

From the environment to the food web: characterization and simultaneous quantification of small microplastics, plastic additives, and other microlitter components

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Bozen, 17/10/2024



Agenda

- i. Microplastics' Lab
- ii. Microplastics and Microlitter
- iii. Pretreatment and Analysis
- iv. Case Study
- v. Take-Home Messages



EFRE1018
PlasticFree

Bozen 17/10/2024

Microplastics' lab – Institute of Polar Sciences, CNR-ISP

And DAIS, Università Ca' Foscari



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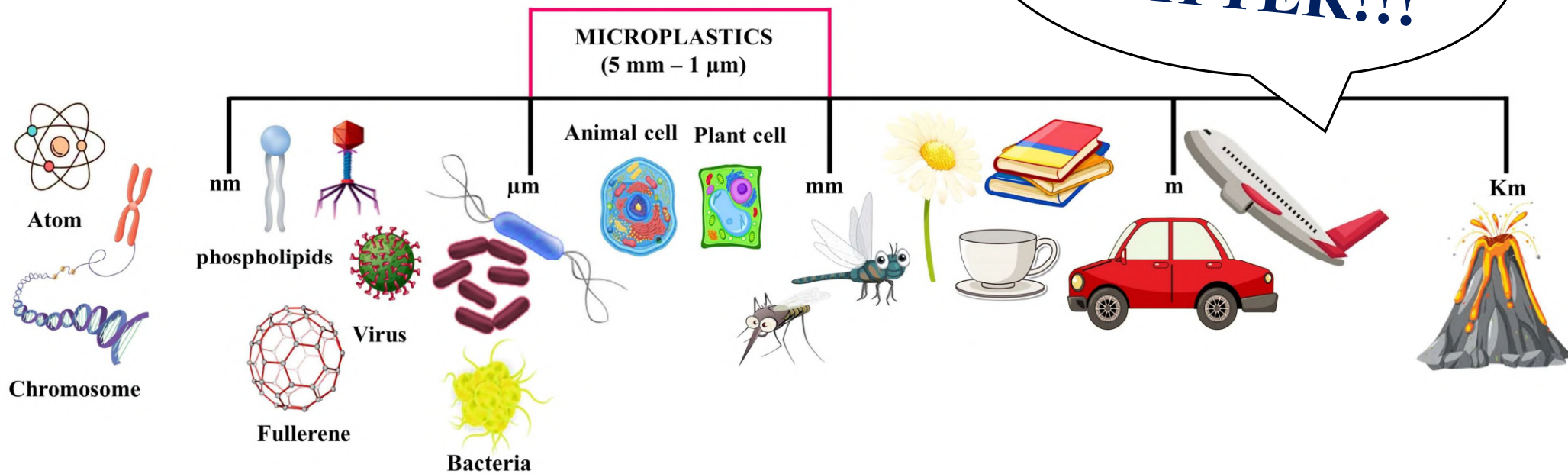


**What do we know
about microplastics?**



2019: Microplastics are solid plastic particles composed of mixtures of polymers and functional additives.

