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# Pilot studies of microplastic abundance in the Yenisei River, Siberia

Yulia Frank\*<sup>†1</sup>, Egor Vorobiev<sup>1</sup>, Anton Trifonov<sup>1</sup>, and Danil Vorobiev<sup>1</sup>

<sup>1</sup>National Research Tomsk State University – Lenina Ave., 36, Tomsk, 634050, Russia

## Abstract

Rivers are major pathways of microplastic (MP) transport from terrestrial areas to the oceans. Siberian rivers can carry MPs into the Arctic Ocean. However, the quantitative contribution of Ob, Yenisei and Lena rivers to MP flows in the Arctic region is still uncertain. In this study we quantified MPs in the Yenisei River system including surface water and bottom sediments. The average MPs content in the surface water and bottom sediments of the Yenisei and its longest tributary, the Nizhnyaya Tunguska River, was determined. The MP total counts in the surface water of the N. Tunguska were  $2.58 \pm 1.87$  items per m<sup>3</sup>, tending to increase along the watercourse ( $p < 0.05$ ). In average,  $2.95 \pm 0.66$  items per m<sup>3</sup> was detected in the Yenisei surface water. Concentrations of MPs in bottom sediments ranged from  $353 \pm 153$  items per kg dry weight in the Yenisei to  $422 \pm 241$  in the N. Tunguska with no significant difference between the two rivers. Microfibers, microfragments, and microfilms were detected among the plastic particles. No microspheres were found in either the surface water or bottom sediments of either river studied. The bottom sediments in the Yenisei River system were obviously dominated by fibers. Probable sources of MPs in the remote N. Tunguska and the Yenisei Rivers include mismanaging plastic waste in settled areas, using of synthetic fabrics, and intensive fishing activity of the local population.

Thus, in the preliminary study we quantified MPs in the Yenisei River system, thereby demonstrating the capacity for MPs to flow to arctic waters via the river discharge. Further spatial-temporal studies are needed to estimate the Yenisei MPs fluxes into the Kara Sea. The work was supported by the Russian Science Foundation under the project No. 22-27-00720 "Abundance and accumulation of microplastics in Siberian Rivers".

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\*Speaker

<sup>†</sup>Corresponding author: yulia.a.frank@gmail.com