Ancient TL

www.ancienttl.org · ISSN: 2693-0935

Ancient TL, 2018. *Thesis Abstracts.* Ancient TL 36(1): 15-17.
https://doi.org/10.26034/la.atl.2018.523

Thesis Abstracts

Index

Janina J. Bösken

Luminescence dating of eolian and fluvial archives in the Middle and Lower Danube catchment and the paleoenvironmental implications

February 2018

Geographical Institute, RWTH Aachen University, Germany

Degree: Dr. rer. nat.
Supervisors: Frank Lehmkuhl, Helmut Brückner

The presented doctoral dissertation uses luminescence dating techniques to reconstruct the paleoenvironmental and paleoclimatic conditions in the Middle and Lower Danube catchments, especially during the period of anatomically modern human emergence. It is embedded in the Collaborative Research Centre 806 "Our Way to Europe - Culture-Environment Interaction and Human Mobility in the Late Quaternary". To increase ones understanding of the environmental conditions during the last 150 ka, four loess-paleosol sequences (LPS) and one fluvial section were investigated. The research area is located at the junction of Atlantic, Mediterranean and continental climatic regimes, which makes it sensitive to climatic changes. Moreover, the geographical position between Asia, Near East and Central Europe and the vast river network connecting these regions, make the area a favorable pathway for anatomically modern human migration. The sediments of the five investigated sites cover various time-frames from the penultimate interglacial to the Holocene. The methodological approach focused on optically stimulated luminescence dating, but for some of the sections the geochronological methods were combined with physical, biological, and geochemical proxy data to reconstruct the paleoenvironmental conditions.

In the Middle Danube Basin (MDB) three sites were investigated. The Ságvár LPS is located in the central basin and its sediments accumulated during the last glacial maximum from approximately 25–17ka. The sequence can be correlated to two Gravettian occupation layers. Paleoenvironmental conditions changed rapidly and Gravettian occupation took place during a typically cold LGM phase. The Bodrogkeresztúr LPS is located in the foothills of the Carpathians in the northern part of the MDB. Its sediments accumulated between 33.5 $\pm$ 2.5 and 28.0 $\pm$ 2.1 ka and the findings highlight unique microclimatic conditions at the foothills of the Carpathian Mountains, which may have offered a favorable environment for Upper Paleolithic populations. The Crvenka-At site contains fluvial sediments and Aurignacian artifacts that were found in sediments with an age between 33.9 $\pm$ 2.9 ka and 41.3 $\pm$ 3.6 ka. This age range fits well to other dated Aurignacian findings in the Banat region and points to a more widespread occurrence of anatomically modern humans during this time frame than previously thought and shows that also lowland areas were attractive for early modern human occupation. Further south, the Stalać section is located in the interior of the Central Balkan region, in a zone of paleoclimatic shifts between continental and Mediterranean climate regimes. Detailed investigations on the luminescence signal of a quartz sample, which is unsuitable for dating, are presented. A firm chronology framing the last two glacial cycles was established using fine-grained polyminerals and the post-infrared infrared stimulated luminescence (pIRIR) protocol. The characteristics of the dated paleosols indicate similar climatic conditions during the last interstadial and interglacial phases, which were different from the penultimate interglacial period. Finally, the Urluia LPS in the Lower Danube Basin was investigated. The section was dated from 20.98 $\pm$ 1.6 ka to 144.9 $\pm$ 12.2 ka. While the chronology of the upper 7 m of the section is supported by independent age control in form of the Campanian Ignimbrite/Y-5 tephra, the lower part of the sequence remains less well constrained. A rapid increase in ages between $\sim$7 and 9 m is followed by rather constant ages $>$130ka in the lower 7 m of the profile. These ages are in contrast with the expectation of a well-developed MIS5 paleosol in the lowermost part of the section. Several hypothesis trying to explain these findings were explored, but could not be solved satisfactorily.

