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Soil characteristics as a proxy for long- and short-term environmental evolution during the second half of the Holocene of the Russian Plain

Fatima Kurbanova (1), Alexander Makeev (1), and Tatiana Puzanova (2)

(1) Lomonosov Moscow State University, Faculty of Soil Science, Soil Geography Department, Russian Federation (fkurbanova403@gmail.com), (2) Lomonosov Moscow State University, Faculty of Geography, Landscape Geochemistry and Soil Geography Department, Russian Federation

Geoarchaeological objects are widely spread on the East-European Plain and buried soils are often well preserved under fortification ramparts and burial mounds. There are numerous studies of the Holocene paleoclimatic variations. However, still, there is no clear picture of climatic trends during Late Holocene.
Buried soils of archaeological monuments are important archives of past environments. Properties of soil chronosequences are commonly used to make assumptions about the climate and vegetation of pre-existing landscapes.
The goal of the study is to use soils buried in various time scales in forest, forest-steppe and steppe bioclimatic zones as a proxy for paleo interpretations. A multi-disciplinary approach is based on a wide spectrum of analyses, including physical-chemical, biomorphic, morphological studies and radiocarbon dating. In a forest zone, we studied soils buried under tumulus of the Bronze Age (∼4200 yr. BP) and fortification rampart of the Early Iron Age (∼2000 yr. BP). Chronosequences of soils buried under five fortification ramparts and varied in age from 2500 to 1500 years BP were studied in the forest-steppe zone. Burial mounds of Bronze and Early Iron age were also investigated in the dry-steppe area.
Buried and surface soil of the forest zone showed similar morphology and key analytical features indicating close similarity of the landscapes in the study area that existed in past epochs and those that are present nowadays. Such characteristics as clay cutans are stable features and retain stability under climatic fluctuations. On the other hand, in a forest-steppe zone, boundaries of forest and steppe areas shifted as a result of changes in temperature and precipitation: in the case of warming, the boundaries of steppe landscapes moved northward, at more humid conditions forest penetrated into a steppe. In this area, dynamic soil properties like Greyzemic features and properties of the humus horizon can instantly emerge and disappear depending on natural conditions. Such soil characteristics as CEC, amount of highly soluble salts and secondary carbonates are very sensitive to slightest climate changes and could be indicators of the short-term evolution in a steppe area.