(Micro)plastics in German waterways - from sampling to analytics and effects

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Methodology sampling

Sediment: van-Veen grasper drill core
Biota: electrofishing
Method development

Sampling flow centrifuge

A: CFC pump ($\dot{V} = 1.5 \text{ m}^3/\text{h}$)
  particles $\leq 5\text{mm}$

B: CFC:
  $\rho > 1 \text{ g/cm}^3$

C: Sieve:
  particles $> 20 \mu\text{m}$
  $\rho < 1 \text{ g/cm}^3$
Method development

Sampling strategy

- Surface
  - Watercolumn
    - E.g. ½ water depth
  - Above the ground
  - Sediment
Sample preparation

- **Sampling**
  - suspended particulate matter OR sediment < 5 mm

- **Freeze-drying**
  - frozen at -20 °C

- **Electroseparation**
  - mean mass reduction of 81 ± 5 %

- **Acidic Digestion**
  - KOH and H₂O₂ neutralisation (HCOOH)

- **Density Separation**
  - 1.6 g/mL K(HCOO)

- **Pressure Filtration**
  - Aloxfilters or glass fiber

**Analytics**

- Microscope
- Pyrolysis-GC/MS
- μFT-IR
- Sediment
Results – River Elbe

In cooperation with Martin Wagner et al. (Goethe Universität Frankfurt/NTNU Trondheim)
Christian Scherer, Annkatrin Weber, Harun Egerci, Sebastijan Vurusic
Lake Biel - drill core

- sampling April 2014
- In cooperation with EAWAG snd PSI; Anja Pregler
  (Eidg. Anstalt für Wasserversorgung, Abwasserreinigung & Gewässerschutz, Paul Scherrer Institut)
- Water depth: 53.1 m
- Length of drill core: 109 cm
Results
Lake Biel $^{137}\text{Cs}$-dating

$^{137}\text{Cs}$ specific activity [Bq/kg] vs. depth [cm]

- Chernobyl 1986
- Mühleberg 1976
- Bomb Tests 1963
Results

Lumbriculus

Uptake and excretion test

- Feeding of *L. variegatus* with microplastics ≤ 200 µm
- Observation under fluorescence microscope
- Removal of exceeding microplastics after uptake of particles

Fluorescence photos of *L. variegatus* after ingestion of PVC (left) and PET (right); small picture: PVC particle
Results - Lumbriculus

- Uptake and excretion of all microplastic particles
- Impact of microplastics possible
  ► Results suggest that this is due to additives (due to a milieu change in the organisms)
  ► Injury in the body or the digestive tract can be excluded
Everybody is invited to join the network and present the projects about plastics.