

EGU23-2670, updated on 28 Nov 2023

<https://doi.org/10.5194/egusphere-egu23-2670>

EGU General Assembly 2023

© Author(s) 2023. This work is distributed under the Creative Commons Attribution 4.0 License.



Soil susceptibility to wind erosion drives the abundance of microplastics in remote Scottish soils

Tereza Pavlíková¹, David Pavlík², Jan Divíšek¹, and Daniel Nývlt¹

¹Masaryk University, Faculty of Science, Department of Geography, Czechia (te.pavlikova@gmail.com)

²Masaryk University, Faculty of Informatics, Czechia

Microplastics have been found in various places, including not only densely populated areas of China or Germany but also remote high-altitude places like the Himalayas or the Pyrenees. However, the remoteness of a place is not determined only by its altitude. The Outer Hebrides (Scotland), with a low population and minimum industry, are remote in terms of direct pollution. This study aims to analyse the occurrence and spatial distribution of microplastics in soils of the Outer Hebrides to discover the factors driving the abundance of microplastics and to find how much more or less are remote Scottish soils polluted with microplastics than inland soils of populated areas.

In the Isle of South Uist, 123 topsoil samples were collected along the western coastline and in four transects through the isle in the west-east direction. In total, 63 samples were analysed using an optical microscope to quantify the plastic microfibrils visually using a semi-automatic algorithm. The amounts of microfibrils were statistically processed, and their distribution was modelled for the entire archipelago.

More microplastics are present in inland soils with loamy soil texture, denser vegetation and denser roots (median = 36,900 microfibrils/L) than in coastal soils with sandy soil texture, sparse vegetation and low root density (median = 3,580 microfibrils/L). Their abundance is mainly influenced by soil texture, vegetation density, and root density.

With the south-western prevailing wind direction, we assume that most microfibrils enter the island from the Atlantic Ocean, and the wind transports the microfibrils inland to the east. Wind deflates the microfibrils from coastal soils, and microfibrils are deposited in inland soils. The inland soils are less susceptible to wind erosion, and the microfibrils accumulate there.

Thus, the remoteness of the Outer Hebrides does not guarantee low microplastic pollution. Contrarily, the Hebridean soils are extensively more polluted than most so far studied sites. The level of pollution is comparable to only a few studies where the abundance of microplastics in the soils is similar, e.g. Beijing (China), Lower Rhine basin (Germany) or Coimbra (Portugal). However, these sites are much more populated and interconnected, which suggests a great contribution of microplastic pollution from Atlantic Ocean and a great magnitude of wind transport processes in the Outer Hebrides.

