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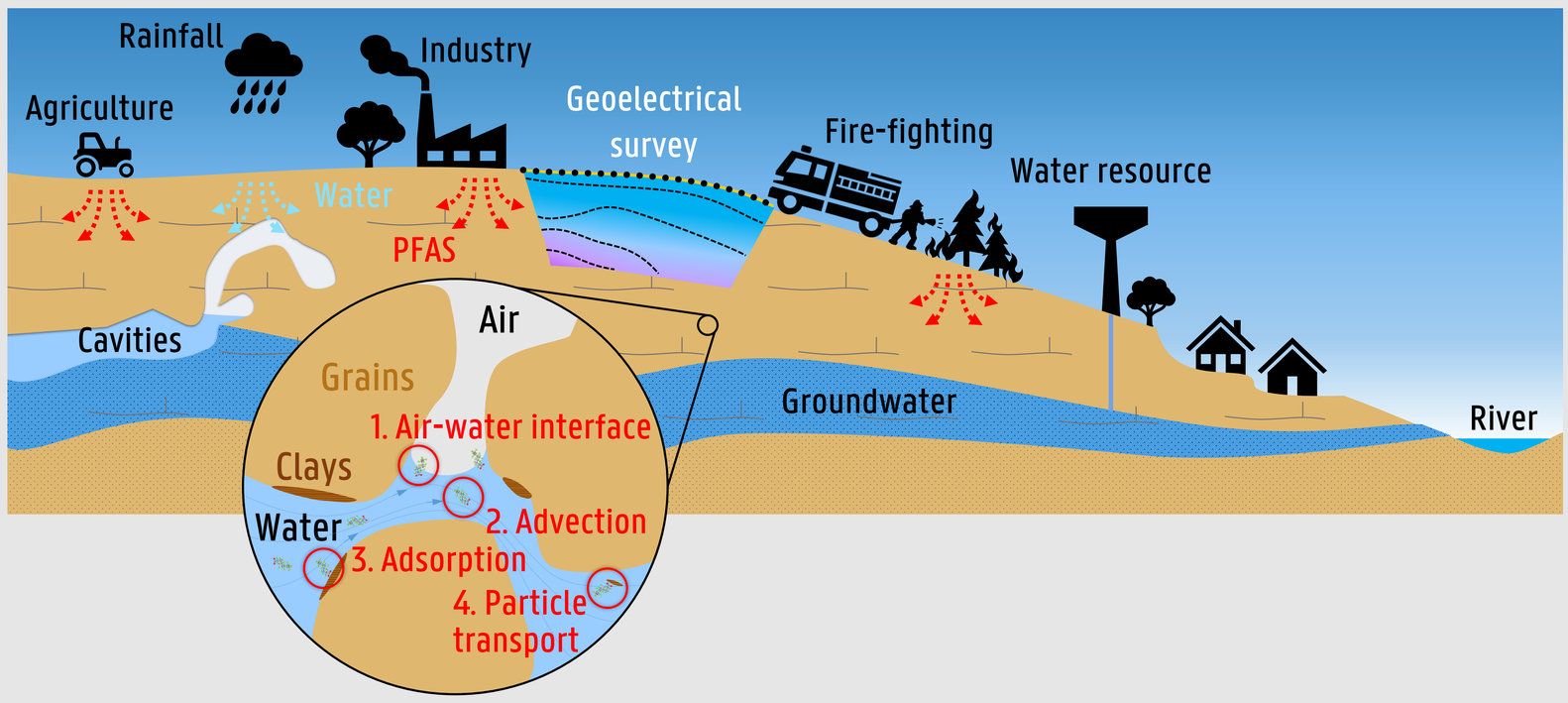
MONITORING PFAS SPREADING AND REMEDIATION IN THE SUBSURFACE FROM THE PORE TO THE FIELD SCALE

Introduction

- Per- and poly-fluoroalkyl substances (PFAS) are long-lasting chemicals that globally contaminate the subsurface.
- Due to important adsorption, the unsaturated zone plays a major role in retaining PFAS. However, decades of pollution reveals that PFAS do not remain stable but leak toward aquifers and contaminate the groundwater with a complex mixing behaviour due to retention on fluid-fluid menisci and on solids. Models predicting PFAS fate in the unsaturated zone neglect the small-scale interactions that control PFAS behaviour and are fundamental for long-term evolution.
- Subsurface remediation with long-term treatment is more cost-effective than inaction or excavation. Adsorption on carbon-rich materials is recommended.

Research objectives

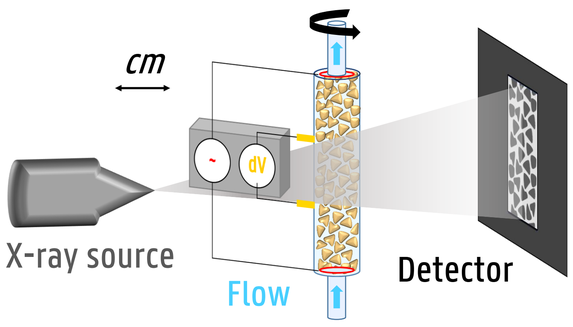
1. Develop geoelectrical monitoring of PFAS contamination and remediation as an integrative and affordable method
2. Investigate the potential of Xray µ-CT to visualize and validate transport mechanisms of PFAS at the microscale
3. Benchmark low-cost remediation strategies using biochar for circular economy
4. Upscale the microscopic findings experimentally and numerically



Methods

Pore-scale

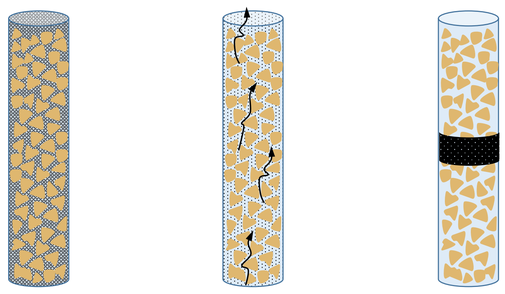
PFAS contamination characterization combining X-ray µ-CT and geoelectrical monitoring



+ PFAS concentration from effluent sampling

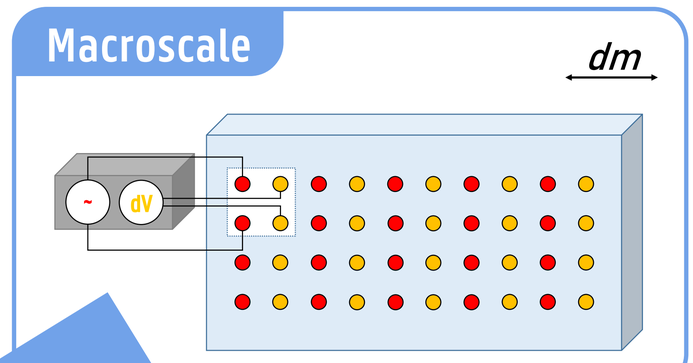
PFAS remediation using biochar

1. Amendment
2. Particles injection
3. Permeable reactive barrier



Upscaling

Macroscale



Expected results and outcomes

- Assess the impact of PFAS on the air-water distribution
- Characterize PFAS contamination/remediation from the geoelectrical response
- Validate PFAS transport laws and incorporate them in vadose zone models
- Propose efficient remediation technic

⇒ Breakthrough for future test-site investigations

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