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Root and microbial respiration from urban, agricultural and natural soils within the Moscow megapolis

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Urbanization is an important process of land-use change, which is increasing with the growth of population and abandonment of rural areas. Urbanization alters profoundly soil features and functions, among which soil respiration, which is one of the main carbon fluxes to the atmosphere. Soil respiration is the result of heterotrophic and autotrophic components, which are driven by biotic and abiotic factors. Little is known about soil respiration and its components in urban environments, which represent highly variable systems, characterized by different functional zones, types and intensities of urban management. In the present study we analyzed the spatial variability and temporal dynamics of total soil respiration (Rs) and its components, autotrophic (Ra) and heterotrophic respiration (Rh), from soils of different environments included in the Moscow megalopolis area. In particular we compared highly impacted areas urban green lawns with less anthropized ecosystems within the Moscow city: arable lands and urban forest sites. Experiments were set after snow melt and respiration fluxes were analyzed during the whole summer period till the beginning of the autumn. Data showed that Rs was significantly higher in the most disturbed sites, the green lawns, and showed the highest variability among the three analyzed land use types. Rh was the dominant component of soil respiration in all sites and did not vary significantly during the study period. However, significant differences was shown for the metabolic quotient qCO_2, estimated as heterotrophic respiration ratio to microbial carbon (Rh/Cmic). The most disturbed sites showed the highest qCO_2 within the lawn land use, followed by arable sites and forest sites, characterized by the lowest qCO_2. Ra contributed to total Rs only at a minor extent (26%) and increased in all study sites along the season following the phenological cycle of the plant communities. Ra absolute values and relative contribution to Rs did not change significantly among land use types. Overall, the high observed fluxes of CO_2 in urban lawns seemed to be driven by land management and disturbance impact on the microbial community