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ABSTRACT

Comparative estimation of methods for separating the root and microbial respiration in permafrost-affected soils

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Soil CO₂ production is an important integral indicator of soil biological activity and it includes several components: the root respiration and microbial decomposition of organic matter. Separate determination of the components of soil respiration is necessary for studying the balance of carbon in the soil and to assessment its potential as a sink or source of CO₂. The aim of this study was testing field methods of separate determination of root and microbial respiration in soils of north of West Siberia.

The research took place near the town Nadym, Yamalo-Nenets Autonomous District (north of West Siberia). The study area was located in the northern taiga with sporadic permafrost. Investigations were carried out at two sites: in forest and in frozen peatland.

3 methods were tested for the separation of microbial and root respiration. 1) "Shading"; 2) "Clipping" (removing the above-ground green plant parts); 3) a modified method of roots exclusion (It is to compare the emission of soils of "peat spots", devoid of vegetation and roots, and soils located in close proximity to the spots on which there is herbaceous vegetation and moss).

For the experiments on methods of "Shading" and "Clipping" in the forest and on the frozen peatland were established 12 plots, 1 x 1 m (3 plots in the forest and at 9 plots on frozen peatland; 4 of them - control). The criteria for choosing location sites were the similarity of meso- and microrelief, the same depth of permafrost, the same vegetation. Measurement of CO₂ emissions (chamber method) was carried out once a day, in the evening, for a week.

Separation the root and microbial respiration by "Shading" showed that in the forest the root respiration contribution is 5%, and microbial - 95%. On peatlands root respiration is 41%, 59% of the microbial. In the experiment "Clipping" in peatlands root respiration is 56%, the microbial respiration - 44%, in forest- root respiration is 17%, and microbial respiration is 83%. A modified method of roots exclusion was tested during field trials in the areas of localization of "peat spots". It showed the following results: 41% of root respiration and 59% of microbial respiration. So, the contribution of root respiration in forest depending on the method varied from 5 to

17%, and on peatland root respiration varied from 41 to 56%.

Thus, all methods gave positive result and are suitable for the separate determination of root and microbial respiration in permafrost-affected soils. However, for a more accurate assessment is necessary to increase the number of replications and the experiment period.