Geophysical Research Abstracts
Vol. 19, EGU2017-192, 2017
EGU General Assembly 2017

Sustainability of C stocks in urban soil constructions at the early stages of development

Viacheslav Vasenev (1,2), Anna Shchepeleva (1,2), Gosse Dmitrii (3), Ivan Vasenev (2), and Ramilla Hajiaghayeva (1)

(1) Peoples' Friendship University of Russia, Agrarian-Technological Institute, Agrobiotechnological department, Moscow, Russian Federation (vasenyov@mail.ru), (2) Russian State Agrarian University, Moscow, Russia (lisi4ka912@mail.ru), (3) Lomonosov Moscow State University, Moscow, Russia (d9151054555@gmail.com)

Urbanization coincides with remarkable expansion of turf grasses and their increasing role in environmental processes and functions, including carbon (C) sequestration. Artificial ecosystems turf grasses are very vulnerable to anthropogenic and environmental factors and their C stocks and fluxes are not stable. Soil organic carbon (SOC) stocks in turf grass soils are substantial, however, an intensive soil respiration is also likely. Therefore C sequestration in turf grasses remains uncertain, especially at the early stages after development, when C uptake and CO_2 emissions are unbalanced. We analyzed changes in SOC stocks and CO_2 emissions at the experimental turf grasses in Moscow megapolis during the three years period after establishment. An influence of the three contrast depths of organic layers (5, 10 and 20 cm) on soil and biomass C and on the ornamental functions of turf grasses was studied. Total CO_2 emission from the turf grasses during the observation period exceeded C uptake in grass and root biomass by two to three times. We clearly demonstrated a substantial CO_2 emission from the turf grasses in Moscow city during the three years after establishment with the largest amount of C lost in the first year. This finding confirms that turf grasses are important sources of biogenic C emissions . Although, the total estimated emissions were substantial, gradual changes towards the equilibrium in C balance were found by the end of the observation period. The substantial increase in total biomass and the belowground component, together with the decrease in CO_2 emission, were observed for the third year after turf grass' establishment. This outcome evidences the possibility for balancing the C uptake and emissions over longer perspective. Positive dynamics in C balance was more evident for the turf constructions with thicker organic layers. The performance of the ornamental function was also positively correlated with the depth of the organic layer. These findings question the existing greenery practice driven by affordability, thus preferencing turf grasses with shallow organic layers. Our study demonstrates high vulnerability of these shallow turf grasses, causing substantial C depletion during the first years after establishment. These findings shall be used to develop guidelines for sustainable turf grass soil construction, which will get essential with increasing urbanization.