



Assessment of vertical soil solid phase transport (pedoturbations) in different types of land use by magnetic tracer method (Belgorod region, Russia)

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New method of quantitative assessments of vertical soil solid phase transport (pedoturbations) is based on redistribution of spherical magnetic particles (SMP) in soil profiles. SMP – are fly ash components, which mainly produce during coal burning. The main sources of SMP on studied object were locomotives on the railroads, which used coal at the turn of the XIX century. SMP income into the soil only from the atmosphere, very stable for destructions, can be preserved in soils for centuries, and have the same size and weight as the soil matter. So SMP redistribution reflects soil solid phase transport. SMP used as tracers of soil erosion (Olson et.al., 2013), but for the first time applied for quantitative assessments of pedoturbations.

In Belgorod region of Russia studied vertical distribution of SMP in soils in different types of land use: a) arable chernozem about 160-year plowing, b) arable chernozem 120-year plowing, c) dark-gray forest soil, which didn't plow at least last 150 years. All three sites are located nearby for the same physical-geography conditions. Distribution of SMP studied layer by layer (thickness of the layer 7 cm) from the top to 70 cm depth, in triplicate soil columns in every land use type (totally 90 soil samples).

The period of SMP kept in studied soils is about 115 years. Revealed the different depth of SMP penetration (burial) in soil profiles for this period: 49 cm in the soil of 160-year arable land, 58 cm in the soil of 120-year arable land and 68 cm in the virgin forest soil. Different depth of SMP penetration is connected with different activity of pedoturbations, which differs according to the composition of soil flora and fauna, root activity, and animal mixing work. It is supposed that in the arable land single cropping can reduce the thickness of the active layer and as a result the zone of active pedoturbation depth.

Based on SMP distribution counted rates of vertical soil solid phase transport, which are equaled: 31 t/ha/year in the soil of 160-year arable land, 28 t/ha/year in the soil of 120-year arable land, 24 t/ha/year in the virgin forest soil. Certainly raised rates of vertical transport in arable land relative to forest is connected with agricultural plowing. Revealed the connection between the period of plowing and rates of vertical soil transport. Also worth noting is that the rates of pedoturbation in virgin forest soils are rather high and only 1,2-1,3 times less than on arable land uses.

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1. Olson K.R., Gennadiyev A.N., Zhidkin A.P., Markelov M.V., Golosov V.N., Lang J.M. Use of magnetic tracer and radio-caesium methods to determine past cropland soil erosion amounts and rates // *Catena*. – 2013. – V. 104 – P. 103–110.