OSL & pIRIR$_{290}$ dating of the Stalac loess profile, Serbia

Janina Bösken[1], Nicole Klasen[2], Igor Obreht[1], Christian Zeeden[1], Frank Lehmkuhl[1]

Who?

- Collaborative research centre 806 “Our way to Europe” investigates the population dynamics & dispersal processes of early mankind
- B1: “eastern trajectory” of modern migration to Europe links Middle East, Anatolia, Balkans, and Black Sea. Special focus: Pannonian Basin.

What?

- past environmental conditions and variations
- combination of dating, sedimentology & geochemistry
- Fig. 1 shows the investigated sections

First steps at loess profile Stalac

- composite profile contains four sections & *presumed* Y5 tephra (see Fig. 2)
- one of the southernmost profiles →outside typical loess belt!
- 5 luminescence samples prepared according to established procedures (Frechen et al., 1996) for polymineral and quartz fine grains (4-11µm)
- Investigation:
  - 1. quartz (Q): preheat plateau test, dose recovery test (Fig. 3)
  - 2. polymineral fine grains (PM): 1. IR stimulation temperature test, dose recovery test (Fig. 5), equivalent dose

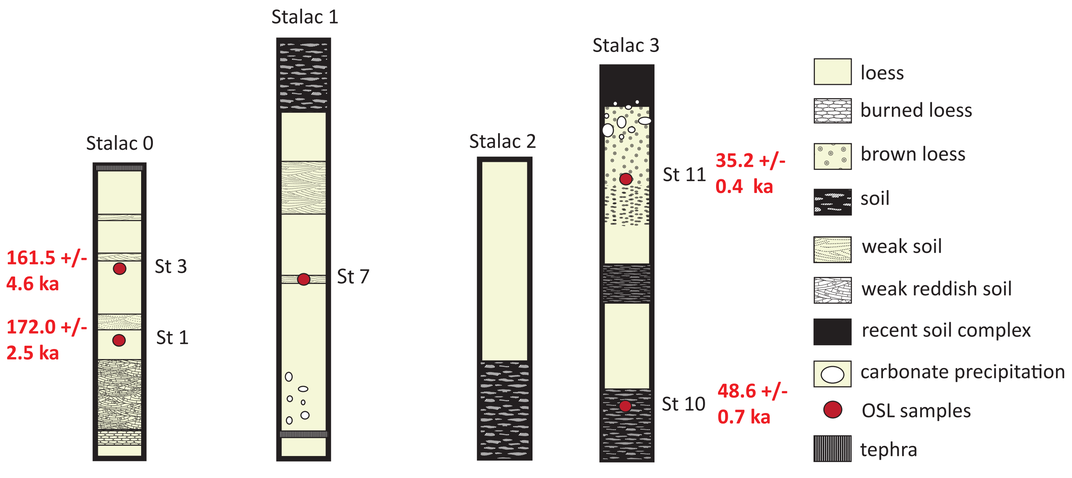

Fig. 2 shows a profile sketch and the location of OSL samples. Central Age Model-ages are shown in red (based on Galbraith et al. (1999), Guerin et al. (2014), Zimmermann (1971), Bell (1970), Preusser (2005)).

