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The response of the River Rhine system following tectonic and climatic changes – New insights by OSL dating

T. Lauer (1), M. Frechen (1), Ch. Hoselmann (2), J. Klostermann (3), and S. Tsukamoto (1)

(1) Leibniz-Institut für Angewandte Geophysik, Stilleweg 2, D-30655 Hannover, Tobias.Lauer@gga-hannover.de, (2) Hessisches Landesamt für Umwelt und Geologie, Rheingaustraße 186, D-65203 Wiesbaden, (3) Geologischer Dienst Nordrhein-Westfalen, De-Greiff-Straße 195, D-47803 Krefeld

A very important requirement for getting an accurate chronological frame by OSL dating is the resetting of the OSL signal by sufficient sunlight-exposure during transportation. It is known that the resetting of most of fluvial sediments is incomplete. However, recent developments in optically stimulated luminescence techniques and statistical treatment made it possible to select ages only from the grains which received enough sunlight (WALLINGA 2002).
OSL dating was applied to Holocene and last glacial fluvial sands and coversands deriving from the Lower Rhine Embayment and the Heidelberg basin which is located in the northern part of the Upper Rhine Graben. The aim of the study is to get a more reliable chronological frame for those deposits providing excellent records on the response of the River Rhine system to tectonics and climatic changes. Furthermore, a better correlation of the alpine glacial-interglacial cycles with those of Scandinavian glaciers is intended.
The single-aliquot regenerative-dose (SAR) protocol was used for dose estimation. For all the fluvial samples the central age model (CAM) and the minimum age model (MAM3) were applied. The K, Th and U content which is needed for the estimation of the dose rate was obtained by high resolution gamma spectrometry. In addition in situ measurements were carried out using a NaI detector.
For the last glacial period at least three aggredation periods could be verified by OSL dating. Significant hiatuses occurring in between the stacked fluvial units give evidence for an alteration of aggradation and erosion mainly controlled by climatic variations and tectonics. The dated coversands from the northern URG yield OSL age estimates of 9-11 ka indicating a period of strong morphodynamic activity for the transition from late Wuermian to early Holocene and a following stabilisation of landscape.
The ongoing work is part of a PhD study in the frame of the “Leibniz Pakt für Forschung und Inovation” at the GGA-Institute in Hannover. It is focusing on the advancement and application of new OSL techniques and a reconstruction of the paleoenvironmental conditions within the Rhine system.

Wallinga, J., 2002. Optically stimulated luminescence dating of fluvial deposits: a review. Boreas 31: 303-322.