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MORPHOLOGY OF PEDOGENIC CARBONATE ACCUMULATIONS IN THE HOLOCENE SOIL CHRONOSEQUENCES OF THE CHERNOZEM' AND KASTANOZEM' ZONES OF RUSSIA

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Paleosols preserved under artificial burial mounds are of major importance for depicting environmental changes in the steppe areas of Eurasia during the Middle-Late Holocene. Until now mostly field morphology and bulk physical and chemical properties were used for paleogeographical interpretation. The main aim of this work is to reveal a change of pedogenic carbonate accumulations (CA) in the Holocene steppe soil chronosequences and to understand their significance for paleoenvironmental reconstructions. Chronosequences of paleosols buried under barrows of the Bronze Age and Early Iron Age and the modern Chernozems (Northern Caucasus) and Dark Kastanozems (Southern Pre-Ural) have been studied. Morphology of CAs has been investigated on the different scales of soil mass organization – macro-, mezo-, micro- and submicromorphological levels.

In the chronosequence of Chernozems in the Northern Caucasus the size of the hard nodules and the halo of dissolved and redeposited calcite crystals surrounding these nodules in soil mass are the largest in the Modern Chernozems as compared with the paleosols of the chronosequence. Some dissolved carbonate material was carried out from the internal part of nodules and the residual recrystallized carbonates are packed looser, hence, the hard nodules are expanded. These changes indicate the incomplete dissolution of hard carbonate nodules due to increasing in humidity of climatic conditions since the middle of the Holocene. In the paleosols of different ages the other

CAs, more mobile than the hard nodules, appear. They are characteristic for the certain hydrological and temperature regime of the soil development. Among them calcified root cells with clear habit observed in paleosols buried at 3800-4000 years BP are indicative of distinctly contrasting climatic conditions (Becze-Deak et al., 1997). The occurrence of carbonate cutans and efflorescences in Bk horizon of paleosols buried at 1600-1700 years BP is connected with the total dissolution of CAs in the upper part of soil profile and subsequent redeposition of carbonates as a consequence of increasing of humidity at that time.

In the chronosequence of Dark Kastanozems in the Southern Pre-Ural one form of CAs, white soft nodules (WSNs), is only observed. In the paleosols of the Late Sarmatian Time (1700-1800 years BP) the WSNs have the largest size and quantity in Bk horizon as compared with the paleosols of the Savromatian Time (2500 years BP) and the modern Dark Kastanozems. Under the scanning electron microscope the WSNs in the paleosols of the Late Sarmatian Time appear as a compact homogeneous mass covered by thick layer of uniform and perfect crystals of calcite. In the modern Dark Kastanozems the former compact internal material of CA is cracked and has large etched holes. In the paleosols buried at the Savromatian Time the surface layer of crystals consists of calcite crystals of different size and imperfect habit. These observations allow us to conclude that the WSNs in the Late Sarmatian paleosols formed under the driest conditions as compared with other soils of the chronosequence studied. In the paleosols buried at the Savromatian Time (2500 years BP) the WSNs developed under the distinctly contrasting climatic conditions when the calcite crystals did not have enough time to form perfect habit. In the modern Dark Kastanozems the CAs are under the process of dissolution.

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