



Signs of pedogenesis in a loess-soil sequence: example of the Basaharc Double paleosoil (Basaharc, Hungary)

B. Bajnóczy (1), M. Tóth (1), E. Horváth (2)

(1) Institute for Geochemical Research, Hungarian Academy of Sciences, Budapest, Hungary,

(2) Department of Physical Geography, Eötvös L. University, Budapest, Hungary

(bajnoczi@geochem.hu, erzsebet.horvath@geology.elte.hu)

Soil carbonate and clay minerals as indicators of pedogenesis and paleoenvironment were examined in a Pleistocene paleosoil complex. The studied Basaharc Double (BD) paleosoil, a reference horizon in the Young Loess Series in Hungary, is a forest-steppe-like soil of most probably OIS 7 age.

BD paleosoil was sampled at its type locality: the former Basaharc brickyard located in the terraced valley of the Danube at the northern end of the Transdanubian Range (Pécsi & Hahn, 1987). In the 20 to 25 m thick loess-paleosoil sequence several paleosoil pedocomplexes occur, one of them is the Basaharc Double composed of upper BD1 and lower BD2 soil horizons with intercalating loess.

Various types of pedogenic carbonates (e.g. diffuse carbonate, nodules and concretions as “loess dolls”) are present, but in this study only forms and distribution of discrete, small scale precipitates were investigated in detail due to their environmental significance. The discrete small scale carbonate (less than a few millimetres in size) appears as calcified root cells and hypocoatings in and around root channels, calcite needles in pores and cavities and earthworms biospheroids. These small scale carbonate accumulations are also known from other loess-paleosoil sequences and their formation is related directly or indirectly to biological activity during pedogenesis (Becze-Deák et al., 1997).

Earthworm biospheroids and hypocoatings distribute uniformly in the sequence, while higher amount of calcified root cells was detected in the paleosoil layers than in the host loess suggesting longer stability of soil surface. Enrichment of needle-fiber calcite is typical for the upper BD1 horizon, but practically absent in the lower BD2

horizon and appears in very small amount in the host loess. Calcite needles formed by biomineralization of fungal filaments indicate the former fresh organic matter in BD1 decomposed by fungi. It is questionable whether needle-fiber calcite, which is rarely preserved in fossil soils, was later leached out from the lower paleosoil or it precipitated primarily in a very small amount.

Several clay minerals were identified both in paleosoil layers and in loess: chlorite, kaolinite, illite and smectite. Smectites are montmorillonite and beidellite. The latter is absent in the upper part and present in small amount in the lower part of BD1; however, it was detected in all but one sample of the lower paleosoil horizon. Beidellite is supposed to be transformed and gradually disappeared from the clay mineral spectrum during pedogenesis. Greater lack of beidellite in the upper paleosoil horizon may indicate higher grade of pedogenesis, and beidellite-bearing BD2 paleosoil is supposed to be less evolved.

This study is supported by the Hungarian Research Fund (OTKA D 048631).

References

- Becze-Deák, J., Langohr, R. & Verrecchia, E.P. (1997) Small scale secondary CaCO₃ accumulations in selected sections of the European loess belt. Morphological forms and potential for paleoenvironmental reconstruction. *Geoderma* 76, 221-252.
- Pécsi, M. & Hahn, G. (1987) Paleosol stratotypes in the Upper Pleistocene loess at Basaharc, Hungary. *Catena Supplement* 9, 95–102.