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Lateral Distribution of Polycyclic Aromatic Hydrocarbons and Spherical Magnetic Particles within Soil Catenas of the Arable Watershed (Tver Region, Russia)

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Polycyclic aromatic hydrocarbons (PAHs) are very dangerous substances because of their carcinogenic properties. It is important to know the features of PAHs transport and accumulation in soils, especially on agricultural lands. Unfortunately this scientific problem is studied not enough.
It is known that predominantly PAHs in soils are sorbed on solid phase particles [2], so redistribution of PAHs should be carried out with transport of soil solid phase matter. For the purpose of assessment of connections between PAHs and soil solid phase transport the lateral distribution of PAHs and spherical magnetic particles (SMP) as tracers of soil solid phase migration has been compared. SMP is the component of fly ash which is used last two decades for quantitative assessment of soil erosion [1].
Studies were conducted in small watershed of south-taiga zone in European part of Russia in Tver region. The watershed has 53 ha, steep slopes, less 50, convex and convexo-concave shapes with ridges and runnels. The watershed lands were plowed up for the last 350-400 years until 1995 year. Predominant soils are Umbric Albeluvisols.
Soil samples were selected at four soil catenas (30 points with average distance about 70 meters). Two catenas were on opposite slopes near the road, and other two catenas were located on the opposite slopes (250-400 m from the road).
It is revealed that average concentration of PAHs in studied soils are 105 ng/g, and varies from 11 to 770 ng/g, with coefficient of variation 143%. Lateral distribution of PAHs and SMP differs within different catenas, because of various factors influence on PAHs concentrations: 1) amounts of PAHs income, depending on the distance from the source; 2) homogenization of PAHs concentrations within arable layer because of mixing the soil matter due to plowing; 3) vertical transport of PAHs in subarable layers is also connected with plowing and bioturbation; 4) rates of decomposition of PAHs in arable layer, depending on photodestruction and biological activity; 5) transport of PAHs caused by soil erosion. Depending on these factors in different parts of the watershed occurred specific lateral and vertical distribution of PAHs.

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