SUITMA 11
11 th Conference on Soils of Urban, Industrial, Traffic and Mining Areas
Soils and the food, water, energy nexus
05.09.– 09.09 2022 Berlin, Germany

Trace metal postpyrogenic soil contamination in traffic area of Russian Arctic

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Abstract (max. 400 words)

Currently consequences of forest fires in the Arctic region are one of the most relevant topics of scientific researches, especially in the context of tundra ecosystems role assessment in processes of carbon release and storage. Forest fires are relatively rare in subarctic tundra ecosystems, but they can greatly change the properties of ecosystems. Postpyrogenic soils in the tundra zone were studied at two objects located in traffic areas of the Nadym region (Yamalo-Nenets Autonomous District) – near Nadym city (forest fire was in 2021) and Pangody city (forest fire was in 2016). The main effect of fire was on the forest floor and organogenic soil horizons due to low reserves of above phytomass in tundra ecosystems.

The study provides information on soil organic carbon (SOC) and trace metal contamination level after forest fires and in comparison with control plots. The quality of soil resources after wildfires was also evaluated in terms of their ecotoxicology condition, namely, the concentrations of trace metals in soils were determined and their current condition was assessed using calculations of various individual and complex soil quality indices. Data obtained on the SOC content in upper organic horizons show sharp decline of these parameters in postfire soil in comparison with control soil of the tundra area unexposed to fire. Post-pyrogenic ecosystems, especially in the vicinity of urbanized landscapes (Nadym) and traffic areas, have significant differences from natural ecosystems, and as a result of secondary succession, a plant species composition different from the natural one is formed, the formed taxonomic composition of soil microbiota disappears, chemical soil characteristics and soil organic matter change during ecosystems transformation. All this requires studying in the Arctic region conditions.

The soil and vegetation cover of postfire areas deserve a close attention as an object of environmental monitoring. Since the soil cover is able to receive natural and technogenic flows of chemical substances coming from autonomous landscapes, and plants can absorb and neutralize a significant amount of them, therefore they (plants and soils) are an informative indicator of environment state. Postpyrogenic ecosystems require a comprehensive study, particularly, for understanding role of soil cover in the functioning and restoration of terrestrial ecosystems, in the context of catastrophic consequences of forest fires on a national scale.

This work was supported by Federal budget of Russian Federation, grant for support for the creation and development of a World-class Scientific Center “Agrotechnologies for the Future”, project No. 075-15-2020-922.