CARBON AND NITOGEN ISOTOPES IN FOREST SOILS OF THE MIDDLE TAIGA SUBZONE OF CENTRAL SIBERIA

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Taiga ecosystems are the active reservoir of organic matter that is very important due to the global problems such as climate warming. The analysis of isotope composition for nitrogen and carbon allows investigating the mechanism of processes in soil development (Robinson, 2001, Hobbie and Ouimette, 2009). The goal of this research was to study the features of forming the isotope structure of laying and soils for different forest types in the middle taiga of Central Siberia as well as to determine the pools of organic carbon and nitrogen.

The landscape complexes provided by various types of forests are typical for middle taiga subzone of Central Siberia. Our research was located in the southern part of Turukhansk region of Krasnoyarsky Krai. The collection of material was performed in lichen and moss pine forests near the ZOTTO – Zotino Tall Tower Observatory (60 °N, 89 °E). The first plot of our research was in the Ket-Sym lowland on a left side of Yenisei River. The second one was on a right side of Yenisei River and the collection of material was carried out in dark taiga with fir and spruce trees on the sublime ledge of the Central Siberian plateau. According to the forest zoning of the Siberian territory, it is located within the middle taiga Sym-Dubeches forest district. Typical soil of the area was podzol.

Samples of grass and shrubs, moss and lichen tier and laying were selected in each forest type by the method of hay crops in 10 recurrences (S = 50 cm^2) at the 10 m transect. In vitro samples were led up to absolute dry state. Samples from the mineral soil horizons were selected by the method of the cutting ring (V = 100 cm^3). Then, the soil samples were sifted through a sieve (2 mm) and were led up to absolute dry state. Before the element analysis, all the selected samples were homogenized by crushing in a vibration mill of MM 200. Content of the general carbon and nitrogen and also their isotope structure ($\delta^{13}C$ and $\delta^{15}N$) were defined on the element analyzer (Vario EL cube, Elementar, Germany) connected to an isotope mass spectrometer (IsoPrime100, Elementar, Germany).

According to the obtained data, the soil organic matter (SOM) in a laying of the dark coniferous forest varied from 609 to 4697 g/m^2, in the lichen pine forest from 448 to 4151 g/m^2 and in the moss pine forest from 1220 to 2966 g/m^2. The highest content of $\delta^{13}C$ was identified in the litter of spruce-fir forests and the lowest one in the lichen pine forests (-28.85 ‰ and -29.45, respectively). Content of $\delta^{15}N$ in the organic horizons authentically did not differ among various forest types. The laying of lichen pine forests contained more C and N than in laying of dark coniferous forest.

In a soil profile at the lichen pine forest, the content of C and N naturally decreases with depth. Respectively, the relation of C/N is narrow with depth with 45 to 6. Content of $\delta^{13}C$ isotope increases greatly with depth. Concentration of $\delta^{15}N$ on a profile is uneven.

The main inventories of carbon in forests of the Sym-Dubches forest district accumulate the laying horizon. Distinctions in content of C and N and their isotope structure in laying tier and soils are caused by hydrothermal conditions, extensive development of a live ground cover and also by degree of a mineralization and transformation of organic substance in soils.

References

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