Geophysical Research Abstracts
Vol. 18, EGU2016-663, 2016
EGU General Assembly 2016

Soil microbial respiration (CO_2) of natural and anthropogenically-transformed ecosystems in Moscow region, Russia

Kristina Ivashchenko (1,2), Nadezhda Ananyeva (1), Sofia Rogovaya (1), and Viacheslav Vasenev (2)

(1) Institute of Physicochemical and Biological Problems in Soil Science of the Russian Academy of Sciences, Pushchino, Moscow region, Russia (ivashchenko-kv@rambler.ru), (2) Institute of Agrotechnology, Peoples' Friendship University of Russia, Moscow, Russia

The CO_2 concentration in modern atmosphere is increasing and one of the most reasons of it is land use changing. It is related not only with soil plowing, but also with growing urbanization and, thereby, forming the urban ecosystems. Such conversion of soil cover might be affected by efflux CO_2 from soil into atmosphere. The soil CO_2 efflux mainly supplies by soil microorganisms respiration (contribution around 70-90%) and plant roots respiration. Soil microbial respiration (MR) is determined in the field (in situ) and laboratory (in vitro) conditions. The measurement of soil MR in situ is labour-consuming, and for district, region and country areas it is difficult carried. We suggest to define the MR of the upper highest active 10 cm mineral soil layer (in vitro) followed by the accounting of area for different ecosystems in large region of Russia. Soils were sampled (autumn, 2011) in natural (forest, meadow) and anthropogenically-transformed (arable, urban) ecosystems of Sergiev-Posad, Taldom, Voskresenk, Shatura, Serpukhov and Serbryanye Prudy districts in Moscow region. In soil samples (total 156) the soil MR (24 h, 22°C, 60% WHC) were measured after preincubation procedure (7 d., 22°C, 55% WHC). The soil MR ranged from 0.13 (urban) to 5.41 μg CO_2-C g-1 h-1 (meadow), the difference between these values was 42 times. Then, the soil MR values (per unit soil weight) were calculated per unit soil area (1 m2), the layer thickness of which was 0.1 m (soil volume weight was equaled 1 g cm-3). The high MR values were noted for forests soil (832-1410 g CO_2-C m-2 yr-1) of studied districts, and the low MR values were for arable and urban soils (by 1.6-3.2 and 1.3-2.7 times less compared to forests, respectively). The MR rate of urban soil in Voskresenk district was comparable to that of corresponding meadows and it was even higher (in average by 2.3 times) in Serpukhov district. The soil MR rate of studied cities was higher by 20%, than in corresponding arable soils (438-517 g CO_2-C m-2 yr-1). Furthermore, we took into account the area of different ecosystems, which achieves 47% for forests, 6, 30 and 5% for meadows, arable and cities, respectively, of total area in studied districts. It turns that the soil MR of forests area was highest reaching 281-1391 thousand tons CO_2-C yr-1. The soil MR of meadows area was reached 15-76 thousand tons CO_2-C yr-1, that was by 1.6-2.7 times lower than those in cities of the most urbanized districts (Sergiev-Posad, Voskresenk and Serpukhov). Suggested approach allows us to compare soil MR (main biogenic CO_2 source) of different ecosystems' area in Moscow region. It was shown that urban soils might be significant source of CO_2 in atmosphere, therefore they should be taken into account for balance calculation of carbon cycle, and especially at regional level. This approach might useful for express assessment of microbial soil CO_2 efflux, soil ecological monitoring, and predictive estimation of soil CO_2 efflux for a wide range of ecosystems, including human activities disturbed ones.