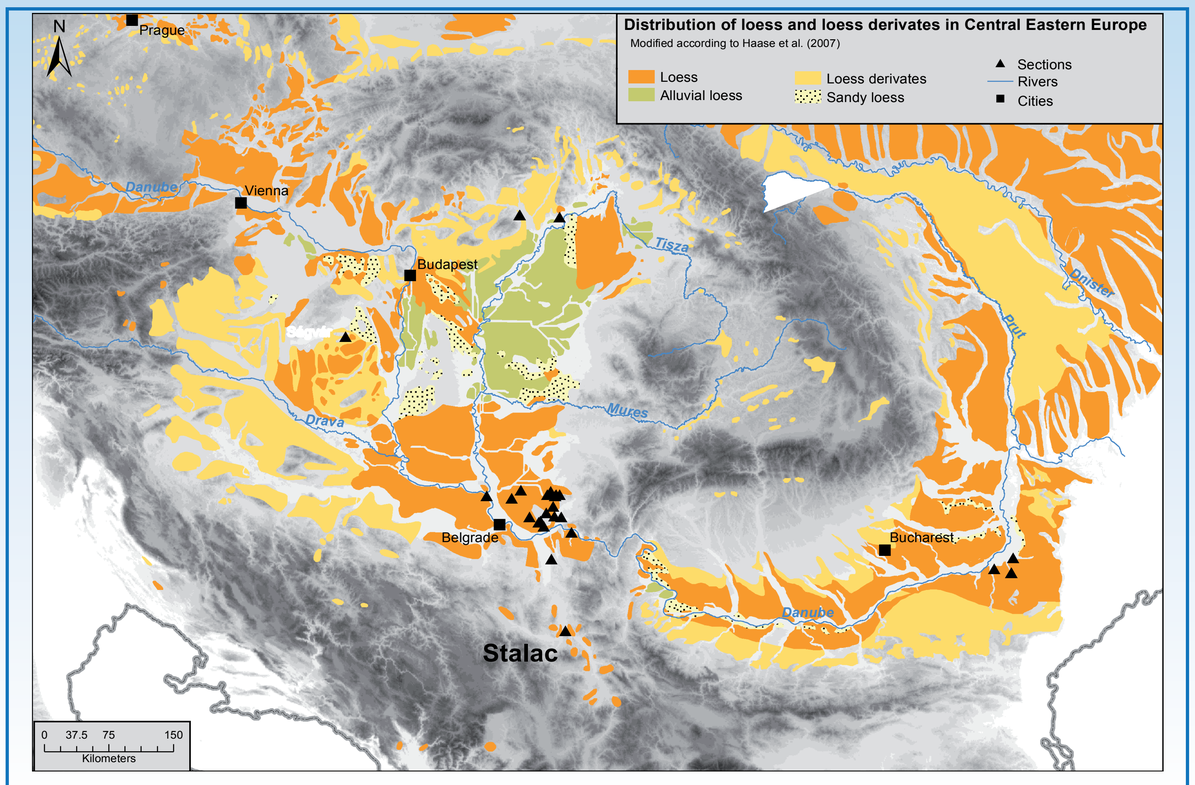

Fig. 1: Loess distribution modified after Haase et al. (2007) and locations sampled in 2013 & 2014. Section Stalac is located outside of typical loess belt.

