



Soils buried under Scythian fortification in the Southern forest-steppe area of the East European Plain as a key source for paleoenvironmental reconstruction

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The study of soil chronosequences (the latest investigations) confirmed that steppe and forest steppe areas of the East European Plain in the second half of the Holocene were influenced by considerable rhythmic climate variations with alternating colder and warmer, more arid and more humid stages. Landscape evolution for this period has not yet been fully studied in the southern forest-steppe area on the close border of the steppe zone. The Borisovka settlement allows studying environmental trends at the southern fringe of the forest-steppe zone since the Early Iron Age (2500 years BP) till now by comparing soils buried under fortification walls and surface soils. Landscape response to Late Holocene climatic cycles is studied based on detailed hierarchical morphological, analytical and micro-biomorphic research of a soil chronosequence which included a soil buried under a fortification earth wall of the Early Iron Age (Luvic Chernozem) and a surface soil (Chernic Greyzemic Luvic Phaeozem) in the southern forest-steppe area of the East European Plain (the Borisovka settlement). Both soils were formed on similar surfaces with the same lithology (non-carbonate loess underlain by carbonate loess), at the same elevation, and in close proximity to each other. The buried soil was truncated by approx. 40 cm and transformed by diagenesis. Taking this into account it was possible to reconstruct the soil formed by the time of burial under the earth wall and to classify it as (Chernic) Luvic Phaeozem. Soils of the chronosequence are polygenetic combining the features of forest and steppe pedogenesis. Humid (forest?) pedogenetic stage resulted in the Luvic features. The subsequent steppe pedogenesis resulted in the thick Mollic (Chernic?) horizon and krotovinas. The radiocarbon dating allow to bracket the steppe stage to the mid-Holocene Atlantic period (6750 ± 120 years CalBP). The next pedogenetic stage since the Early Iron Age was influenced by pedogenesis in the broadleaf forest environment. It resulted in the transformation of the upper part of the Humic horizon, further clay translocation and development of Greyzemic features in the upper part of the Argic horizon. Modern clay illuviation is presented by thin hypo-coatings. This paleopedological reconstruction is in line with other palaeoclimatic proxies like phytoliths and microbial genes. It was shown that the analysis of total microbial DNA is still a little-used, but promising method for studying the soil chronosequences. The studied Phaeozems indicate relative landscape stability at the southern boundary of the forest-steppe zone.

Fortifications of the Early Iron Age are not only indicators of landscape dynamics, but also the unique cultural heritage of the East European Plain. Further studies will link the critical stages of landscape evolution with the migration waves of the ancient tribes.

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