



Profile distribution of polycyclic aromatic hydrocarbons in soils of drained peatlands after wildfires (Moscow region, Russia)

Anna Tsibart, Alexander Gennadiev, Timur Koshovskii, and Roman Kovach

Moscow State University, Faculty of Geography, Department of Landscape Geochemistry and Soil Geography, Moscow, Russian Federation

Polycyclic aromatic compounds (PAHs) are formed in different natural and anthropogenic processes and could be found in many landscape components. These compounds are carcinogenic and belong to the group of persistent organic pollutants. The anthropogenic sources of PAHs are well-studied, but insufficient data are available on the hightemperature production of PAHs in natural processes. For example, natural fires are frequently related to the PAHs sources in landscapes, but very little factual data are on this topic.

The soils of drained peatlands affected by catastrophic wildfires of 2010 and 2002 were studied in the Eastern part of Moscow Region (Russia). A total of 14 profiles of histosols and histic podsols were investigated. These series included soils of plots subjected to fires of different intensities and age, as well as soils of the background plots. Soil samples were taken from genetic horizons and from every 10 cm.

The samples were analyzed for the contents of 14 prevailing individual compounds: fluorene, naphthalene, phenanthrene, chrysene, pyrene, anthracene, tetraphene, benz[a]pyrene, benzo[ghi]perylene, benzo[e]pyrene, coronene, dibenzo[1,2,5,6]phenanthro[4,3,2]perylene, triphenilene, benz(k)fluorantene.

Morfological properties of soils after wildfires on drained peatlands were changed dramatically, the horizons of ash and char instead of organic layers were formed. These new horizons differ in the capability of PAHs accumulation. The char horizons have the highest concentrations of PAHs – up to 300 ng/g because of incomplete burning of organic matter in this sites, and the ash horizons, where the complete burning occurred, contain only 10 ng/g PAHs. The highest concentrations of PAHs in soil profiles were detected after recent fires, and in cases of thick peat layers.

After the combustion of peat chrysene, benz[a]pyrene, benz[e]pyrene, benzo[ghi]perylene, benz(k)fluorantene and tetraphene accumulated in soils. This is mainly the group of 4-6-nuclear compounds. The formation of high-molecular weight compounds is possible during smoldering process under a low oxygen supply. The oxygen deficit acts as a factor of the organic fragments recombination and PAHs production; therefore, relatively large amounts of PAHs are formed in peat fires. Moreover the peat fires occur directly in the soil layer; therefore, larger amounts of the resulting PAHs remain in the soils of the fire sites. The migration of low-molecular weight compounds occurs in histic podsols, in histosols PAHs accumulate only in upper organic horizons.

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