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The Pleistocene loess and Holocene alluvial sediments are dominant lithological members of Eastern Slavonia. The Upper Pleistocene loess/paleosol section "Šarengrad", representing the oldest loess deposits in the region, was investigated using field and laboratory research methods (GALOVIĆ, 2005). Investigated section is located on the south bank of the Danube River near Šarengrad in the easternmost part of Croatia. The section was investigated on the several vertical profiles with a total length of 16.20 m.

The section is characterized by interchange of loess horizons formed during glacial (stadial) periods and paleosols developed during interglacials (interstadials). Throughout the section, four paleosol levels, represented by B- and C-horizons, are recognized. A-horizons are eroded from all paleosols. The oldest, hydromorphic paleosol is followed by laminated alluvial sediment and the loess. The second paleosol is well developed dark brown soil, about 2 m thick. The other two soils are less developed brownish paleosols.

The laboratory investigations included X-ray diffraction analysis, grain size analysis (sieving and aerometry); microscopic analyses of light and heavy mineral fraction, chemical analyses of major and trace elements, determination of carbonate content by Scheibler procedure and determination of pH and TOC.

The mineral composition was determined by X-ray diffraction using Philips diffractometer with Cu*K*α radiation on ten randomly oriented powdered bulk samples of loess and different paleosols, as well as on their clay fraction (<2 μm) that was separated by sedimentation. The bulk mineral composition of all samples is typical of loess/paleosol sequences. Major phases are quartz, white mica, feldspars and chlorite, as well as carbonates (calcite and dolomite). The carbonates occur in very small amounts and lack in some samples of two older paleosols. Minor phases are amphiboles. Other heavy minerals as opâque minerals, chlorite, biotite, epidote–zoisite, amphibole, pyroxene, garnet, kyanite, staurolite, tourmaline, zircon, rutile, titanite, apatite and chromite are proved only by microscopic investigations. The clay fractions are composed mainly of illitic material, chlorite and smectite. Kaolinite, proved by DMSO, is present in negligible amount, and lacks in the third paleosol. Small amount of interstratified mineral with smectitic and illitic layers as well as chloritic and vermiculitic layers are also present.

The main grain size fraction is represented by silt. Higher content of clay fraction is present in paleosol horizons, especially in second, well developed soil where pedogenic process was intensive. The carbonate content is highest in BC- and C-horizons as a consequence of migration and accumulation processes. The only exception is the oldest hydromorphyc paleosol. The modal analyses show strongly abraded typical aeolian spherical grains characterized by pitted well-rounded surface. Paleosol horizons could be clearly extracted based on weathering coefficients, Ba/Sr, and $(CaO+Na_2O+MgO+K_2O)/Al_2O_3$ ratio. The content of REE, as well as trace elements, are higher in paleosol then in loess horizons. Elementary statistics shows no significant difference in chemical composition between profiles. Loess horizons contain <0.1% of TOC, while paleosol horizons contain between 0.1 and 0.5% of TOC. Based on TOC values, we can distinguish the sub-groups of samples selected according to the degree of soil development. The results of F- and t-tests show that weathering coefficient Ba/Sr fits the criteria of equality of variances and means in less developed paleosols and paleosols. Accordingly, the possibility that two sub-groups of samples belong to the same population cannot be rejected.

References

GALOVIĆ, L. (2005): Geochemical and mineralogical characteristics of the Pleistocene paleosols in loess profiles in eastern Slavonia and Baranja (in Croatian).– Unpubl. PhD Thesis, University of Zagreb, 278 p.

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