

Sources and pathways of small microplastics (<100 µm) in terrestrial ecosystems

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Microplastics are present in all environmental compartments (e.g. water, soil, sediments, etc.) and they are considered emerging pollutants. The European Chemical Agency (ECHA, 2019) has defined microplastics as “a material composed of solid polymer-containing particles, to which additives or other substances may have been added, with particle dimensions ranging from 1 nm to 5 mm and with fiber lengths ranging from 3 nm to 15 mm and length to diameter ratio of >3. Furthermore, ECHA has firmly stated the need of polymer identification when analyzing microplastics.

The potential impacts of microplastics in terrestrial ecosystems are still unexplored. Most plastics arriving in the oceans were produced, used, and often disposed on land. Microplastics might first interact with biota within terrestrial systems, causing ecologically relevant impacts. According to the size of mouthparts of macro- and micro-invertebrates, these small microplastics (<100 µm) can be mistaken as food particles, ingested and then enter the food web. Small microplastics may be accumulated, especially in the higher trophic level, and may pose a threat for the environment and human beings.

In literature several methods, especially microscopic methods, were employed for the evaluation of microplastics in water and sediments, but the identification of polymers using microscopy is not possible. In many studies only a subset of samples was analyzed via FTIR. Generally, only large microplastics were studied and small microplastics were neglected, especially in water studies, since the mesh sizes of manta trawls can be either 330 µm or 100 µm. Almost none of these methods were tested for the investigation of microplastics in soil. In this study pretreatment methods (e.g. purification) quantification and polymer identification of small microplastics (1-100 µm) using Micro-FTIR were developed. Soil from Stelvio Natural Park and permafrost from Svalbard Islands were analysed; preliminary findings showed differences among the sites studied.