



Paleoenvironmental reconstruction based on the analysis of secondary carbonates - a case study from the Süttő loess-paleosoil sequence, Hungary

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The analysis of secondary carbonates is broadening our knowledge about the loess-paleosoil sequences through providing more information about the paleoenvironmental and climatic changes during the glacial-interglacial cycles. The Süttő section in Hungary is counted as a high-resolution archive of these changes, because it was recently studied with various methods including chronology, granulometry, malacology and magnetic susceptibility. The origin of secondary carbonates is connected with the resettlement of carbonates during the pedogenesis in the soil-sedimentary environment, in which the flow of bicarbonate solutions and biomineralization also played an important role. Secondary carbonates are very sensitive for the environmental changes: the various types are indicating different paleoenvironmental signals also through their amount and distribution. During the dust accumulation only patchy vegetation covered the surface. Through the formation of the loess horizons biomineralization was always inherited, which means that the microecosystem was moving even higher in the strata according to the velocity of the dust accumulation.

The uneven distribution of the secondary carbonates refer to gradual dust accumulation and patchy vegetation, while denser appearance indicates the absence or decrease of dust accumulation or a pause in the process. Leaching environments are characterized by partially or totally dissolved secondary carbonates. Calcified root cells are referring to dry conditions, more drier than hypocoatings do. Carbonate coatings provide information about the process of the leaching.

In the case study of the approximately 15 m thick Süttő sequence bulk samples were collected in 10 cm vertical resolution and analysed after wet sieving under an optical microscope. Chosen samples were examined under scanning electron microscope as well. Based on the new results of the luminescence dating the Süttő section was divided into six units on the grounds of the marine oxygen isotope stratigraphy. These units served as a basis for the paleoenvironmental reconstruction by reason of secondary carbonates. The results are in good agreement with the malacological and grain size analysis.

The MIS 6 unit could be characterized by alternating humid and dry periods: the inner wall of many hypocoatings are covered by carbonate membranes, which also occur on the internal wall of carbonate coatings. The alternating amount of carbonate coatings can deduce the leaching, which is also connected with the varying size of loess dolls.

The lower part of the MIS 5 unit contains the last interglacial paleosoil, which is well leached and provide limited information on secondary carbonates. Upwards in the section the climate could have been cooler and drier: weaker leaching characterised the two younger paleosols, which fact is also supported by the absence of loess dolls.

The great thickness of the MIS 4 unit is to be connected with the high dust accumulation rates in Europe. Upwards in this part the velocity of the dust accumulation was slowing down maybe also with breaks. The even drier conditions could also be traced upwards in the paleosoil of the MIS 3 unit, showed by the presence (and higher amount) of hypocoatings.

The thick loess deposit in the MIS 2 unit correlates well with the high dust accumulation rates in Central-Europe. Upwards in this section the velocity of the dust accumulation was slowing down (huge amount of HCs) and the climate was getting drier (significant amount of CRCs).