Investigating Microplastic Flux Rates in Icelandic Lakes: Linking Atmospheric Deposition to Precipitation Patterns

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Abstract

Atmospheric transport is a major pathway for microplastics (MPs) to reach remote regions, and it plays a significant role in the global distribution of MPs. Processes of wet and dry deposition of atmospheric MPs are not well understood, but fallouts from atmospheric MPs have been previously measured in remote locations. Iceland holds a very strategic location for studying long-range transport of MPs, as it is scarcely populated and is located within major oceanic current and large scale weather patterns, far from continental Europe and North America.

This study aims to estimate flux rates of atmospheric deposition of MPs in Icelandic lakes and to improve the understanding of the atmospheric transport and deposition of MPs towards the Arctic. We collected surface sediment from remote crater-like lakes (elevated, small catchment areas and no apparent main in- or outflows) to minimize contributions from runoff and avoid local sources of MPs. A total of six lakes were targeted, located in strategic locations around Iceland to cover the whole scale of mean annual precipitation, ranging from 1000 to 5000 mm. We sampled from the central part of ice-covered lakes, using a short coring device to preserve the water-sediment interface and prevent loss of easily suspended particles. Only the interface water and upper first centimetre of sediment were collected for the MP study, and additional short cores were retrieved to assess sediment-accumulation rates, and estimate MP flux rates for each lake. MPs were extracted using a heavy liquid separation method, followed by organic matter elimination with an enzymatic purification protocol, and identified using micro-FTIR spectroscopy analyses.

Preliminary data suggest a close relationship between mean annual precipitation and accumulated MPs. This highlight the significance of precipitation for the atmospheric deposition of MPs and provide a baseline for future studies on Icelandic freshwater bodies and land-based MP research.

Keywords: Microplastics, Atmospheric Transports, Lake sediments, Freshwater, Iceland

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