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Analysis of the dynamics in urban soil organic carbon during the first year after construction

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The global soil organic carbon (SOC) stock amounts to 1200-1600 billion ton carbon in the 1 m layer, which is three times carbon stock in vegetation or two times of carbon in the atmosphere. Carbon stocks in soils of agricultural, forest and fallow lands in different climatic conditions are well understood. Much less is known about SOC stocks in urban areas.

Cities play a key role in the alteration of global biogeochemical. Conversion of certain land use types into urban may have a larger impact on SOC storage than climate change and has the potential to drastically alter soil carbon pool and fluxes. In urban landscapes with their physical disturbances and inputs of various materials, SOC may be affected both directly and indirectly.

Urban lawns are among the predominant land cover in urban areas. Contribution of green lawn areas to carbon balance is poorly understood so far, but can be considerable. Green lawns are usually developed on the highly fertile soils and soil mixtures with high carbon content. As a rule high carbon stocks in such soil is explained by high content of turf and turf-based organic substrates used in greenery for creation of the artificial topsoil layers. Such turf grass soils are rather variable in space and very unstable, since turf substrates have a high potential to get mineralized in automorphic conditions. As a result, carbon stocks in urban lawn soils can get considerably depleted during the first years of functioning, which can have a severe effect on CO_2 emissions and thus contribute to climate change. The current study aimed to analyze dynamic in SOC of urban soil in the recreational areas during the first year after construction.

As the research area we took the plots under sown lawn in the park "Oaks", located in the northern district of Moscow. In this area we took seven sampling points with 2-3 months' time step in the period from 2012 to 2013. Samples were taken from the depths of 0-10, 10-30 and 30-50 cm. In the samples we analyzed the following features: Ntot, Corg, pHKCL, P2O5 and K2O.

We found that the average content of Corg for the upper horizon (0-10) was 22.0% and changed slightly during the first season. However, after the winter, this value decreased up to average 7.3%. Also, SOC spatial variation represented by range decreased from 17-28% during in autumn 2012 to 5-7% in spring 2013. Besides considerable increase of Corg in lower horizons (10-30, 30-50) increased almost two times during the same period which can be an evidence of rapid leaching of soil organic carbon through soil profile.