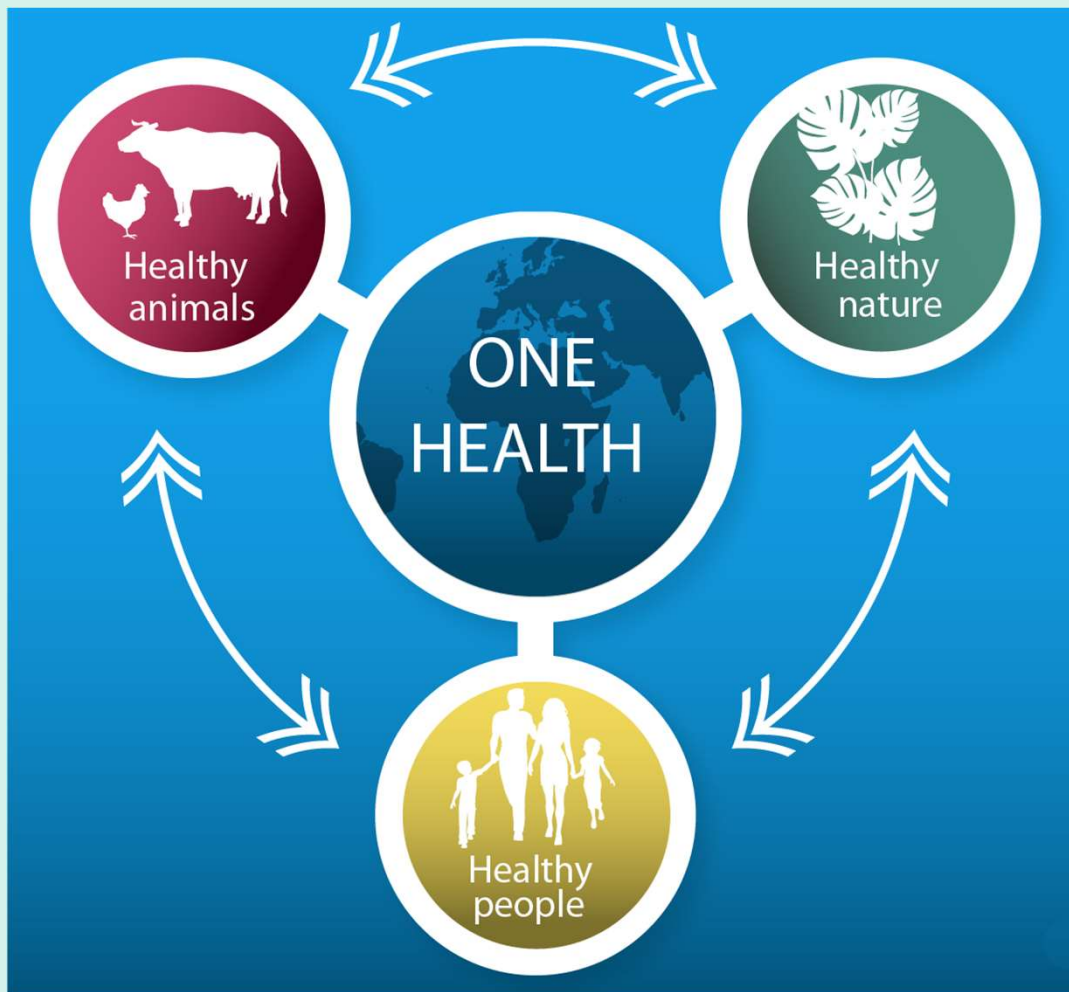
**SIZES
MATTER!!!**



Modified from the book «Mostri di Plastica: come le microplastiche stanno cambiando l'ambiente a livello globale. Dr. Fabiana Corami e Dr. Beatrice Rosso, ed. Phoresta

ii. Microplastics and microlitter

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Why is the SMPs' analysis crucial?