Methods quartz fine grains

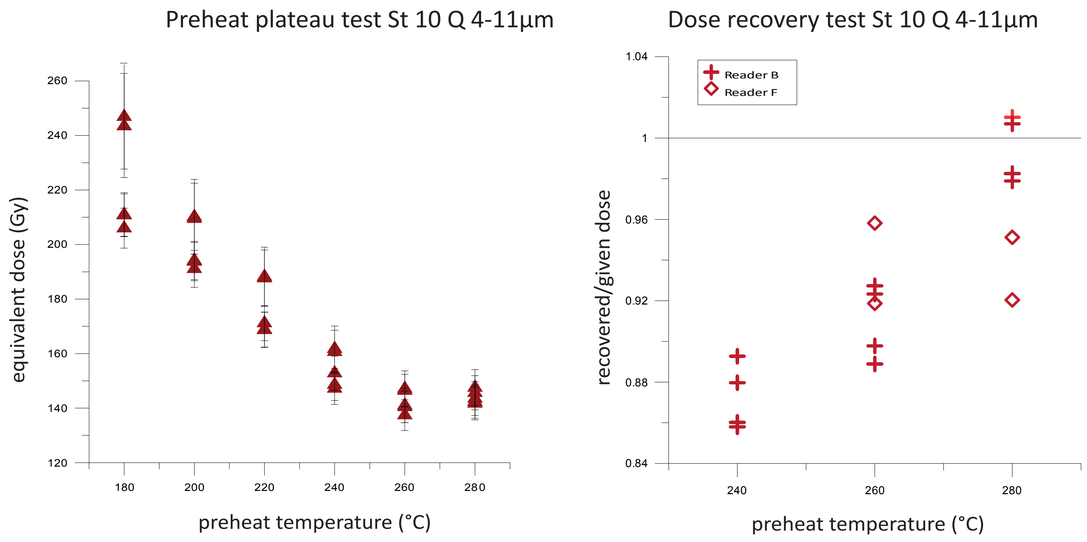

Fig. 3: Quartz samples were analysed with the SAR protocol (Murray & Wintle, 2000 & 2003). Preheat test on the left does not show a plateau. Dose recovery test on the right shows the dependency of preheat temperature on measurement. Therefore, measurements with quartz were neglected.

Methods polymineral fine grains

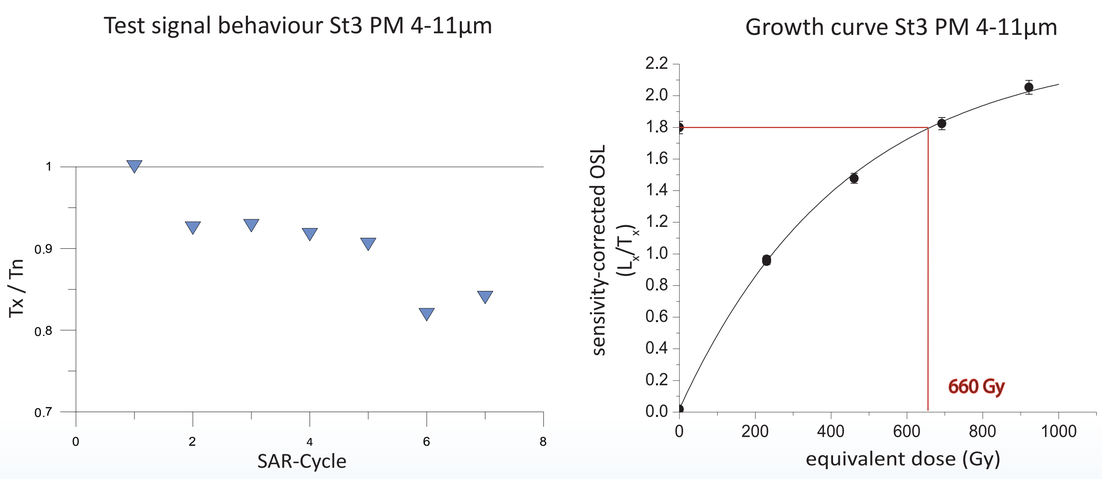

Fig. 4: Polymineral samples were analysed according to Thiel et al., 2011 & Buylaert et al., 2012. Example of test signal behaviour of St3 on the left. Typical growth curve of St 3 on the right.

