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Microplastics pollution in groundwater: Case study - Slovenia

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Microplastics (MPs), are considered an emerging global pollutant and a significant contributor to environmental pollution. They are defined as plastic particles measuring less than 5 mm which can vary in chemical composition, color, shape, density, size, and other characteristics. MPs generated through urban, industrial, and agricultural activities have the potential to reach the environment, including groundwater. However, despite the significance of groundwater as a vital resource, there is a notable dearth of information regarding the occurrence, transport, and risk of MPs in this environment.

In Slovenia, groundwater resources are the primary source of drinking water for 98% of the population. A considerable number of these resources are affected by different anthropogenic activities that result in contamination by different pollutants, among which MPs are probably included. The present study aimed to investigate the presence of MPs in karst and alluvial aquifers of three different regions of Slovenia. Particular emphasis has been given to the improvement of sampling and detection of MPs in groundwater along with the evaluation of the impact of hydrogeological environment, land use and anthropogenic activities in the recharge zone of each sampling site on the occurrence of MPs in groundwater.

Groundwater samples were collected from a total of 19 locations, 8 were situated in alluvial aquifers and 11 in karst formations. In each location a total of 3 cubic meters of water was sampled using an in-situ filtration system with a filter pore size of 10 - 100 µm. The samples were then analyzed in the laboratory using a digital microscope with a magnification range of 100 - 5000x and stereomicroscope with magnification 12,5 - 100x. The chemical composition of particles was determined using FTIR microscope and ATR-FTIR. The results showed that MPs were present in all sampled sites, with fibers and fragments being the most common observed shapes. The study proves the presence of MPs in both, alluvial and karst aquifers of Slovenia and demonstrates the suitability of an in-situ filtration system for sampling MPs in groundwater.