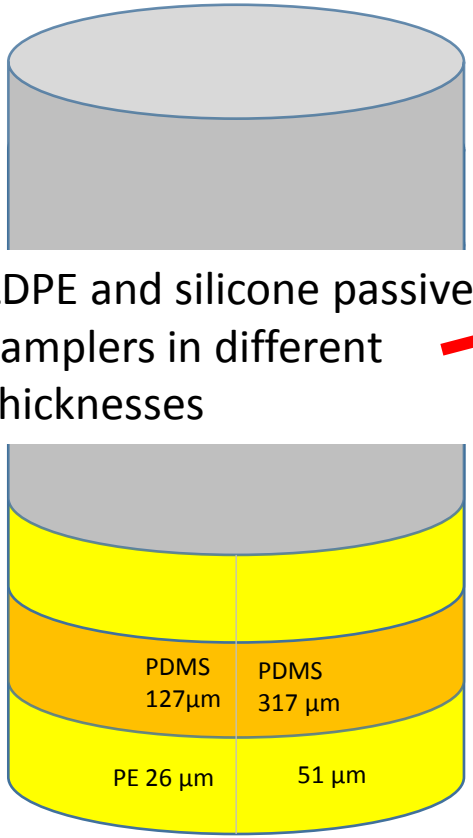
$$C_{total} = \underbrace{C_{free} + C_{bound}}_{\text{«speciation»}}$$

The first sampling campaign October 2015: Outlets of the WWTPs at Bekkelaget and VEAS in the Oslofjord

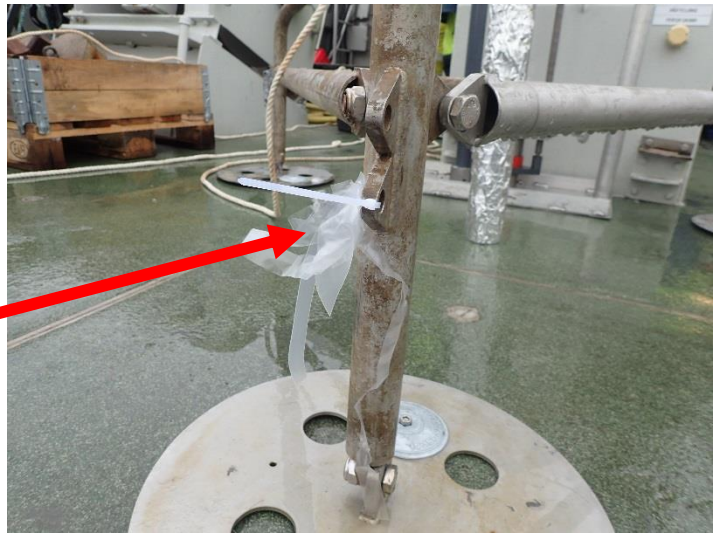
Norwegian Geotechnical Institute

Project FANTOM: Deployment of Sediment-Water Interface Profiler Inner Oslofjord

October 19, 2015



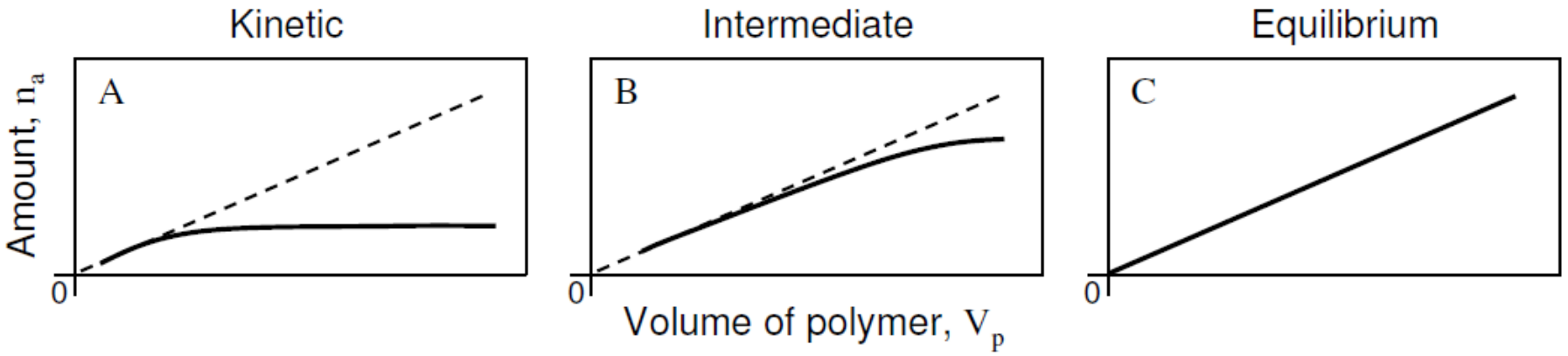
LDPE and silicone passive samplers in different thicknesses



