

Abstract IAS

Regional database of Lower Rhine OSL dates in sedimentary context: Can we unravel preservation and sampling bias from climatic depositional overprints?

Cohen, K.M.^{*1,23}; Wallinga, J.²; Busschers, F.S.²³; Hoek, W.Z.¹²; Kasse, C.⁴; Jones, A.⁵; Rhodes, E.⁶; Macklin, M.G.⁵; Benito, G.⁷

¹ Utrecht University, Fac. Geosciences, Dept. of Physical Geography, Utrecht, The Netherlands

² Netherlands Centre of Luminescence Dating, Delft, The Netherlands

³ Deltares | TNO *Geological Survey of the Netherlands*; Utrecht, The Netherlands

⁴ Vrije Universiteit, Fac. Earth & Life sciences, Amsterdam, The Netherlands

⁵ University of Aberystwyth, Aberystwyth, Wales, U.K.

⁶ UCLA, Los Angeles, U.S.A.

⁷ Spanish Council for Research, Madrid, Spain

Session T4: PLEISTOCENE-HOLOCENE STRATIGRAPHY AND SEDIMENTARY RESPONSE TO HIGH-FREQUENCY CLIMATIC OSCILLATION.
Subsession T4a: LATE PLEISTOCENE LANDSCAPE RESPONSE TO CLIMATE CHANGE AND SEA-LEVEL VARIATION.

The last decade has seen a rise of applying optical stimulated luminescence (OSL) dating techniques to fluvial sequences of the Pleistocene and Holocene. Samples have been collected from fluvial deposits that constitute terraced valleys, alluvial plains and terrestrial basin fills, using various strategies (shallow outcrops, deeper quarries, high-quality cores) as researchers have to deal with differences in geological setting along their rivers.

We present a database storing OSL-dates collected over the past years from along the Lower and Middle Rhine. This includes the Lower Rhine Embayment in NW-Germany and its continuation at depth below the Rhine delta in the Netherlands, i.e. some 400 km of river length. The former area hosts a terraced fluvial sequence with low valley gradients developed in older Plio-Pleistocene alluvium, the latter area a stacked basin-fill with even lower valley slope. Over the full length of the region the Rhine river was in braided mode during Pleistocene glacial maxima and in meandering mode during interglacials. Glacial-interglacial transitions lead to geomorphological adaptations along the Lower Rhine valley, lastly between 15.000 and 8.000 years ago. The sequence has been mapped in great detail (by geomorphologists, sedimentologists, pedologists, stratigraphers; in isolation and in teams) and OSL dating strategies have intimate relations with this mapping, yielding some ~200 OSL dates of relevance to this study. These have a clustered distribution but evenly cover the terraced German and the delta-buried Dutch rhine valley reaches. OSL dates last transport of buried sand grains (quartz), and in the Lower Rhine gave robust results back to ~150.000 years ago (sediment composition) with ~10% error.

This amount of OSL dates allows to construct summed probability density functions (PDFs; stacked histograms for individual dates), which characterize the age-distribution of preserved fluvial deposits. These PDFs are a powerful tool to compare the fluvial sedimentary registration between different rivers and reaches and to aggregate a regional signal from patchy fluvial records. The Lower Rhine accumulated data allows to develop and test our concepts of PDF analysis. By constructing PDFs for subselections we show the impact of sampling strategies on overall PDFs.