The doctoral dissertation demonstrates that a detailed investigation is necessary in order to build robust age models. For quartz samples, the importance of preheat plateau and dose recovery tests are pointed out. Some samples of Stalać and Urluia, that have high equivalent doses, show falling preheat plateaus, while the quartz samples of Crvenka-At are already in saturation at very low doses. These findings indicate that these samples cannot be dated reliably using the SAR protocol. Most samples of this dissertation were dated with the pIRIR protocol. The necessary first IR stimulation temperature tests, dose recovery tests, fading experiments and residual dose measurements are presented. It is demonstrated that polymineral and potassium feldspar samples can be dated with higher doses than quartz. However, it remains unclear up to which dose range age estimates are

reliable. Overall, this doctoral dissertation highlights the importance of luminescence dating in paleoenvironmental and geoarcheological studies. It demonstrates how the combination of multiple proxy data enhances the paleoenvironmental interpretations, and identifies remaining challenges. The paleoclimatic dynamics in the research area at the junction of Atlantic, Mediterranean and continental climatic regimes are discussed. Finally, paleoenvironmental conditions during phases of Upper Paleolithic occupation were equally diverse highlighting anatomically modern humans' ability to adapt to changing paleoenvironments.

A PDF of this thesis can be downloaded from: www.doi.org/10.18154/RWTH-2018-01253

Yan Li

Luminescence dating of transgressions in the Bohai Coast China since the Middle Pleistocene

April 25, 2018

Freie Universität Berlin, Berlin, Germany

Degree: Dr. rer. nat.

Supervisors: Manfred Frechen, Sumiko Tsukamoto

Coastal areas hold major social and economic value. Understanding past coastal evolution is therefore crucial to anticipating future changes which will affect these areas of high significance. The Bohai Sea, situated at the transition zone between the East Eurasian Continent and West Pacific Ocean, is an area particularly sensitive to sea-level changes and sediment inputs. Due to the continuous subsidence of the Bohai basin since the Cenozoic, thick sediment sequences have accumulated progressively on the Bohai Coast, providing a valuable proxy record of climate and environmental evolution. Sedimentary sequences on the Bohai Coast indicate three main transgressive and regressive phases, associated with the regional sea-level change and terrestrial influence since the Middle Pleistocene. The chronology of these transgressions and regressions is however not well constrained, and requires a thorough investigation.

The main objective of this thesis is to establish a reliable chronological framework for the three transgressions identified on the Bohai Coast since the Middle Pleistocene, using Optically Stimulated Luminescence (OSL) dating. A careful validation of different OSL approaches is first conducted. The quartz OSL signal was fully reset for materials from the North Bohai Coast, while the K-feldspar luminescence signals were well bleached for the pre-Holocene deposits, validating the use of this dosimeter to establish a robust chronology of the Bohai sediments. To correct the undesirable signal loss over geological time scale associated with the use of this mineral, the fading correction method based upon the theory of power-law decay of tunnelling is tested. Fading corrected ages in agreement with the reference chronology confirm the validity of this fading correction method. Quartz OSL dating is applied to the coastal core sediments and dune sands from the North Bohai Coast. The quartz and feldspar luminescence chronologies indicate that the earliest transgression occurred ca. 200 ka ago, correlating with the sea-level highstand during Marine Isotope Stage (MIS) 7. Based on the age-depth relation, the second transgression very likely occurred during MIS 5. Both, the radiocarbon dates and the quartz OSL ages show that the transgressive sedimentary facies in association with the rising of the sea-level during MIS 3 is not preserved in the Bohai cores. The last transgression correlates with the Holocene sea-level rise.

