

# Field studies for detecting microplastic in environmental compartments and a novel tomography approach for analysis of undisturbed soil or sediment cores

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by

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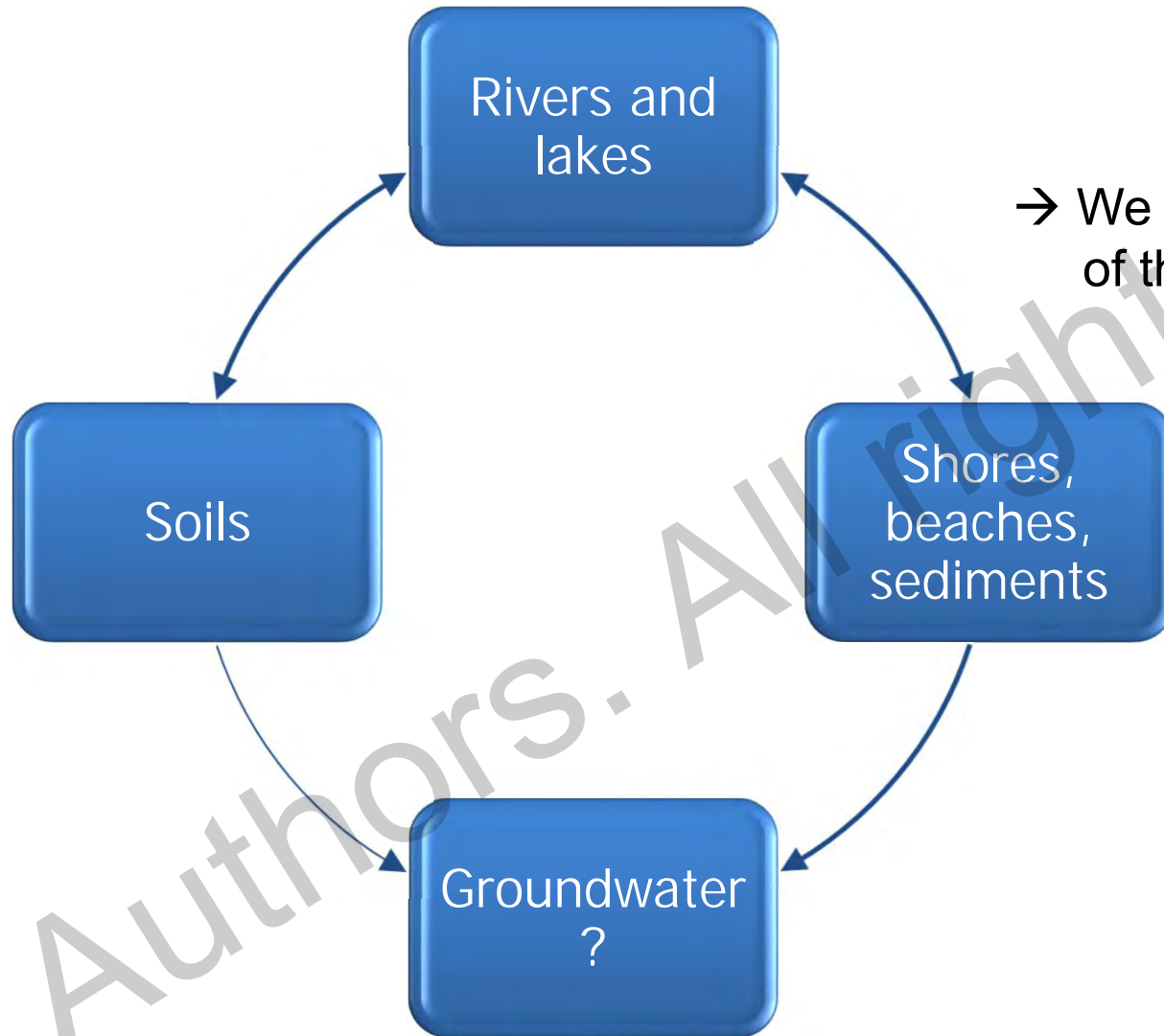
from

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# Presence of microplastics in the terrestrial environment

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→ We should investigate all of these compartments

# Methods used for our field studies

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## Brief overview of methods and links

1. River water – volume sampling, filtration, treatment, filtration, optical detection by NIR imaging and analysis via PLAMAPP algorithm; yielding number, type, size (Schmidt et al., 2018)
2. Groundwater – volume sampling from wells, then procedure via NIR imaging as above (according to Schmidt et al., 2018)
3. Soils and beach sands – Coring from surface, density separation, treatment, optical counts via microscope
4. Sandy soils and sediments – development of a thomography method for sediment and soil cores (Tötzke et al., 2020)