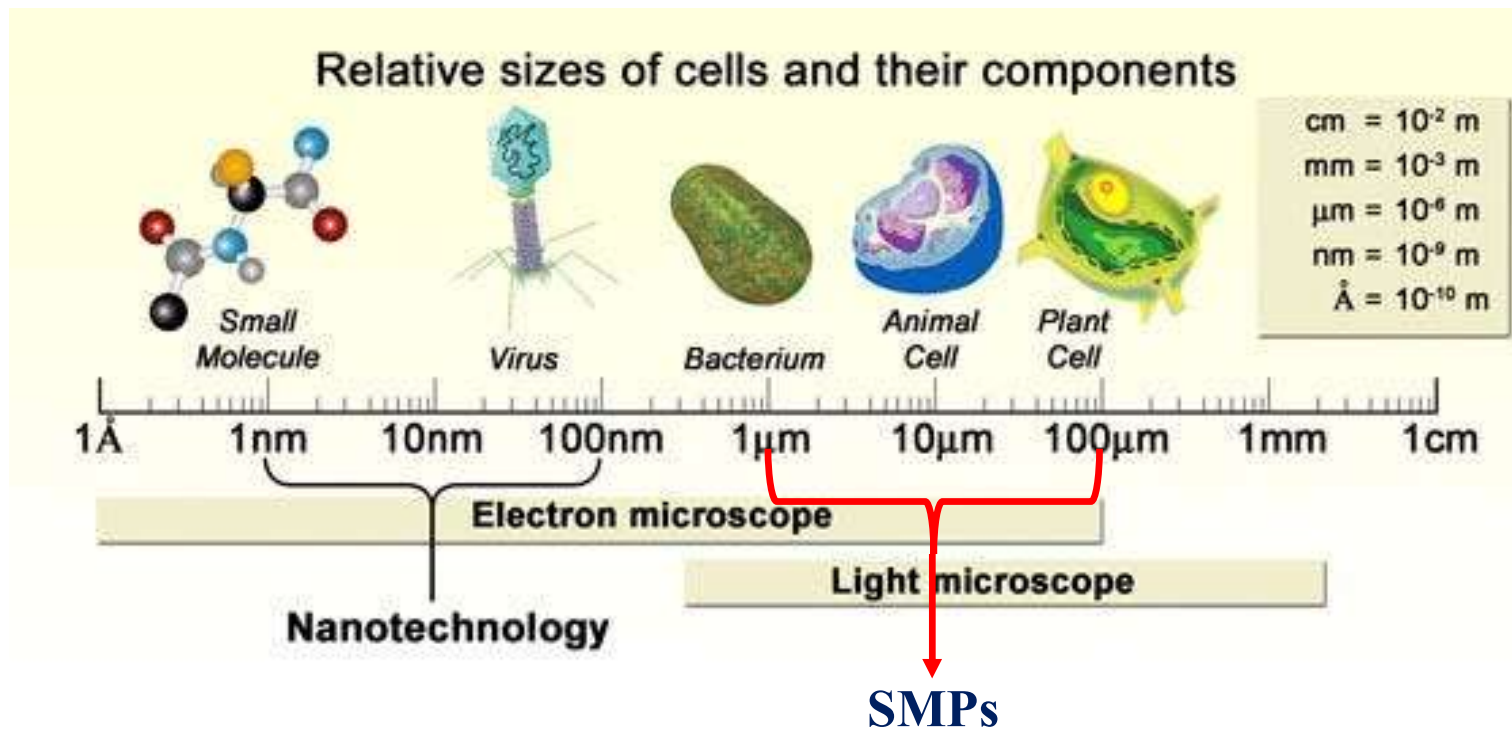
ONE HEALTH APPROACH

ii. Microplastics and microlitter

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Why is the SMPs' analysis crucial?



How many plastic
polymers?



What about the
tirewear particles?

Journals & Books



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Environmental Pollution

Volume 326, 1 June 2023, 121511



Identification and quantification of tire wear particles by employing different cross-validation techniques: FTIR-ATR Micro-FTIR, Pyr-GC/MS, and SEM ☆

Beatrice Rosso^a, Elena Gregoris^{a, b}, Lucio Littì^c, Federico Zorzi^{c, d},
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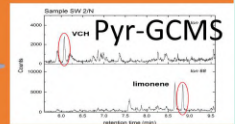
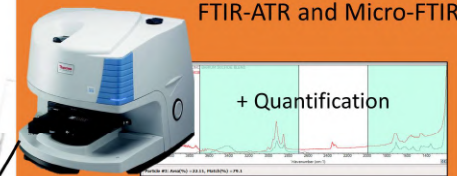


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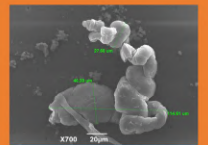
Cross-validation techniques for the chemical identification of TWP



FTIR-ATR and Micro-FTIR



SEM



ii. Microplastics and microlitter

Renewable sources (Biobased)

**Not
biodegradable**

Polymers from renewable
sources, e.g., PE, PET, PA,
PTT, bio-PP
**COMPOSTABLE, NOT
BIODEGRADABLE**

Polymers from renewable
sources, e.g., PLA, PHA, PBS,
PHB, PGA, mix of starches
biodegradable