Luminescence chronology, in conjunction with the historical records of the shoreline migration, reveals that the sea-level constantly stayed at highstand between ca. 6 and 1 ka in the North Bohai Coast, and then retreated rapidly causing the delta progradation. Thin transgressive deposits, equivalent to an annual sediment increment of 2.7×10^4 m^3/a between 6–1 ka, are explained by the flat relief and insufficient sediment supply. The rapid deltaic progradation, which includes an episodic deposition by multiple flooding events at ca. 700 a, resulted in the dramatic increase of sediment increment (9.1×10^6 m^3/a) over the last millennia. This sudden increase was triggered by both the winter monsoon enhancement and the reduction of plant cover and soil erosion by human activity. On the contrary, a rapid inland sand deposition after the Little Ice Age was most likely related to the Immigrant and Reclamation Policy.

A PDF of this thesis can be downloaded from: http://www.diss.fu-berlin.de/diss/receive/FUDISS_thesis_000000107263

Stefania Cristino de Oliveira

Geomorfologia e cronologia dos depósitos da planície fluvial no Alto Curso do rio Paraná, MS/SP. (Geomorphology and chronology of the fluvial plain deposits in Upper Paraná River Course, MS/SP.)

April 2018

Universidade Estadual Paulista "Júlio de Mesquita Filho", Rio Claro, Brazil

Degree: M.Sc.

Supervisors: Mario Luis Assine, Fabiano do Nascimento Pupim

The knowledge of the geomorphological evolution of the Paraná River fluvial plain in the stretch upstream of the Porto Primavera dam is still precarious, since most of the published works on this fluvial course focused on the stretch downstream of the dam. In this context, the objective of this study was to investigate the succession of geological events responsible for the evolution and current configuration of the river system of the Upper Paraná River, between the Jupiá and Porto Primavera Hydroelectric Plants (between the States of São Paulo and Mato Grosso do Sul). Remote sensing data, sedimentological, geochronological and topobatimetric profiles were used for the development of the research. Four geomorphological compartments were identified and three

of these compartments were dated: Unit 1, raised terrace with circular and semi-circular ponds; Unit 2, intermediate terrace with small ponds and soaked areas (OSL age from 60,5 ± 6,1 kyears); Unit 3, low terrace with preserved paleo canals (OSL age from 39,8 ± 2,8 kyears); and Unit 4, current fluvial plain (OSL age from 8.9 ± 1.6 kyears). The defined geomorphological units were correlated with units of previous works located downstream of the studied area. Unit 1, Unit 3 and Unit 4 are considered extensions of the geomorphological units Taquaruçu, Fazenda Boa Vista and Rio Paraná, respectively. Unit 2 is a compartment with unique morphological characteristics, therefore, not correlated with units presented in previous works. Two zones of *knickpoints* have also been identified that probably occur due to lithological changes in the river thalweg. In addition, in the studied section the Paraná River presents sinuosities that may be related to the sedimentary contribution of the tributaries. Sedimentary records of the deposits of the fluvial plain of the Aguapeí River indicate that this river presented a channel with high energy approximately 8 thousand years ago, when the climate was drier than the present one. Later, about 2,000 years to the present, the region will have similar climatic characteristics to the current ones.

A PDF of this thesis can be downloaded from: http://hdl.handle.net/11449/154032

Marius Pfeifer

Remote Luminescence Dating of Asteroids – A Preliminary Feasibility Study

March 2018

Astrophysical Institute, Göttingen, Germany

Degree: M.Sc.

Supervisors: Dr. Rita Schulz, Prof. Dr. Stefan Dreizler

The purpose of this work is to collect data and results that might be relevant for the development of a procedure for remote OSL dating of asteroids. This work presents a basic summary of each of the major disciplines involved (asteroid research, solid state physics and luminescence dating) up to and including the most recent information available. In addition, it presents an initial assessment of the physical, technical and methodological challenges, and discusses tentative ideas for instrumentation. Lastly, potential approaches for further investigations of certain key aspects are proposed. The hope is that future researchers might be able to use this work as a basis and guideline in follow-up studies.

A PDF of this thesis can be downloaded from: https://www.dropbox.com/s/b3ir5tzoiyfnveh/mthesis_astro.pdf?dl=0