Regional Assessment of soil organic matter profile distribution in the boreal forest ecosystems of Russia

Joulia Meshalkina (1,3), Nataliya Belousova (2), and Ivan Vasenev (3)

(1) Soil Science Faculty of Moscow Lomonosov State University, Moscow, Russia, (2) Dokuchaev Soil Science Institute, Moscow, Russia, (3) Laboratory of Agroecological Monitoring, Ecosystem Modelling and Prediction, Russian Timiryazev State Agrarian University, Moscow, Russia

Boreal forest ecosystems play one of the key roles in the Global Change challenges responses. The soil carbon stocks are principal regulators of their environmental functions. Boreal forest soil cover is characterized by mutually increased spatial variability in soil organic matter content (SOMC) that one need to take into attention in its current and future environmental functions state assessment including the potential of regional soil organic matter stocks changes due to Global Change and inverse ones.

Knowledge of the regional regularities in SOMC profile vertical distribution allows improving their soil environmental functions prediction land quality evaluation. More than 900 profiles of SOMC distribution were studied using the database Boreal that contains data on Russian boreal soils developed in drained conditions on loamy soil forming rocks. These soil profiles belong to seven main types of forest soils of Russian classification and six major regions of Russia. The predomination of accumulation profile type was observed for all cases. Thus the vertical distribution of OMC in the profiles of boreal soils can be described as follow: the layer of maximum OMC is replaced by the layer of dramatic OMC reduction; then the layer of minimal OMC extends up to 2.5 m.

The layer of maximal OMC accumulation has the low depth of 5-15 cm. It carried out in different genetic horizons: A1, A1A2, A2, B, AB; sometimes it captures the A2B horizon or the upper part of the illuvial horizon. The OMC in this layer increases from the northern taiga to the southern taiga and from the European part of Russia to Siberia. The second layer is characterized by its depth and by the gradient of OMC decreasing. A great variety of the both parameters is observed. The layer of the sharp OMC fall most often fits with the eluvial horizons A2 or 2 or even the upper part of the t (textural) or Bm (metamorphic) horizons. The layer of permanently small OMC may begin in any genetic horizon, except the A1. The OMC in it ranges from 0.05 to 0.5%.

Organic matter stocks in the layer due to its high depth are comparable to the stocks of the top two layers, and sometimes exceed them. According to the database the depth of organic matter penetration is same in Podzolics (Albeluvisols Haplic) soils and Sod-podzolics (Albeluvisols Umbric) soils. It is noticeably deeply in Gley-podzolics (Albeluvisols Gleyic) soils, mainly because of the greater mobility of organic matter in the more humid and cold climates conditions. Also this may be explained by frequent trees falls. It was found that regional differences often exceed differences between soil classification types. So, the vertical distribution of soil organic matter content is not associated with the morphological profile in boreal genetic soil types. The organic matter profile of mountain analogues of different soil types has specific features: high OMC (3-5%), unstable penetration deepness.