# Paleoenvironmental anaysis of two loess profiles at the Ságvár Lyukas Hill in western Hungary

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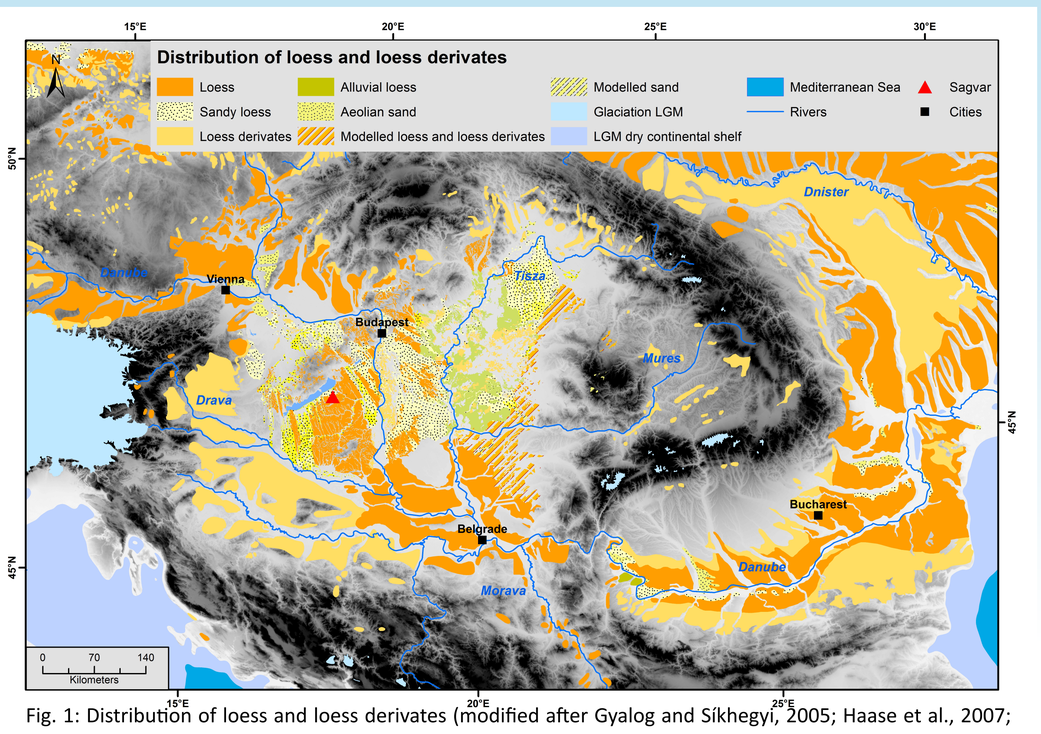


Fig. 1: Distribution of loess and loess derivates (modified after Gyalog and Síkhegyi, 2005; Haase et al., 2007; and Vandenberghe et al., 2014). The expected extend of the dry continental shelf (Willmes, 2015) and glaciers (Ehlers et al., 2011) during the LGM are indicated. The sampled section is shown with a red triangle.

## Introduction & Methods

The Ságvár Lyukas Hill is situated in the hilly loess area of Somogy Hilly region in Hungary, ca. 12 km south-east of Siofok at Lake Balaton. It exhibits an Upper paleolithic site and is located in a loess landscape with dominantly northwest-southeast striking valleys and landforms suggested to be of eolian origin (Sebe, 2013; Sebe et al., 2011). This Upper Paleolithic site was first recognized in 1922 (Laczkó, 1929). After several archeological excavations a geological profile was formed very closed to the archeological excavation surface, on the resting loess wall where the archeological layers can be seen (Krolopp & Sümegi, 2002). This profile was sampled once more for sedimentological, geochemical, malacological and luminescence analyses in 2013. Here, only the physical proxy data and luminescence data are presented. OSL samples were measured with the pIRIR290 protocol (Thiel et al., 2011). Prior IR stimulation temperature test (Buylaert et al., 2012), dose recovery tests and residual measurements were performed prior to De measurements.

