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Topsoil DOC Alteration in Mountain Tundra after Fire

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An increase the frequency of occurrence and the area of the fire observed in the last decade in tundra indicate that fire becomes an important factor regulating these ecosystems, however, the effects of tundra fires are still not studied.
We have studied DOC and microbial biomass carbon (C micr) dynamics in the surface horizons of tundra heaths soils in the Khibiny mountains (Russia). Our studies were carried out post-fire ecosystems with different self-recovery period after the impact of fire (2 years, 3 years, 12 years, 60 years and also ecosystem that was twice exposed to fire – 60 and 12 years ago).
On average for the period of observation, the concentration of DOC were estimated as 125-250 mg/kg and increases with increasing time of self-recovery of the ecosystem. Overall, after 12 years of recovery the soil not significantly differ in the content of DOC in control soils. A increase in DOC concentrations in top-soil recovery after fire impact is associated with the recovery of the plant cover and, therefore, formation of DOC due increased revenues of root exudates, and also with the accumulation and decomposition of mortmass.
In most part of the soils the concentration of DOC was increase during the period of study. The summer increase in the concentration of DOC is associated with the progressive activation of below-ground biomass of plants and the in vivo secretion of the exudates. The autumn maximum concentrations of DOC, obviously due to the receipt in soil of fresh litter. However, in the soil with self-recovery period after the impact of fire 3 years and 12 years, there was an opposite dynamics with a maximum in June and minimum in September. Such dynamics partly consistent with the dynamics of the emission of C-CO_2 in these soils. Probably, the decrease in the concentration of DOC due to his intense lost by soil respiration.
On average for the period of observation, the concentration of C micr were estimated as 900-1400 mg/kg and increases with increasing time of self-recovery of the ecosystem. However, significant differences in this parameter recorded only for the soil 2-years after the impact of fire. This indicates a fairly rapid colonization of burnt areas by the microbiota.
Similar tendencies observed for different soils can indicate the seasonal dynamics of C micr. Among the most general tendencies, a decrease in the concentration of C micr at the beginning of the vegetation period (in June), which corresponds to the analogous decrease in the concentration of DOC, should be noted. The nature of this seasonal effect is obvious, because this period was characterized by the spring cycles of freezing-thawing, which could affect the destruction of microbial biomass. Another general tendency is the increase in the concentrations of C micr in July-August with the further rise of soil temperature, and, also, with the arrival on the soil of root exudates and other sources of DOC, as well as by increasing availability of nitrogen.
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