



## **Late Holocene environmental trends in the center of the Russian Plain\***

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Russian Plain in the second half of the Holocene is an area of rhythmic climatic variations. Temporal and spatial variability of climatic changes remains uncertain. Climatic rhythms entailed the transformation of the whole complex of landscape parameters, including soils. Early Iron Age in the center of the Russian Plain is the time broad penetration of sedentary tribes that introduced the culture of fortified settlements starting from the VII century BC. All studied soils are buried under the fortification earth walls of ancient settlements.

The complex landscape dynamics in the second half of the Holocene is revealed based on these studies. Thus, clear unidirectional trend of soil evolution associated with the onset of the forest to the steppe in Sub-Atlantic is recorded in the Southern Forest-Steppe areas. Indicators of such changes are the formation of cutan complex in the subsoil horizons and the appearance of uncoated sand and silt grains in the lower part of the Mollic horizon. Soil evolution results in the formation of modern polygenetic Luvic Phaeozems with features both of forest and steppe pedogenesis.

The study of soil chronosequence in the Central part of Forest-Steppe area revealed multidirectional landscape dynamic. The soil buried under the fortification walls of the Early Iron Age are similar to modern surface soils – Greyzemic Luvic Phaeozems Loamic. Clay cutans are recorded in the subsoil horizons, and abundance of uncoated sand and silt grains are present in the lower part of the Mollic horizons. The soils buried under the fortification walls of early Middle Ages (5th century AD) are presented by polygenetic Luvic Chernozems. Uncoated grains are absent in the Mollic horizon, carbonates are abundant in various forms: impregnation of plasma, soft and hard nodules and carbonate films over clay cutans. Clay cutans proved to be preserved from the previous (forest) stage. Due to a combination of stable and unstable features the soils of the Central Forest-Steppe areas are polygenetic indicating both forest and steppe pedogenesis.

Buried and surface soils in the Southern fringe of the Forest zone (Retisols) are quite similar in grain size distribution and both have well developed clay cutans. Microbiomorphoc analyses (pollen, phytolith, microbial genes) also confirm landscape stability since the Early Iron Age.

In conclusion, the Russian plain in the second half of the Holocene seems to be an arena of complex interactions of different civilizations. Ethnic shifts were largely determined by the climatic rhythms recorded in the buried soils of archaeological sites. In this regard, paleolandscape reconstructions are important for understanding the causes of ethnic shifts and migration waves. Fortification walls of the Early Iron Age and burial mounds of the Bronze 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 evolution with the migration waves of the ancient tribes.

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