Geophysical Research Abstracts
Vol. 19, EGU2017-1004, 2017
EGU General Assembly 2017

Mineralogical composition changes of postagrogenic soils under different plant communities.

Nikita Churilin, Natalia Chizhikova, Evgheni Varlamov, and Alexandra Churilina

V.V. Dokuchaev Soil Science Institute, Soil Mineralogy and Micromorphology, Moscow, Russian Federation (nikitachur@ya.ru)

Plant communities play the leading role in transformation of soil. The need of studying former arable lands increases due to large number of abandoned lands in Russia. It is necessary to study mineralogical composition of soils involved into natural processes to understand the trends of their development after agricultural activities in the past.
The aim of the study is to identify changes in mineralogical composition of soils under the influence of different plant communities.
Soils were sampled in the south of Arkhangelsk region, Ustyansky district, near Akichkin Pochinok village. Soils are formed on clay moraine of Moscow glaciation. Soil profiles were dug on interfluve. We selected 4 plant communities on different stages of succession: upland meadow with domination of sod grasses (Phleum pratense, Agrostis tenuis), 16-year-old birch forest where dominants are herbaceous plants such as Poa sp., Chamerion angustiflium, Agrostis tenuis, 16-year-old spruce forest with no herbaceous vegetation and 70-year-old bilberry spruce forest with domination of Vaccinium myrtillus and Vaccinium vitis-idaea.
To separate soil fractions <1 micron, 1-5 micron and 5-10 micron samples were rubbed into a thick paste and sedimented. Oriented preparations of fractions were examined by XRD method.
The results show that podzol processes lead to significant changes of mineral content. We noticed a clear differentiation of studied soils both in the content of fraction and composition of minerals.
Mineralogical composition and major mineral phases correlation of profiles under 70 years and 16 years of spruce forests are different. Mineralogical content in upper part of profile under the young spruce is more differentiated than in old spruce forest: the amount of quartz and kaolinite increases in upper horizon, although in this case the overall pattern of profile formation of clay material during podzolization remains unchanged.
There is more substantial desilting under the birch forest, compared with profile under the spruce of same age within top 50 cm.
Under the meadow vegetation we've discovered differentiation in mineral composition. Upper horizons contain smectite phase and differ from the underlying horizons by predominance of chlorite-vermiculite kaolinite and high amount of quartz.
All profiles are characterised by accumulation of quartz in upper parts (due to its weathering resistance) and reduction of its content with depth.
The 16-year-old spruce forms conditions for differentiation of fine minerals in profile. Acidic spruce litter creates conditions for differentiation of native arable horizon in distribution of 1-5 micron fraction. This results in accumulation of quartz at the surface while content of chlorite decreases twice as compared with underlying horizons.
We'ye noticed less differentiation in profile under the birch forest: accumulation of quartz in the range of 10%, chlorite - 2-3% compared to the lower part of profile.
Under the meadow vegetation the differentiation in quartz is more than 4% and chlorite is less than 2% comparing arable and subsurface horizons.
This mineralogical research confirms significant trend toward the development of profile differentiation in row from old spruce forest to the soil under meadow.