Biodegradable

**Conventional polymers
PE, PP, PET, PS, PVC**

**BIODEGRADABLE
BIOPOLYMERS, e.g.,
PBAT, PCL, PBS, PVOH,
PVA**

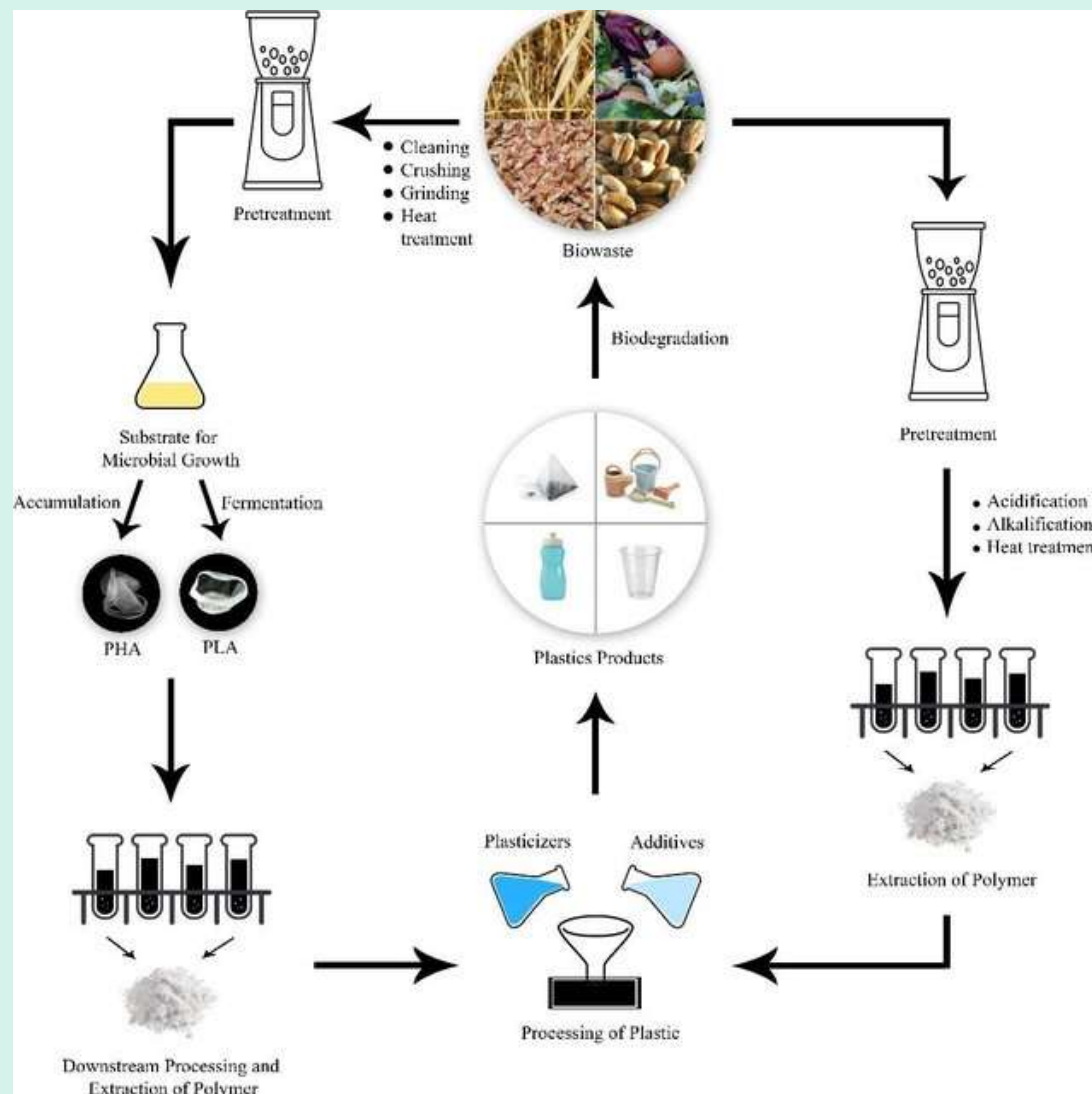
Fossils sources (not renewable)

From the book «Mostri di Plastica: come le
microplastiche stanno cambiando
l'ambiente a livello globale. Dr. Fabiana
Corami e Dr. Beatrice Rosso, ed. Phoresta

