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Aspects of loess doll development with impacts on understanding the paleoenvironment

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Loess dolls are carbonate concretions in loess-paleosoil sequences which cause associations due to their various morphologies. They can either be found dispersed in loess deposits or right under paleosoils. Their formation is connected with leaching and reprecipitation processes. For the redistribution of carbonates infiltrating solutions play a major role. The formation of loess dolls occur in cavity systems of biogenic or abiogenic origin, which are well exposed to air and therefore have lower partial CO_2 pressure. Carbonates also precipitate around condensation nuclei, e.g. certain secondary carbonate types. With knowledge on morphological and structural properties of loess dolls specific hypotheses can be drawn on multiphase development history.

We collected five loess doll samples from the Paks sequence in Hungary and cut them into two parts for the following subsequent investigations: A) visualization of pore network and pore development by using high resolution micro-CT analysis, B) measurement of stable oxygen and carbon isotope compositions through high resolution sampling by a hand drill, and C) a thin section preparation in order to recognize recrystallization effects.

First results indicate that the loess dolls with prominent cavities allow to distinguish between different developmental phases. Their structural units are characterized by distinct stable oxygen isotope clusters. More compensated oxygen isotope compositions are characteristic of loess dolls that either owing a more homogeneous build-up or have disperserly scattered pores.

We discuss if stable isotope signals of these loess dolls are useful as paleoenvironmental proxies or if the signals are just suitable to differentiate between the development of structural phases. Eventually this work helps to clarify between the applicability versus doubts of a possible paleoenvironmental reconstruction based on loess dolls research.