*Geogr. Fis. Dinam. Quat.*
*21 (1998), 15-17, 3 figg., 1 tab.*

SZABOLCS CZIGÁNY (*)

# PALEOENVIRONMENTAL IMPLICATIONS OF A LOESS PROFILE IN S-TRANSDANUBIA, HUNGARY

**ABSTRACT:** CZIGÁNY S., *Paleoenvironmental implications of a loess profile in S-Transdanubia, Hungary.* (IT ISSN 0391-9838, 1998).

Investigations of loess profiles have started recently in the N and S forelands of the Villány Hills and in the Mecsek Mountains. Detailed laboratory analyses are expected to provide new information on Pleistocene geomorphic evolution and on the nature of paleosols formed on ancient surfaces.

The horizontal distribution of paleosols found in the loess profiles of the N foreland indicate that the erosionally remodelled dry valleys of N to S alignment developed as early as the second half of the Pleistocene.

The reddish tint in the paleosols of the loess sequence overlying the *lapiés* surfaces of the limestone mass of the Mecsek seem to show that products of limestone weathering were also involved in soil formation. In the intermountain area well-developed and deep paleosols of medium brown colour are characteristic. The underlying loess of horizontal microstratification proves the reworked nature of paleosol horizons.

KEY WORDS: Loess Paleosoil, Pleistocene, S-Transdanubia, Hungary.

**RIASSUNTO:** CZIGÁNY S., *Implicazioni paleoambientali di un profilo di loess nella Regione Transdanubiana meridionale (Ungheria).* (IT ISSN 0391-9838, 1998).

Ricerche su profili di loess sono iniziati recentemente nel nord e nel sud delle Villany Hills e nei Monti Mecsek. Dettagliate analisi di laboratorio dovrebbero fornire nuovi dati sull'evoluzione geomorfologica nel Pleistocene e sulla natura dei paleosuoli formati su antiche superfici.

La distribuzione orizzontale dei paleosuoli trovata nei profili di loess dell'avampaese indica che le valli secche rimodellate dall'erosione si sono sviluppate sia nella prima parte del Pleistocene sia nella seconda.

Il colore rosso dei paleosuoli che ricoprono superfici a *lapiez* dei calcari di Mecsek sembrano dimostrare che i prodotti della alterazione dei calcari sono stati coinvolti nella formazione dei suoli. Nell'area intermontana sono caratteristici ben sviluppati e profondi suoli bruni. Il sottostante loess con microstratificazione orizzontale prova la rielaborazione degli orizzonti dei paleosuoli.

TERMINI CHIAVE: Loess, Paleosuolo, Transdanubiana Meridionale, Ungheria.

(*) *Janus Pannonius University, Ifjusag 6, H-7624 Pécs, Hungary.*

## THE LOESS PROFILE OF BUKKÖSD VALLEY

Loess deposits in Hungary (fig. 1) are well studied Pécsi, 1965, 1967; Pécsi & *alii*, 1977, 1988). In the S part of Transdanubia, however, some profiles, known from the N and S forelands of the Villány Hills and in the intermountain area between the Villány Hills and the Mecsek Mountains, have not yet been analysed in proper depth. Author's observations already allow some conclusions for the geomorphic evolution of this hill region.

At one of the sites studied in the valley of the Bükkösd stream (W-Mecsek Mountains), the Budapest-Pécs railway exposes a 3.5 to 4 m deep loess mantle over Triassic (Anysian) limestone. This loess sequence includes two paleosols of reddish colour, in contrast with the brown forest soils prevalent in the region. Since the lower one directly overlies the limestone, it is presumed that soil formation took place directly on the corroded limestone surface. The paleosol probably covers an Upper Pleistocene *lapiés* surface.

The upper paleosol horizon also shows a reddish tint. It may have also formed on the karstic surface of the Mecsek Mountains and was subsequently removed and deposited in its present place. This is confirmed by the sharp boundary with the underlying loess. If it were an *in situ* paleosol, there should be gradual transition towards the underlying loess. It seems probable that the plaeosols included in the loess of the Mecsek were redeposited over an eroded surface.

The study of an exposure in valley-side position (near the village Görcsöny) points to the development of valleys of 10 to 20 m relative depth as early as the second half of the Pleistocene. In the profile at 15 m depth sand strings indicate Upper Pleistocene fluvial erosion. This stage was followed by a quiet period with undisturbed loess formation. Then another spell of revived erosion and accumula-

