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Content of heavy metals and polycyclic aromatic hydrocarbons in soils of vicinities the Bulgarian Antarctic station "St. Kliment Ohridski"

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Currently, more and more researchers are recording increased pollution levels of chemicals in the environment of the Antarctic regions. It is noted that mostly concentrations are fixed for non-typical chemical contaminants of anthropogenic origin. These can be Heavy Metals (HM), Polycyclic Aromatic Hydrocarbons (PAH) or Polychlorinated Dibenzodioxins (PCDD). It is well known that these classes of substances have a negative impact on human health and are detrimental to the development of endemic species, as well as having carcinogenic and mutagenic effects.

The problem of pollution of Antarctic territories is especially relevant recently. As the scientific interest in these territories increases, the anthropogenic load on the fragile Antarctic ecosystems also increases in parallel. Chemical contaminants can enter the Antarctic continent in a variety of ways. Researchers bring large volumes of diesel fuel and other fossil fuels with them to heat research stations. This often results in oil spills and the discharge of contaminated wastewater into sub-Antarctic waters. Entry is also possible as a result of transboundary transfer of atmospheric emissions from the territories of Australia and South America, which are deposited in Antarctica.

In our investigation, 15 priority concentrations of PAHs and some heavy metals in the soils of Livingston Island (Antarctic Peninsula) were analyzed based on the analysis of soil samples obtained during the Bulgarian Antarctic Expedition. The data on PAH concentrations in soils allowed us to calculate different isomer ratios of aromatic hydrocarbons, which may indicate the nature of the origin of the contaminants.

Significant differences were recorded in the content of chemical contaminants between soils in the station area and its vicinity. Thus, for instance, the content of Naphthalene, Acenaphthene, Naphthalene and Pyrene in soils at "St. Kliment Ohridski" Station (Cryosol Toxic Transportic, WRB 2014) was at 170, 41, 38 and 60 µg/kg, respectively. While in the soils (Cryosoils Leptic Stagnic, Cryosol Leptic Ornitic Hypersceletic, Cryosol Turbic Gleyic, WRB 2014) around the station the content of similar PAHs were 53, 6, 20, and 21 µg/kg.

The highest concentration of heavy metals was also recorded in soils exposed to anthropogenic load. The concentrations of Cu, Pb, Zn, Cd, Ni and Cr were 22.6, 10.7, 75.7, 0.28, 10.1 and 5.25

$\mu\text{g}/\text{kg}$, respectively, in the soils of the Bulgarian station. For undisturbed Antarctic soils of Livingstone Island, heavy metal concentrations were significantly lower.

We also calculated some isomeric ratios of PAHs. The values of these ratios allowed us to reveal the nature of the origin of PAHs on Livingstone Island. In the samples collected at "St. Clement Ochridski" Station, the sources of PAHs are predominantly pyrogenic processes, combustion of liquid fossil fuels, and traffic source.

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