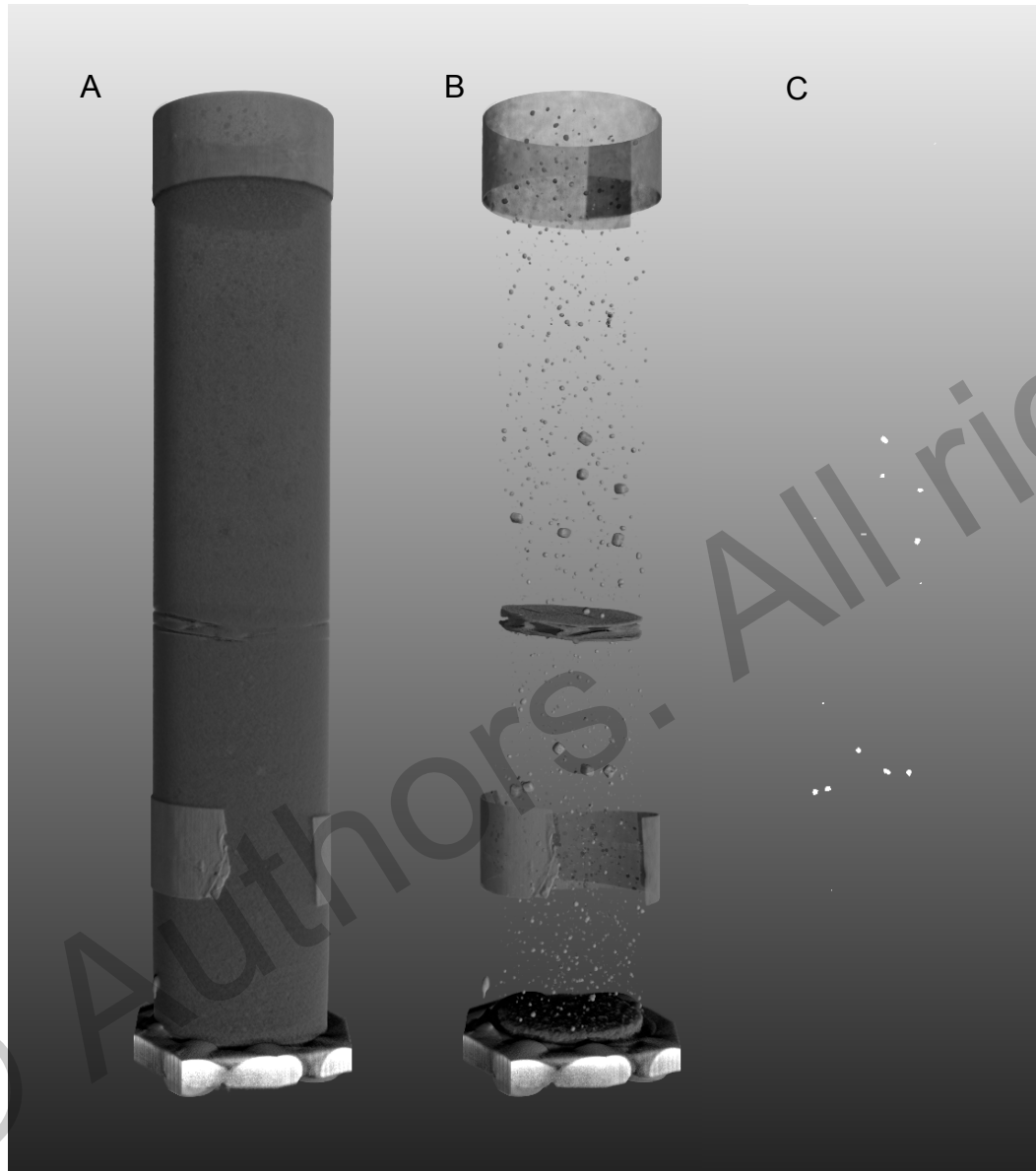
# Exemplary results or field studies

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## Microplastic particles (MPP) found in ...