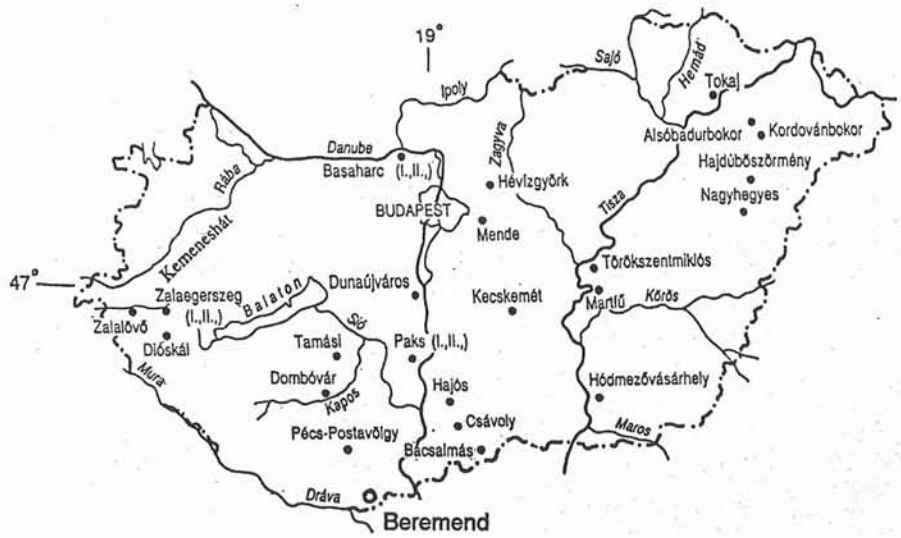


FIG. 1 - Key loess profiles in Hungary with the location of the Beremend profile.

tion followed and as a result a soil of considerable thickness was redeposited over the loess with a markedly sharp contact. The recent soil developed on this paleosol.

The contrast of horizons is marked for all properties including humus (fig. 2) and phosphorus content (fig. 3). Humus, $CaCO_3$ and phosphorus contents of grayish-blackish chernozem-like and reddish terra rossa-like paleosols in the S foreland of the Villány Hills of the intercalated loess pockets vary regularly in the profile.

## DISCUSSION

The findings of laboratory analyses allow to draw conclusions about the climate during loess formation. Particularly important is the information of grain size distribution, $CaCO_3$ content, hygroscopy (hy), humus and phosphorus content (tab. 1) for estimating aridity (Pécsi & *alii*, 1988).

The loess profile studied in detail lies on the N margin of the Beremend limestone horst, the southernmost member of the imbricate structure of the Villány Hills, utilised for cement production. The exposure itself is located in a small depression in the Lower Cretaceous (Aptian-Albian) limestone. The 130-140 m wide and 12-12.5 m high exposure is dissected by five well-developed paleosols (P13 to P9). The fourth paleosol horizon below the surface (P11) is a dell fill to be observed at the whole length of the profile.

An interesting aspect of the profile is the reddish colour of the lower paleosols (deriving from iron oxides). On this ground they are grouped with warm loess (Obruchev, 1945). The profile may contain the oldest loess horizons in the Carpathian Basin, although there has been no opportunity for precise dating until now. Age estimation was promoted by the investigation of a borehole S of Pécs (by F. Schweitzer and M. Pécsi). In the samples taken from here, a marker horizon with a high $CaCO_3$ content points to comparison with the now studied loess profile.

The findings make it probable that the two lower loam horizons (P13 and P12) correspond to the Paks Double Soil Complex developed under Mediterranean climate.

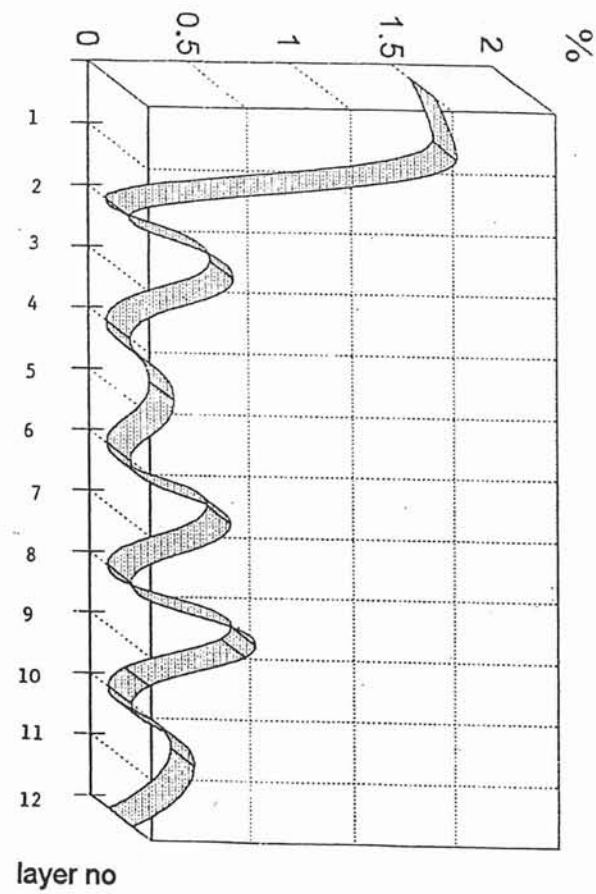


FIG. 2 - Humus contents in the layers of the Beremend profile (by Czigány).

