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# Understanding the path of microplastics in lake from surface water to sediments

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## Abstract

Microplastics are considered to be an emerging pollutant in aquatic ecosystems. However, most studies have had a focus on microplastics occurrence in the marine environment, leaving freshwater microplastics contamination less understood. Here we set forth an extensive study on microplastics in a small urban lake located in Northern Europe – Latvia, presenting pollution's seasonal dynamics in surface water, accumulation rate through one-year period and historic distribution in dated sediment core.

In this study widely applied and innovative microplastics collection methods have been used: Manta trawling for surface water, sediment coring for sediments and trapping for assessing microplastics accumulation rate. For identification of microplastics particles found throughout the different lake compartments Attenuated Total Reflection and micro-Fourier transform infrared spectroscopy (ATR-FTIR and  $\mu$ FTIR) methods were used. Sediment core chronology was validated using the reliable 210Pb method.

Surface water microplastics concentrations were found to be higher over summer period (5.71 items/m<sup>3</sup>) and lower in winter (0.75 items/m<sup>3</sup>). Microplastics were up to 20 times more abundant in recent sediments (year 2019) than in the deeper layers referring to year 1924. The assessed microplastics deposition rate was 8.77 items/cm<sup>2</sup>/year or 1.91  $\mu$ g/cm<sup>2</sup>/year and the majority of found polymers were polyethylene, polystyrene and polypropylene.

The most appropriate method for monitoring microplastics in lake environment proved to

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be sediment trapping since it demands little time and financial resources for samples acquisition and processing. Moreover, it is not dependent on changes in weather events and provides information on current-time microplastics accumulation. Our results set a baseline for apprising the potential changes in microplastics contamination level due to alteration of plastics consumption and waste management patterns.

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