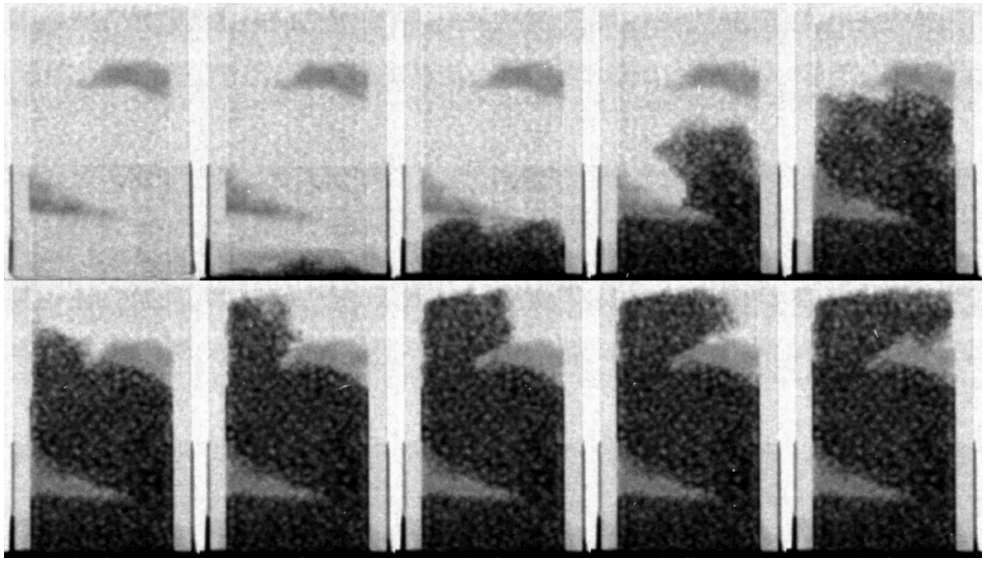
Bachelor / Master thesis

Department of Environmental Systems Science (D-USYS);
Institute of Terrestrial Ecosystems (ITES)
Physics of Soils and Terrestrial Ecosystems (PoSE)

Effects of microplastic in soils – water dynamics and liquid configuration



Time-series neutron radiography of an effect of microplastic (MP) (dark gray) on capillary rise of water (black) into sand columns (light gray). Water flows around MP in an elongated flow path increasing tortuosity and entrapping air around MP aggregations. (A. Cramer et al., 2021)

Motivation and Research Questions

Little is known about the implications of microplastic (MP) on soil physical properties. Our soils are confronted with ever increasing quantities of MP particles with the majority not considered biodegradable. Terrestrial soils are connected to groundwater, rivers and oceans. Although there is limited evidence of MP transport from soil to groundwater, the effects of MP on transport and fate in soil, as well as the effect of MP on soil processes need to be studied. Additionally, their effect on soil hydraulic properties and soil moisture dynamics is largely unknown. Since MP is considered hydrophobic, we hypothesize that MP enhances soil water repellency. The magnitude of this effect depends on MP content, type, shape as well as state of degradation and MP and soil particle size. We are describing and quantifying effects of MP by application of soil physical concepts and methods.

Objective, Methods and Timeline

Dynamic contact angles of different microplastic contaminated soils

- **Bachelor Thesis:** Quantifying wettability of different artificially microplastic amended soils by dynamic contact angles in the lab. Can be started anytime.
- **Master Thesis:** Density separation of natural soil samples to estimate MP content, capillary rise method with replicates to estimate dynamic contact angles and estimation of particle size distributions. Needs to wait for frost free period.

You will learn how to design, implement and conduct an experiment all the way to analysis and writing scientifically about it. You will be part of our research group and gain insights into the job and everyday life of a scientist.
If you are interested in one of the topics or even if you have your own ideas or additions, feel free to contact andrea.carminati@usys.ethz.ch and or andreas.cramer@usys.ethz.ch.