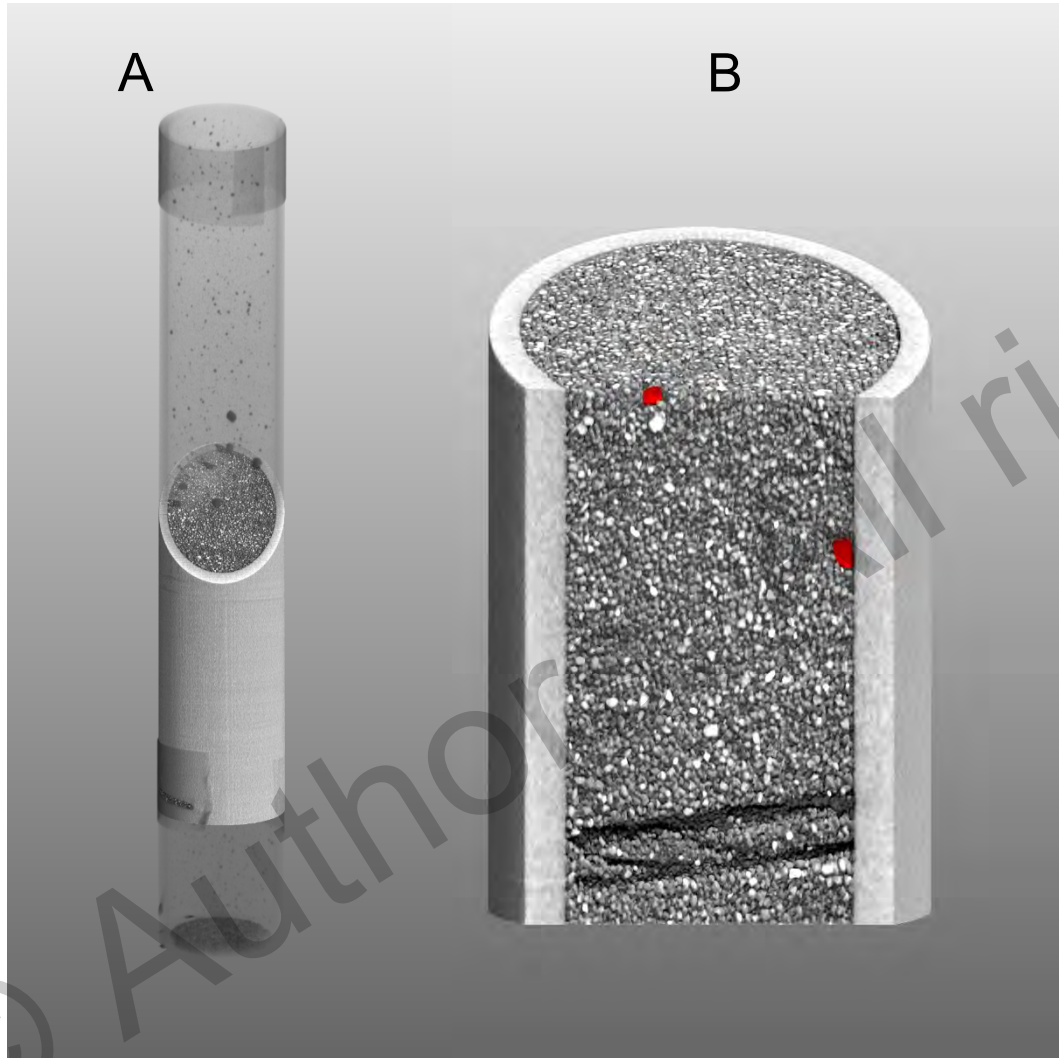
1. River water surveys – very high concentrations at the water surface, mainly polyethylen; influence of rain events and sewage treatment plant effluents (Schmidt et al., 2018)
2. Groundwater – MPPs were found in groundwater wells, but detailed analysis needed to clarify origin (Krüger, 2017)
3. Soils and beach sands – MPPs found in almost all samples, sometimes in high concentrations; varying sizes and shapes, often dominated by fibres (Aruch, 2019)
4. Sandy soils and sediments – non-destructive tomography method developed, analysis on-going

# Intro to MPP tomography approach



- Aiming for the analysis of soil or sediment cores
- Key is the sensitivity of neutron imaging to hydrogen
- A test sample was prepared with microplastic particles in an upper and lower compartment within a sand matrix (A)
- By a simple thresholding the bulk sand can be excluded from object (B)
- Refining thresholds localizes a number of potential MPP (C)

# Identification of MPPs with tomo approach



- Additional X-ray tomography of sample (A)
- Enables to exclude a number of sand particles with high neutron attenuation
- Completes the identification of MPPs; in test sample all MPPs could be found (B)
- Size and shape of MPPs can be retrieved also
- Not only the position, but also the surrounding matrix structure can be analysed

# Conclusions

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1. River water – surveys needed, also event driven ones; requires analysis methods that are fast in processing
2. Groundwater – Specific monitoring strategies need to be developed
3. Soils and beach sands – Serious concerns about widespread pollution of soils with MPPs ask for extensive monitoring and targetting underlying processes and sources
4. Sandy soils and sediments – tomography approach very promising to identify and characterise MPPs non-invasively while obtaining the structural context also



# References

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