Abundance of tire tread wear particles in West Siberian snow cover

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Abstract

Tire tread abrasion has been recognized as one of major sources of microplastics (MPs) in the environment. Tire tread wear particles (TWPs) emit to the air, can be carried by the wind and enter remote areas, or can be discharged with untreated runoff from roads to the water recipient. There are few reports on the local emissions and transport of tire and road wear particles into environmental compartments over the world. Data on concentrations and snow load of TWPs and other MPs in West Siberia were obtained. Snow core samples from 25 sites scattered from the Altai Mountains to the Arctic Circle were collected at the end of the winter in 2021 and analyzed by visual microscopy combined with Raman spectroscopy. TWPs concentrations in snow varied widely among different sites, highest values were detected in relatively populated area in the South-West of the region with the maximum of 192 items L-1 melted snow or 13,439 items m-2. Absolute concentrations of TWPs in snow were not directly associated with population density in all sites, obviously depending on natural and climatic factors. Comparing the levels of TWPs to the total concentrations of MPs, showed that tire tread abrasion contributes up to 94.8 and 95.2% load of the total concentration of particles in snow samples near large cities of Novosibirsk (1.51 million population) and Omsk (1.16 million), correspondingly.

Keywords: Tire tread wear particles, microplastics, snow, West Siberia

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