### Optically Stimulated Luminescence Dating

> polymineral 4-11µm pIRIR290 protocol (Thiel et al., 2011)

> first IR stimulation temperature test (Buylaert et al., 2012)

> dose recovery test: after bleaching for 24h in solar simulator a given beta dose was tried to be recovered

> measurement of residuals after bleaching for 24h in a solar simulator

> De measurement

### Sediment analysis

Sedimentological and geochemical measurements were carried out at the Chair of Physical Geography and Geoecology, RWTH Aachen University. Procedures follow Schulte et al. 2016, Yu et al. 2016.

## Results

### Optically Stimulated Luminescence Dating

> 1st IR stimulation temperature plateau 50-110°C

> dose recovery ratio within 5% of unity

> low residuals < 4Gy

> low rel. standard error < 4%

> overdispersion 0-3%

> water content of 10±5% used for age calculation (see associated problems in Fig. 2)

-> good behaviour

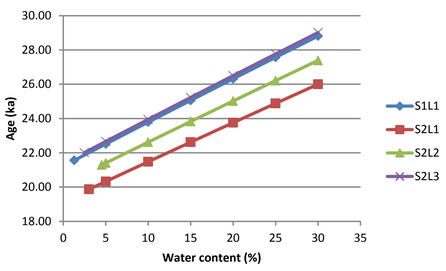


Fig. 2: General problem within OSL dating: the correct estimation of an average water content over the time since sediment accumulation. The big influence of this water content on the age is shown.

Fig. 3: Two profiles were sampled: one 1.24 m long profile covers the interval of an archaeological layer in the upper part (Ságvár I, left). A second 2.6 m long profile is located ca. 20 m further towards the hilltop (Ságvár II, right). It was sampled because a longer outcrop of loess is available here, which allows for a higher resolution of paleoenvironmental proxy data. In total six luminescence samples were taken. Both profiles were sampled for geochemistry, grain size, and magnetic susceptibility in a resolution of 4 cm.