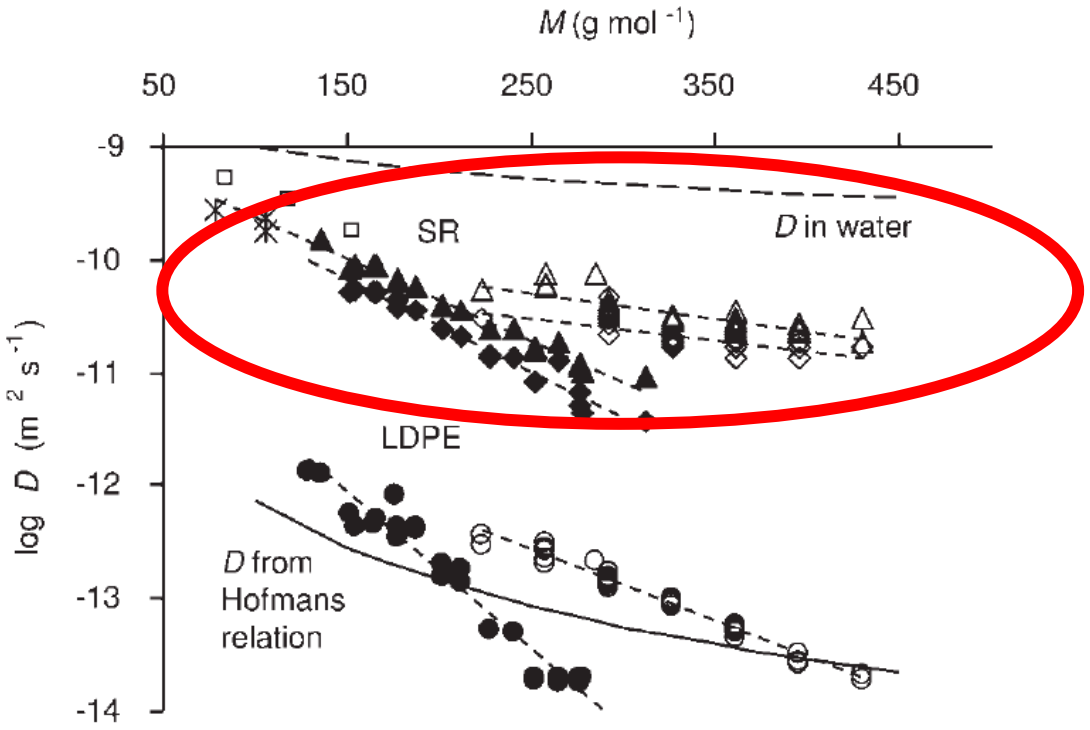
Chemistry Central Journal 2008, **2**:8

http://journal.chemistrycentral.com/content/2/1/8

Reichenberg et al. 2008



New silicone passive sampling material: cross-validation of passive sampler measurements



diffusion coefficients ca. 100-fold larger in silicone compared to LDPE!

Rusina et al. 2010, Journal of Appl Pol Sci vol. 116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OCEANTEST EQUIPMENT

New silicone passive sampling material: cross-validation of passive sampler measurements

$C_{free} = C_{pol} / K_{pol:w}$

(1) Consistency check on the basis of C_{free}

$C_{free} = C_{PE} / K_{PE:w}$ and

$C_{free} = C_{PDMS} / K_{PDMS:w}$

(2) Consistency check on the basis of $K_{pol:pol}$

$C_{PDMS} / C_{PE} = K_{PDMS:PE}$

Sediment cores

VEAS

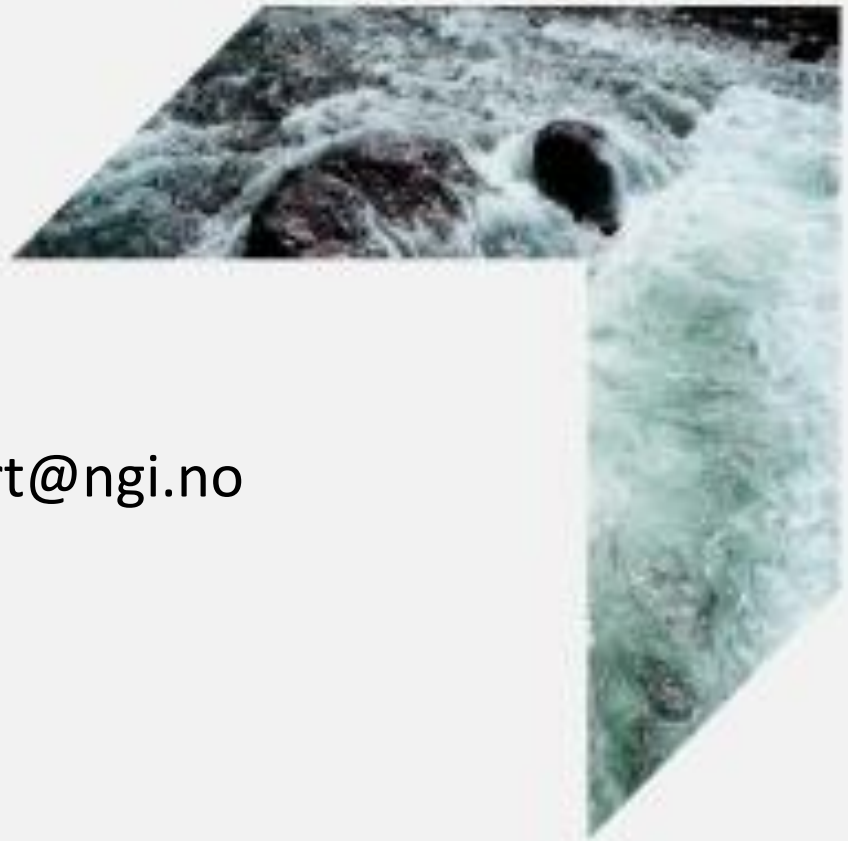
Bekkelaget Gåsøya

Microplastic sampling

Microplastic = plastic particles < 1mm

no standardized methods for collection;
so far mainly collected from surface water;
estimated 1-10 mg/kg sediment

Thank you for your attention.



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