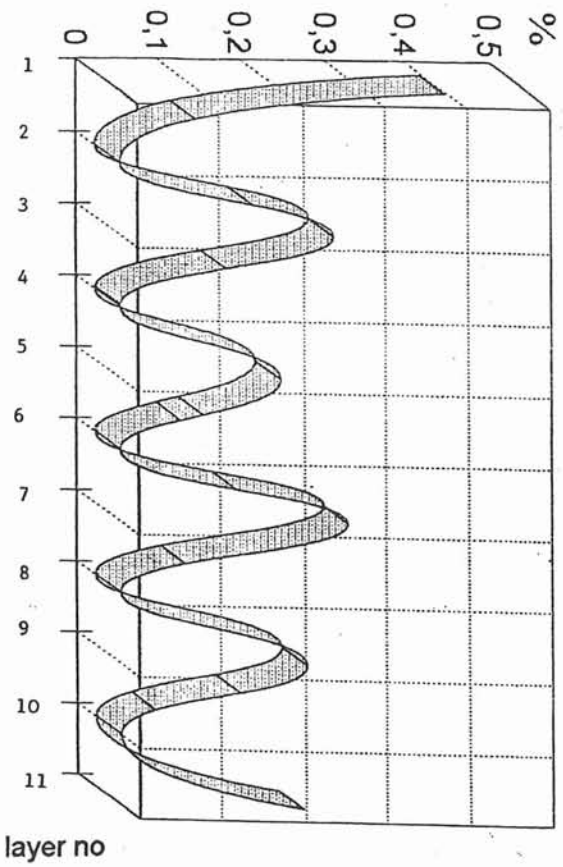


FIG. 3 - Phosphorous contents in the layers of the Beremend profile (by Czigány).

Therefore, these paleosols are somewhat younger than the Brunhes/Matuyama boundary (0.69 Ma BP).

The first results of the investigation suggest that the youngest paleosols of the profile could have developed in the more humid and somewhat warmer interglacial or interstadial stages of the Lower Pleistocene. The transition from brown forest soil to the chernozem type points to climate change. This is also supported by increasing values for humus content, hygroscopy and phosphorus content (tab. 1).

TABLE 1 - Results of laboratory analyses for the Beremend profile

| layer no | layer (cm) | $CO_3^{2-}$ (%) | humus (%) | P (%) | Hy (0-1) |
|---|---|---|---|---|---|
| 1. | 0 - 55 | 10.80 | 1.51 | 0.4 | 0.083 |
| 2. | 55 - 315 | 13.34 | — | | 0.036 |
| 3. | 315 - 390 | 4.69 | 0.4 | 0.22 | 0.085 |
| 4. | 390 - 450 | 17.61 | — | | 0.03 |
| 5. | 450 - 575 | 3.11 | 0.2 | 0.17 | 0.052 |
| 6. | 575 - 690 | 16.11 | — | | 0.042 |
| 7. | 690 - 780 | 4.4 | 0.42 | 0.25 | 0.062 |
| 8. | 780 - 940 | 21.42 | — | | 0.036 |
| 9. | 940 - 1035 | 1.42 | 0.53 | 0.2 | 0.056 |
| 10. | 1035 - 1130 | 36.28 | — | | 0.032 |
| 11. | 1130 - 1195 | 1.55 | 0.34 | 0.18 | 0.057 |
| 12. | 1195 - | 38 | | | 0.028 |

## REFERENCES

OBRUCHEV V.A. (1945) - *Loess types and origin*. Amer. Jour. Sc., 243, 256-262.

PÉCSI M. (1965) - *A Kárpát-medencebeli lösszök, lösszerü üledékek típusai és litosztratigráfiai beosztásuk* (Types and lithostratigraphical classification of loess and loess-like deposits in the Carpathian Basin). Földr. Közl., 13 (4), 305-356.

PÉCSI M. (1967) - *A löszfeltárások üledékeinek genetikai osztályozása a Kárpát-medencében* (A genetic classification of deposits in loes profiles in the Carpathian Basin). Földr. Ért. 16 (1), 1-9.

PÉCSI M., PÉCSI-DONÁTH, É., SZEBÉNYI E., HAHN GY., SCHWEITZER F. & PEVZNER M.A. (1977) - *A magyarországi lösszök fosszilis talajainak paleogeográfiai értékelése és tagolása* (A paleogeographical evaluation and division of paleosols in the loess of Hungary). Földr. Közl., 25 (1-3), 94-137.

PÉCSI M., GEREI L., SCHWEITZER F., SCHEUER GY. & MÁRTON P. (1988) - *Ciklikus éghajlatváltozás és rosszabbodás visszatükrözése a magyarországi lösszök és eltemetett talajok sorozatában* (Cyclic climate changes and deterioration as reflected in the loess-paleosol sequences of Hungary). Időjárás, 92 (2-3), 75-86.