



The assessment of solid-phase organic matter transport in soils with the use of the magnetic tracer method

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Soil organic matters are important product of soil-forming processes, which affects soil fertility, structural, and other soil properties. In addition, soil organic carbon (SOC) stocks of the soil are an significant reservoir of global carbon stock. In this paper we made an attempt to quantify the mass of carbon transported in the solid phase, in the watershed forest-steppe zone (Tula region). The basic erosion and accumulation zone of SOC was identifying in the watershed. Assume the factors that influence the distribution of SOC stocks in the watershed.

We used the magnetic tracer method, allowing estimating the volume of soil substance, which transport in solid form. It is based on an assessment of the distribution fly ash in soils. Fly ash drop to the soil surface evenly, and their movement in the soil - it is the result of solid-phase migration. To calculate the volume of transported organic matter, we have assumed that the substance being transferred to the same extent saturated with humus, as well as the substance of the arable layer of chernozems.

The transport of SOC in forest-steppe landscapes occurs in the form of dissolved organic carbon (DOC) in runoff water and particulate organic carbon (POC) in erosion sediments. The humus in chernozems is mainly in solid form and therefore poorly transport in a dissolved form. Thus, the calculation of the solid-phase soil material produced by the magnetic tracer method [1], the calculation of the transported POC - by multiplying the humus content on the amount of the transported solid-phase soil material.

The object of study was a small watershed area of 0.96 square kilometers, in the Central Russian Upland, Tula region, Russia. Watershed fully plowed, except the steep slopes of the ravine. Predominant soil is a Luvic Chernozems. Within a watershed along 10 catens selected 70 samples from two depths (0-25 and 25-50 cm). In the samples was determined by total organic carbon content and the content of spherical magnetic particles (the basic component of fly ash). Discussion revealed regularities of the spatial distribution of erosion and accumulation processes set out in Article [1].

We obtained the following results. On average, the catchment for 100 years moved about 35 percent SOC of the total reserves of humus layer 0-50 sm. Redeposit about 20 percent of all stocks of SOC. Brought outside arable area about 15 percent of organic matter. Estimates of volumes are preliminary, for a more accurate assessment is necessary to determine the proportion of tightly bound carbon fraction in the total stock, as well as search non-eroded plot with reference values of stocks fly ash and humus.

There is significant between the distribution humus and fly ash, $r = 0.38$ at $p < 0.00$ ($n = 70$). The high Pearson coefficient (0.7-0.8) appear on slopes with exposure to the south and east. Opposite, the low relationship observed in catens, located in the bottom of arable hollows.

Results show, that lateral migration of soil solid-phase material has a significant impact of humus content in the forest-steppe watershed.

[1] Gennadiev, A. N., et al. Lateral migration of soil solid-phase material within a landscape-geochemical arena detected using the magnetic tracer method. Eurasian Soil Science 46.10 (2013): 983-993