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To the soil genesis in tundra-forest ecotone belt in the Northeastern European Russia

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Ecotone belt representing the gradual transition between different bioclimatic zones (taiga and tundra) is of specific research interest. This transition zone is characterized by variety of landscapes and soil cover affected by climate changes which were accompanied with shifts of natural zones during Holocene. Paleoclimate changes had complicated the specifity of pedogenesis in the ecotone. The aim of the study was to reveal soil geneses in forest-tundra ecotone zone. The study area is characterized by drained topography and soil forming deposits represented by silty loams covering watersheds, permafrost is massive island and up to 50 m thick, permafrost table located at depths of 0,5-8 m. Vegetation cover is birch-spruce light forests where lichen-moss ground cover dominates, tree height is up to 4-6 m. Fe-illuvial svetlozoms (according to Russian classification 2004) were chosen as the study objects. According to WRB (2007) these soils are classified as Cambisols.

In this soil study the complex approach was used, it includes (i) analysis of both structural organization and differentiation of functioning products on undisturbed monolith structure using mezo-micromorthologic methods; (ii) reveal of main soil-forming processes based on physical-chemical soil analysis. Quantitative chemical analysis has been conducted at an accredited laboratory “Ecoanalit” affiliated at Institute of Biology Komi SC UB RAS (Syktyvkar).

Studied Cambisols are developed in upland forest sites located in the forest-tundra subzone. These soils are recognized by combination of podzolic, Fe-illuvial and cryomethamorphic horizons in the soil profile. Using of present-day methods and approaches for soil profile studies allowed to reveal the polygenesis of Cambisols which structure represents two pedogenic stages. The basis to determine these stages are the morphological features (structural organization, differentiation of cutan complex) as well as recent and inherited features of pedogenic and cryogenic processes. Upper soil has signs of present-day “cryogenic” evolution phase: features of migration of Al-Fe-humus complexes down profile. Middle and lower part of soil profile have features of taiga soil formation occurred during the Middle Holocene. Taiga stage of soil formation could be diagnosed by the presence of fragments of clay cutans and humic pedorelics. Destruction of cutan complex is a result of sharp climatic cooling occurred in Subboreal period when cryomethamorphic horizon was formed. The similar type of profile structure could be explained by specifity of soil evolution in the transition zone impacted by repeated tree line shifts during Holocene.

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