CHARACTERIZATION OF PALEOSOL-LOESS AND THEIR MODIFICATION PROCESSES

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Paleosols' chemical and physical behavior depends on different processes, such as climate, reworking, weathering, and connection with different fluid systems. For this reason, it is important to know how we can distinguish among the different processes. This study focused on three different kinds of loess-paleosol systems (from Zebegény, Nagymaros, and Bátaapáti, Hungary). We analyzed the chemical and physical properties to understand the processes affecting the system. For this reason, granulometry, mineralogy, organic material, and susceptibility were also studied. The results show that the three paleosol-loess systems were not reworked, however, macro morphology suggested the opposite in two cases (Nagymaros, Zebegény). Furthermore, the climate in two cases was rainy (Zebegény, Nagymaros), and one was alternating (dry and rainy periods) during the paleosol formation. The main result of weathering is the clay mineral precipitation, mainly smectite in all areas.

Keywords: paleosol, weathering, reworking, granulometry, mineralogy

STUDY AREA: The Bátaapáti Loess Exposure (N 46°13'49.7"; E 18°36'28.9") is situated northeast of the village Bátaapáti in the Geresdi Hills. The hill is a loess-covered area, with its plateau surface barely reaching an elevation of 250 meters above sea level. The typical landform types of the hill include loess plateaus, interfluvial ridges, hillslopes, erosional and derasional (dry) valleys, and gullies (Balogh, Schweitzer 2008). The streams in the micro-region drain towards the adjacent hilly regions.

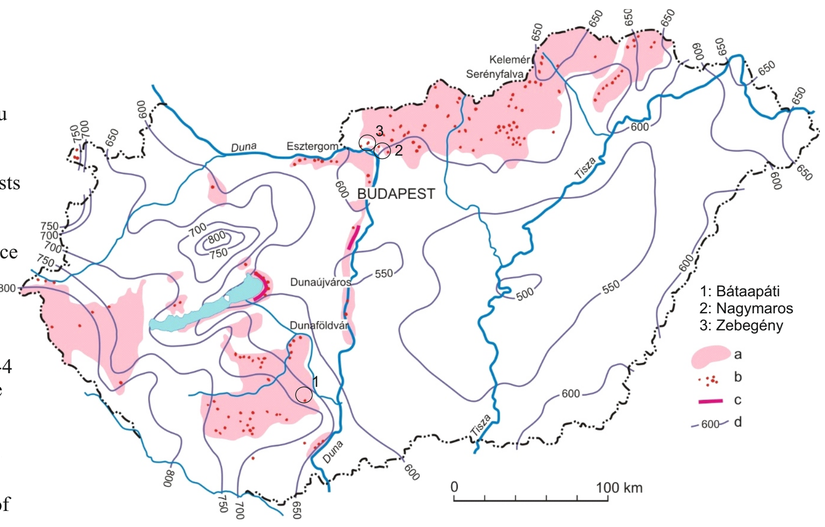
These hills represent remnants of the Upper Pannonian, Upper Pliocene piedmont, situated in the south-eastern foothills of the Mecsek Mountain. The basement rock of the Geresdi Hills consists of Paleozoic granitic-crystalline formations. Subsequently, a major stratigraphic hiatus is observed, followed by the deposition of Miocene Helvetian (Carpathian) terrestrial conglomerates, sandstone, variegated clays, as well as Pannonian clay, silty clay, sand, and sandstone layers. These geological units are overlain by thick Quaternary loess deposits, which are further characterized by loess-paleosol sequences (Császár 1997). The hill's surface is predominantly covered by brown forest soils. Sediment sampling was conducted from the loess–paleosol sequence located in one of the left tributary valleys within the Huta stream's drainage basin, known as the Nyár or Naspolya valley. This 250 cm sequence includes two middle Pleistocene loess layers separated by a paleosol layer.

The Zebegény Loess Exposure (N 47°48'05.5"; E 18°54'42.3"; 115 m asl) and the Nagymaros Exposure (N 46°13'49.7"; E 18°36'28.9"; 125-127 m asl; Pécsi 1959) are situated in the southern foreland of the Börzsöny Hills, within the Danube Bend region, also known as the Visegrád Gorge.

In this river bend, the Danube has developed an antecedent valley between the Börzsöny and Visegrad Hills since the Middle Pleistocene (Riss) period (Pécsi 1959). The Danube has formed 3-4 terraces here and receives several tributaries from the adjacent regions (Ruszkiczay et al. 2005). The region reaches its lowest point at an elevation of 105-107 meters above sea level, while the highest areas of the surrounding hills range from 480 to 600 meters above sea level.