**What about the
Microlitter
components?**

sebacates
polyamide
nylon
laurates
plasticizers
antioxidants
sea silk
antistatic agents
vulcanizers
adipates
ftalates
curing agents
flame retardants
pigments
lubricants
bisphenols
retrocare
vanox
plastic additives
extruders
polyols
antistatic agents

From George N. et al., 2021,
Journal of Applied Biotechnology Reports
10.30491/JABR.2021.259403.1318



Research field

Biota



Scientific Campus



Svalbard Islands



Gruvebadet



Venice Lagoon

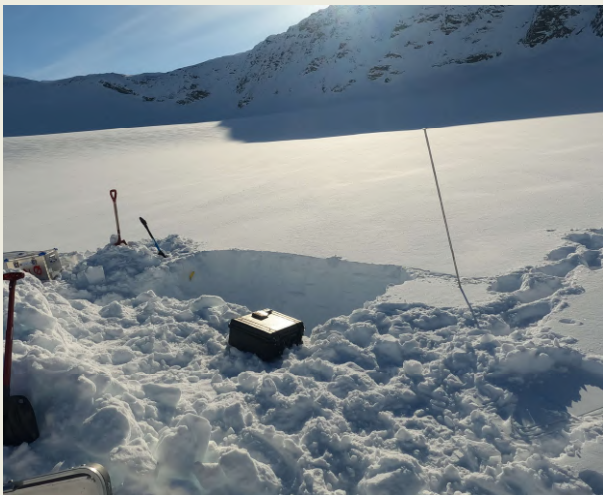


Highways



**Different environmental
matrices
Different species of
organisms**

How to sample snow for microplastics analysis?



FIELD BLANKS!

iii. Pretreatment and analysis

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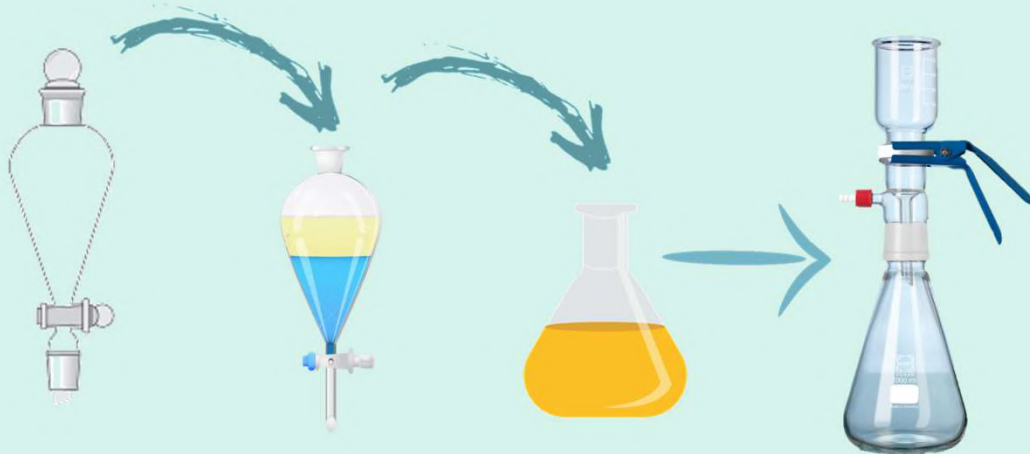


QA/QC
Sampling
Materials
Contamination
Blanks
Reagents
Temperature
Yield
STANDARDS
CRMs