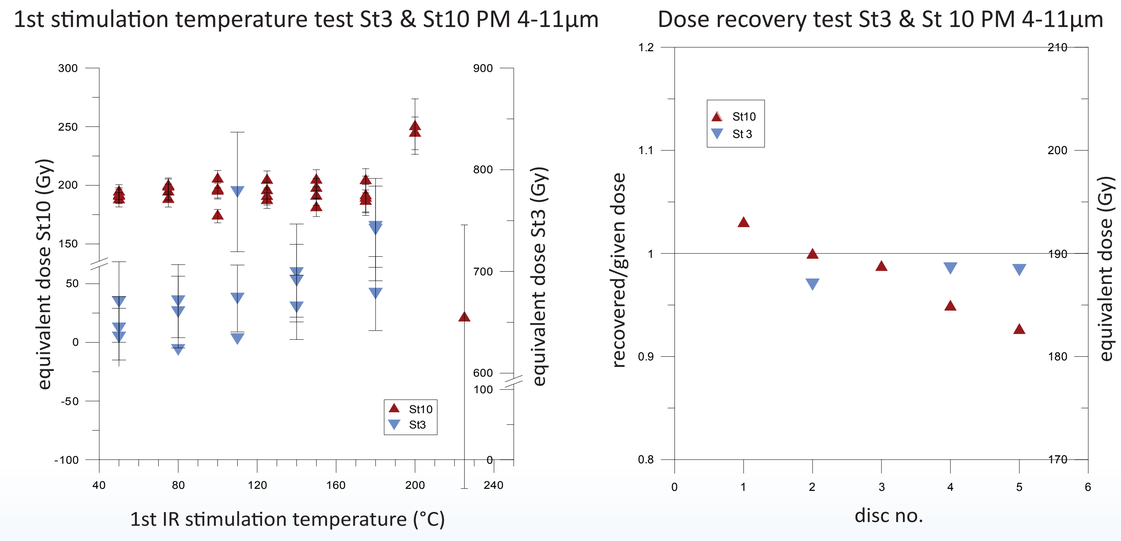

Fig. 5: Left: 1st IR stimulation temperature was tested for St3 and St10 (according to Buylaert et al., 2012). Both show a plateau. Therefore measurements were continued with pIR$_{50}$IR$_{290}$ (according to Thiel et al., 2011). Right: results of dose recovery tests. The ratio of recovered to given dose lies within 10% of unity for both samples.

Results & Conclusion

- quartz is not the mineral of choice
- polymineral pIR$_{50}$IR$_{290}$ shows promising results
- ages explain stratigraphy from MIS 1-MIS 6: profiles Stalac 0 & Stalac 1 show MIS 6 (L2), profile Stalac 2 offers MIS 5 (S1) soil and MIS 4 (L1L2) loess, profile Stalac 3 is characterized by MIS 3 (L1S1) soil, MIS 2 (L1S1) loess, and recent soil
- tephra does not resemble Y5 tephra, but shows another tephra (of MIS 6)

Acknowledgments

This project is affiliated to the CRC 806 “Our way to Europe”. We thank the German Science Foundation (DFG) for funding this project. Moreover, we thank Slobodan Markovic and Nikola Bačević for their support in Serbia.

References

J.-P. BUYLAERT, M. JAIN, A.S. MURRAY, K.J. THOMSEN, C. THIEL & R. SOHBATI (2012): A robust feldspar luminescence dating method for Middle and Late Pleistocene sediments. Boreas 41, pp. 435-451.

D. HAASE, J. FINK, G. HAASE, R. RUSKE, M. PÉCSI, H. RICHTER, M. ALTERMANN & K.-D. JÄGER (2007): Loess in Europe—its spatial distribution based on a European Loess Map, scale 1:2,500,000. Quaternary Science Reviews 26, pp. 1301–1312.

M. FRECHEN, U. SCHWEITZER & A.ZANDER (1996): Improvements in sample preparation for the fine grain technique. Ancient TL 14, pp. 15-17.

A.S. MURRAY & A.G. WINTLE (2003): The single aliquot regenerative dose protocol: potential for improvements in reliability. Radiation Measurements 37, pp. 377-381.

A.S. MURRAY & A.G. WINTLE (2000): Luminescence dating of quartz using an improved single-aliquot regenerative-dose protocol. Radiation Measurements 32, pp. 57-73.

C. THIEL, J.-P. BUYLAERT, A. MURRAY, B. TERHORST, I. HOFER, S. TSUKAMOTO, M. FRECHEN (2011): Luminescence dating of Stratzing loess profile (Austria) - Testing the potential of an elevated temperature post-IR IRSL protocol. Quaternary International 234, pp. 23-31.

Janina Bösken
[1]Physical Geography and Geoecology
Department of Geography, RWTH Aachen University
+49 241 80 96476
[2] Cologne Luminescence Lab, Institute of Geography, University of Cologne

Universität zu Köln

DFG Deutsche Forschungsgemeinschaft

Physical Geography and Geoecology | RWTH AACHEN UNIVERSITY