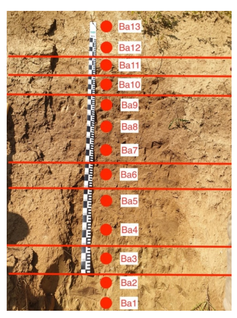
The basement rock primarily consists of Miocene andesite and dacite, with some areas also containing littoral-sublittoral limestone (Rákosi Limestone Formation, Korpás 1990) and sandy gravel. These geological units are overlain by thick Quaternary deposits, including fluvial deposits (sand and gravel) of the Danube and its tributaries, thick loess-paleosol sequences that cover the older terraces, as well as older and younger delluvial and colluvial sediments.

The Zebegény Exposure is situated on the Malom Stream's small terrace, which is 200 meters north of the confluence with the Danube. The Nagymaros Exposure is located on terrace No. III of the Danube developed in the Middle Pleistocene (Riss).



Bátaapáti

Reworked?



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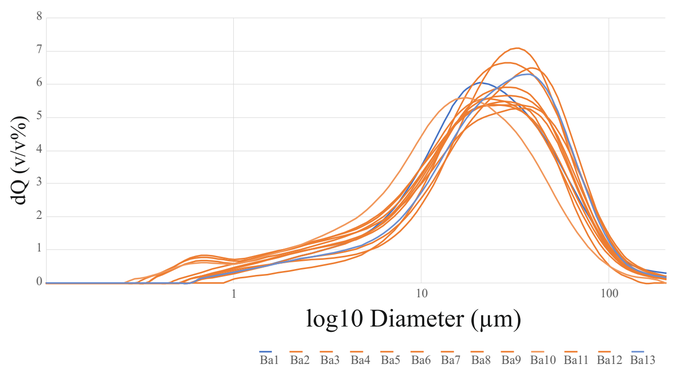

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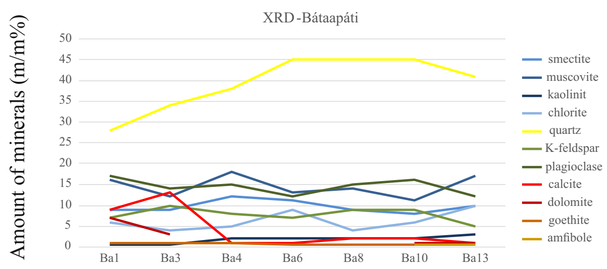

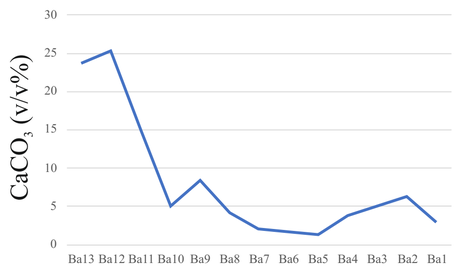

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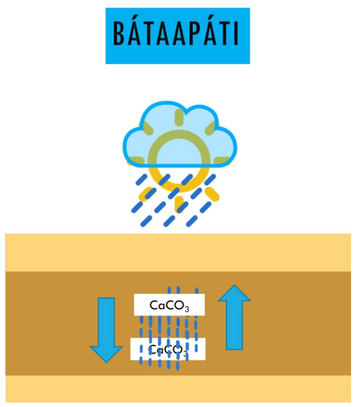
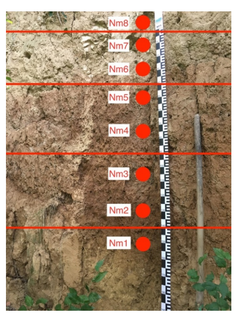
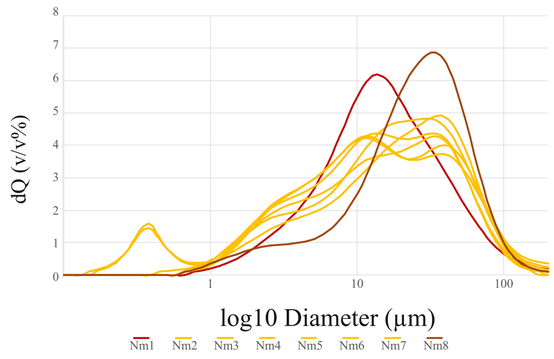


Nagymaros

Reworked?



