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The change of soil properties after wildfires in drained peatlands (Moscow region, Russia)

Timur Koshovskii, Anna Tsibart, Maria Smirnova, Gavrilova Valentina, and Kiseleva Anna

Moscow State University, Faculty of Geography, Department of Landscape Geochemistry and Soil Geography, Russia (tkzv@ya.ru)

The peat fires differ from the forest and grassland fires, because the soil organic matter acts as burning material. The deep peat horizons are heated or burned during smoldering fires, causing the dramatic change in soil properties. But the most of available data are devoted to changes in organo-mineral soils. In addition, the alteration in hydrological regime, for instance drainage, makes landscapes and soils very vulnerable to wildfires. Drained peatlands are widespread in the European part of Russia and they are affected to extreme wildfires of 2010. So there is a need of post-fire peat soils investigations in this region.

During current research the soils of drained peatlands of Moscow Region (Russia) subjected to wildfires of 2002 and 2010 were studied. A total of 14 profiles including background and post-pyrogenic histosols and histic podsols were investigated. Soil samples were taken from genetic horizons and from every 10 cm in cases of thick horizons. The morfological properties of soil profiles were studied and the samples were analysed on macroelements content and organic carbon. The total organic carbon contentrations were detected with spectrofotometric method and the concentrations of macroelements were analysed with X-ray fluorescence method.

After wildfires on drained peatlands morfological and physico-chemical properties of soils were changed, the horizons of ash (up to 5 cm) and char (up to 3 cm) instead of organic layers were formed. In addition, the plots of post-pirogenic landscape were characterized by high variability of soil properties. For instance, the thickness of organic layer changed from 5 to 30 cm in a small plot of 5X5 m.

The changes in element composition were detected. The peat horizons of background histosols had 80-90% of SiO_2, 9-5,8% of $Al2O_3$,1,5-5,6% of $Fe2O_3$, 3,7-6,3% of CaO, 0,7-2,8 % of MnO. Background histic podsols contained 88-90% of SiO_2, to 4,8% of $Al2O_3$, and the proportion of $Fe2O_3$ and MnO was about 2,3%. After the fire ash horizons had elevated concentrations of $Al2O_3$ (9-17%), $Fe2O_3$ (4-11%), $P2O_3$ (1-1,8 %), CaO (1,9-2,8 %) and K2O (0,1-1,9%). The char horizons had composition similar to background peat.

On the one hand the loss of organic matter took place after burning. But on the other hand after the fire new stage of humus formation started and in 2 years after the burning the content of organic carbon reached up to 10 % in upper horizons.