iii. Pretreatment and analysis

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Oleoextraction



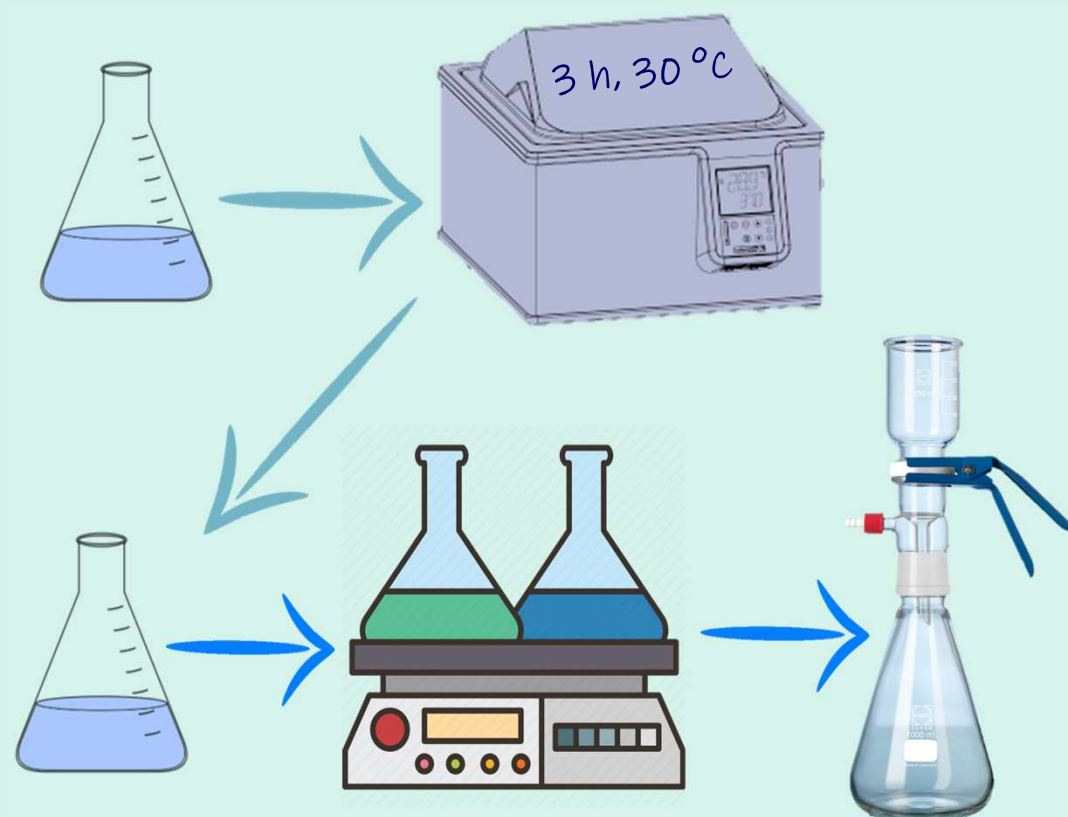
From Corami et al., 2021, STOTEN, 10.1016/j.scitotenv.2021.148937





Pseudodigestion

Pretreatment method developed in Corami et al., Mar. Poll. Bull., 160, 2020

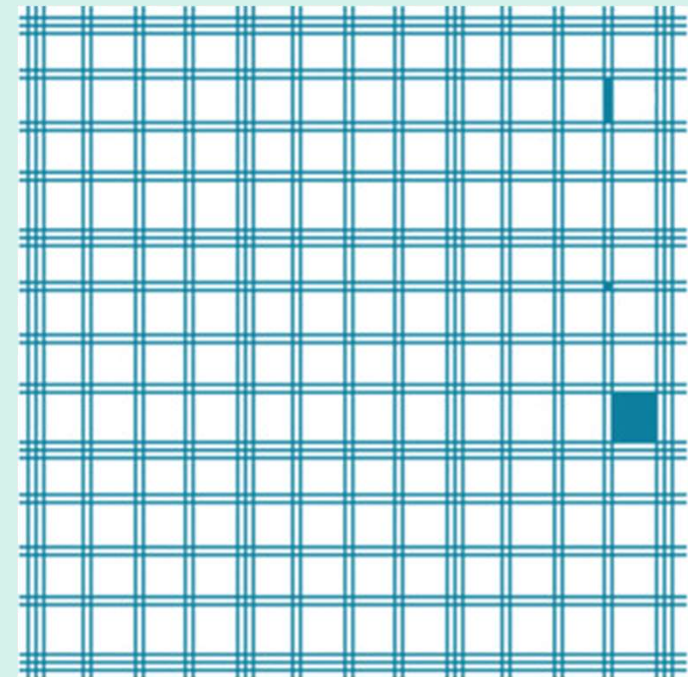
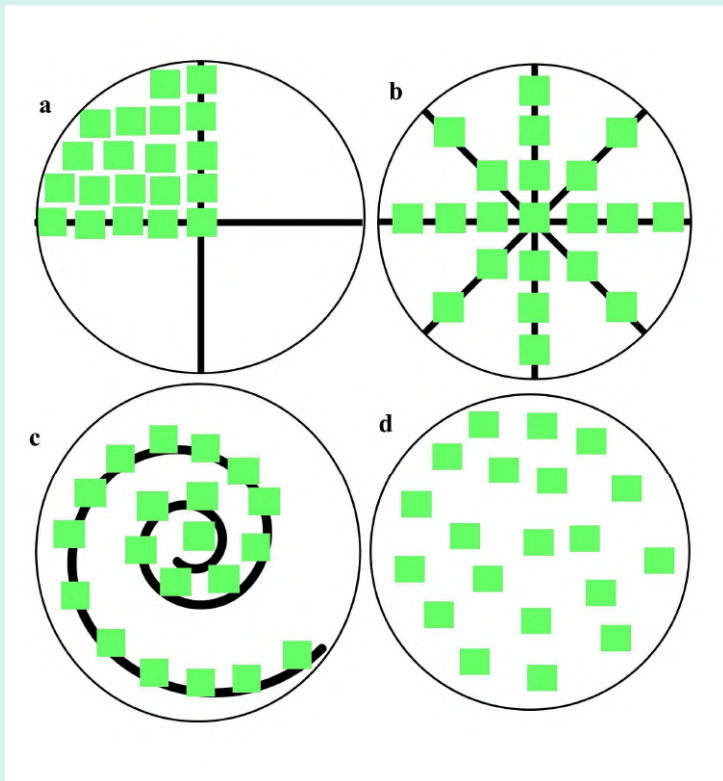