MAYBE



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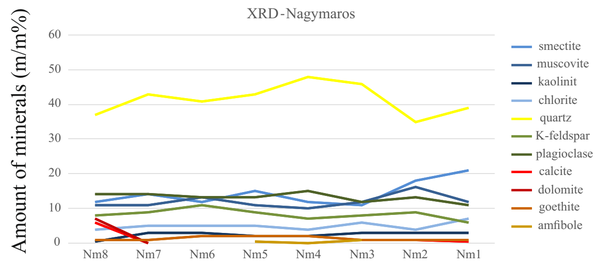

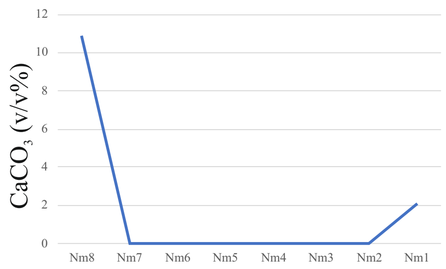

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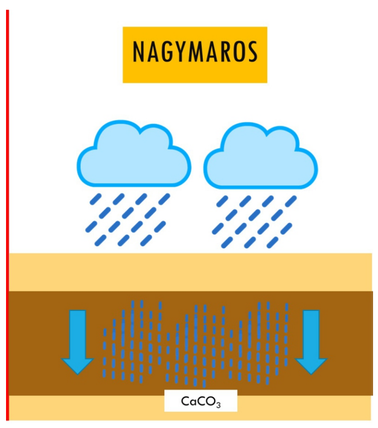
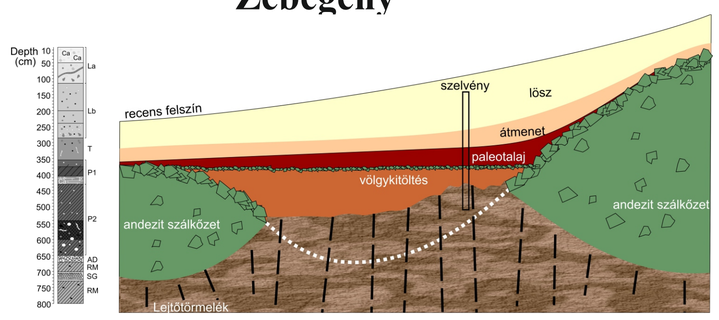


Zebegény

Reworked?



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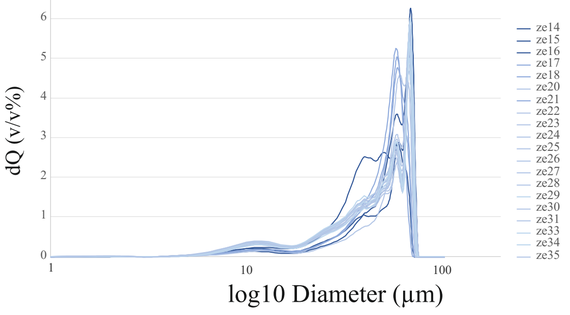

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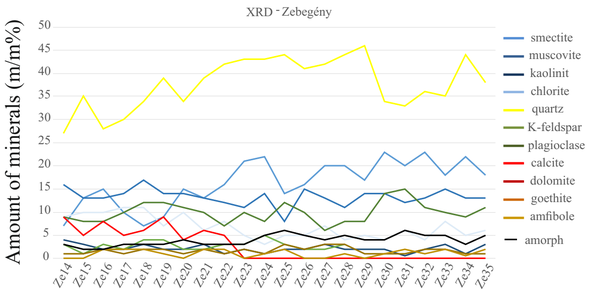

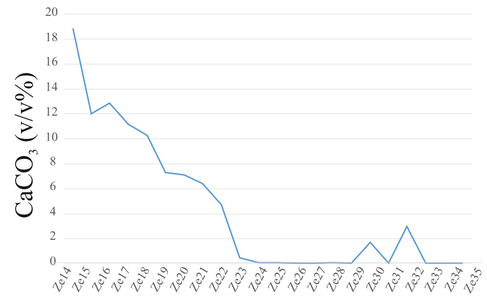

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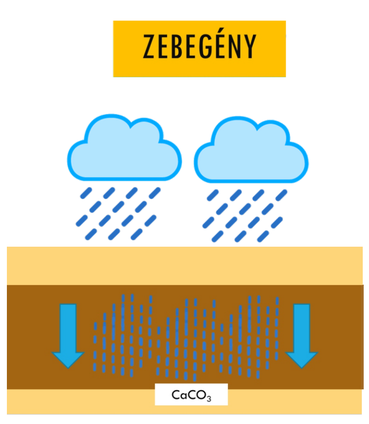

CONCLUSIONS

1) Complex grain size distribution curves themselves do not necessarily indicate that a loess-paleosol sample has been reworked; they may form during weathering processes.
2) Carbonate content can be a useful indicator for studying whether a sequence has been reworked or not. Changes in carbonate precipitation can signify reworking. However, if the original soil also contains carbonate, alteration in carbonate levels within the sequence may result from alternating climatic conditions.
3) Different types of clay minerals can provide insights into estimating the temperature at which soils were formed.

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