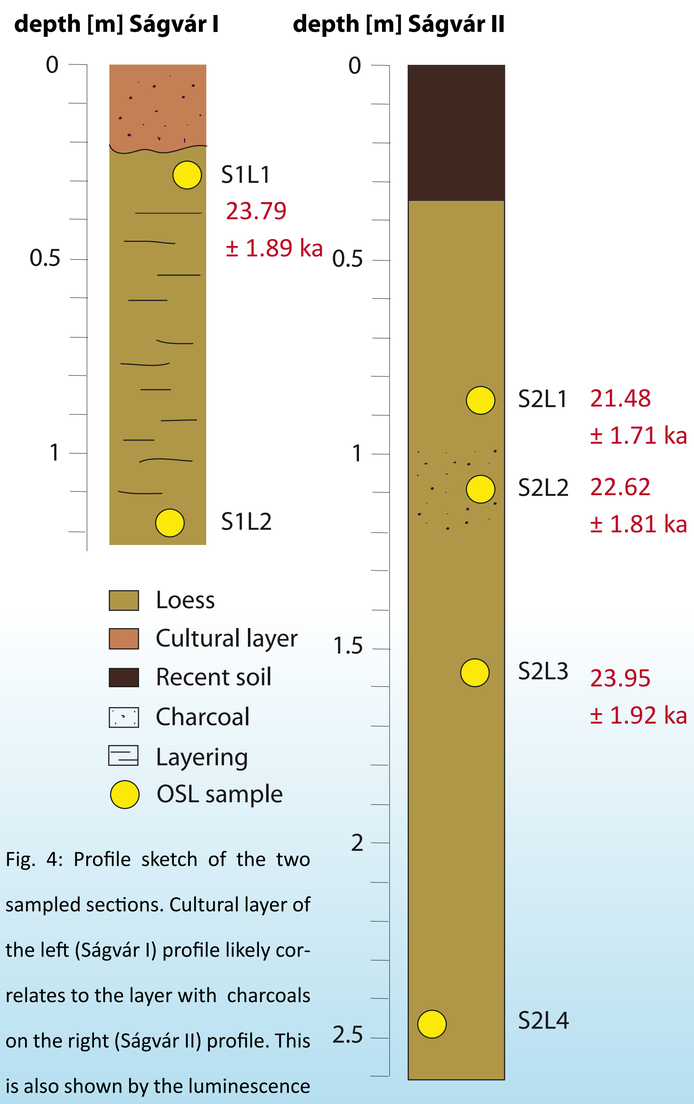


Fig. 4: Profile sketch of the two sampled sections. Cultural layer of the left (Ságvár I) profile likely correlates to the layer with charcoals on the right (Ságvár II) profile. This is also shown by the luminescence data. OSL data calculated with an average water content of 10±5%.

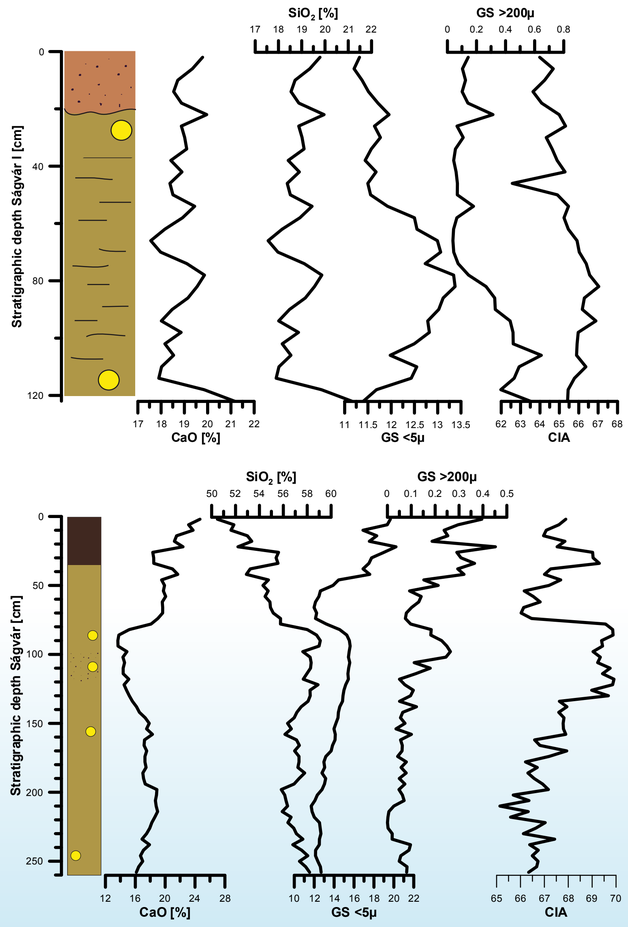


Fig. 5: Selected physical and chemical sediment properties from Ságvár I (top) and Ságcár II (bottom). Grain size (GS) fractions below 5µ represent clay, and GS>200µ represents the coarsest fraction of samples. The Chemical Index of Alteration (CIA) represents feldspar weathering.

## Discussion & Conclusion

**Physical sediment properties are relatively homogeneous in both profiles. In the Ságvár II profile a peak in weathering occurrs around the cultural layer; this feature is also seen in grain size data where both the clay and coarse fractions are enhanced. This may be interpreted as a relatively mild phase with weak weathering and strong (seasonal) eolian activity .**

**The low variability in weathering indices also suggesting no dramatic changes in soil formation and weathering, as also indicated by the homogenous loess in the field. Given the relatively short deposition span (see luminescence ages in Fig. 4) during a generally cold period this may be seen as support for the dating.**

**Previous $^{14}$C dating (Vörös 1982: ~20500-23100 calBP; Krolopp & Sümegi 2002: around 19,000 BP) can be confirmed by the luminescence dating results.**

## Selected literature

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UoC Cologne Luminescence Laboratory

DFG Deutsche Forschungsgemeinschaft

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