iii. Pretreatment and analysis

**Simultaneous
characterization
and quantification:
vibrational
spectroscopy
(Micro-FTIR)**



Quantification: Microscopic counting



Bürker Chamber

From Corami et al., 2021, STOTEN,
10.1016/j.scitotenv.2021.148937



Vibrational spectroscopy



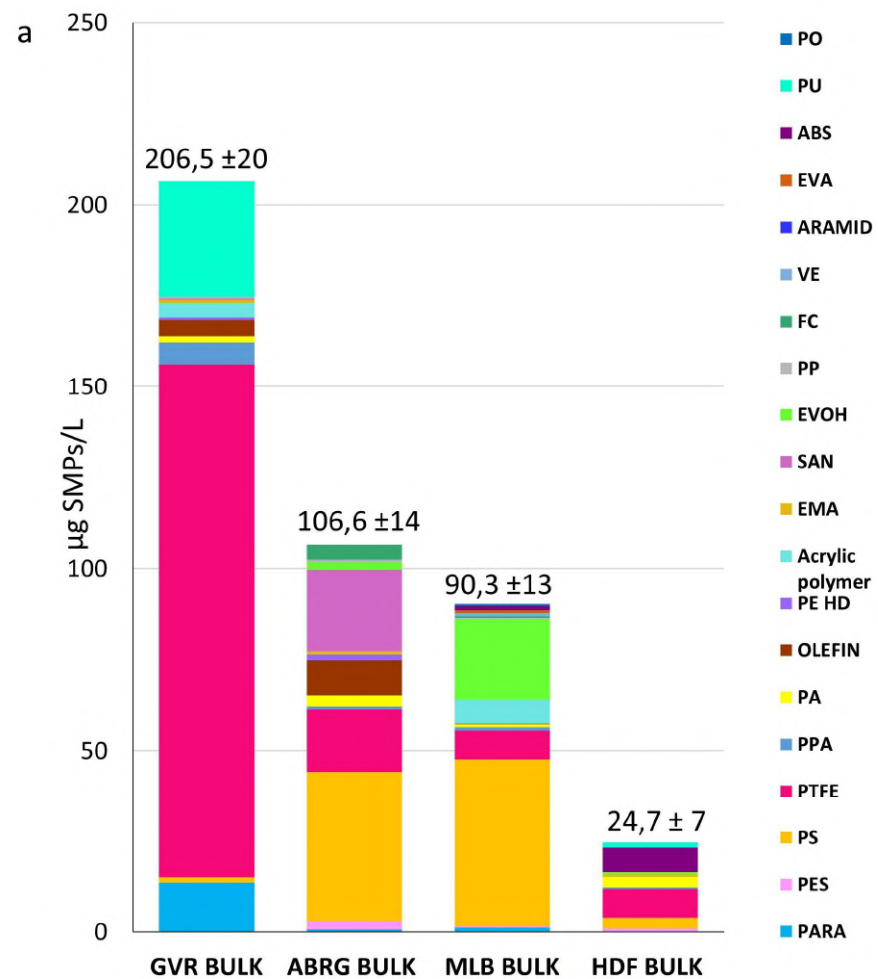
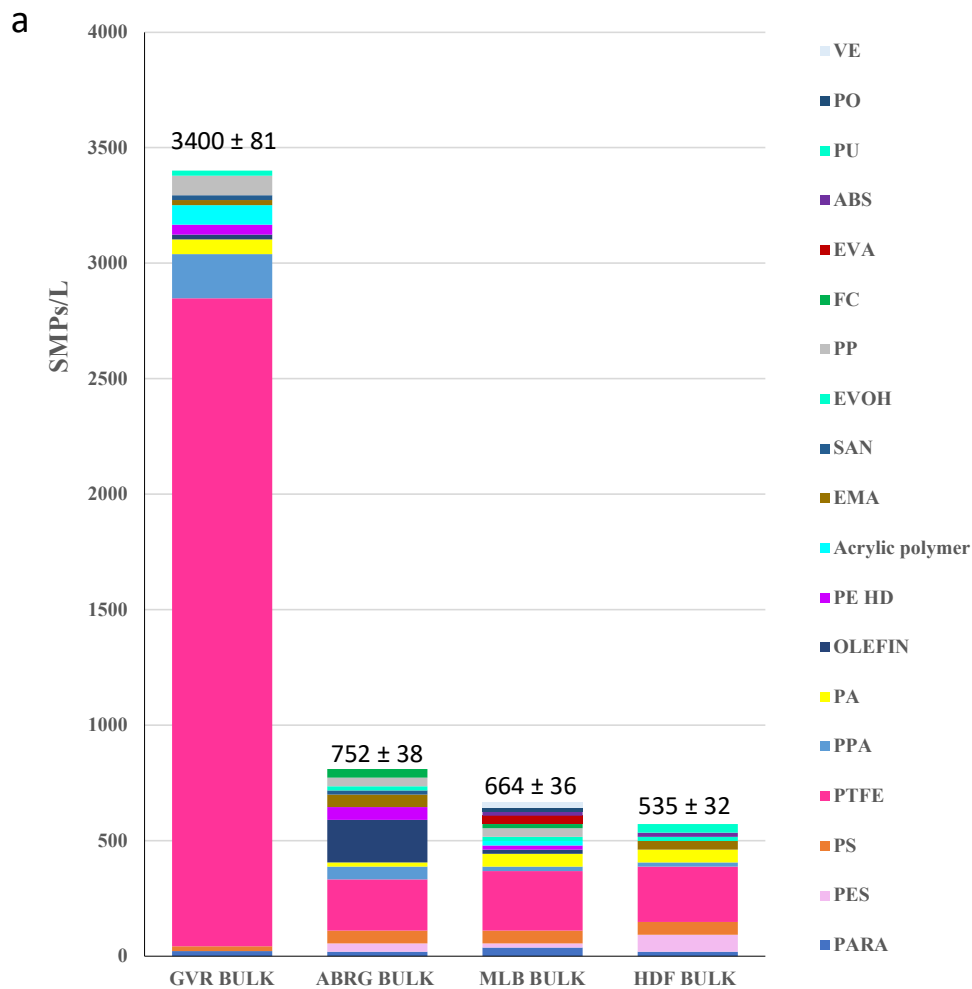
Pyrolysis/GC-MS



SEM-EDX



Cross-validation is crucial



SMPs in snow from glaciers and land in Svalbards



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iv. Case of study

iv. Case of study





Take-home messages

Polymers' characterization

What are the sources?

Transport pathways
long-range and short-range transport of
microplastics and microlitter

PROXIES!

Bioindicators and biomarkers

One-health approach!

Policy and regulations





**Thank you for your
attention
Any question?**

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