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Luminescence dating and R: Largely automated scripts as tools for increasing the efficiency of luminescence data analysis

Thomas Kolb (1,2)

(1) University of Bayreuth, Geographical Institute, Chair of Geomorphology, Bayreuth, Germany (thomas.kolb@uni-bayreuth.de), (2) Department of Geography, Justus-Liebig-University Giessen, D-35390 Giessen, Germany

Over the last decades, numerical dating approaches have become widespread tools in earth sciences and geoarchaeology. This is particularly true for luminescence dating procedures, which have successfully been applied to a great variety of sediments originating from various environmental settings and different temporal contexts. The importance of luminescence dating for geomorphology, archaeology and even for modern river engineering is well documented by a huge and still growing number of studies spanning a wide range of climatic and regional settings.

For routine dating applications, rather simple to use software tools, such as the Analyst software or the age calculation program ADELE, are available. For more complex experimental and exploratory luminescence studies, KREUTZER ET AL. (2012) introduced an R package providing a powerful set of functions for analyzing and illustrating luminescence data.

However, also in routine luminescence dating the commonly used standard software solutions may sometimes not be sufficient or may at least be inefficient. Besides long lasting sample preparation and measurement procedures, analyzing luminescence data is typically a time consuming process and might therefore regularly be a limiting factor. This is especially true when a large number of samples have to be analyzed within a relatively short time.

For such studies, a flexible, efficient and easy to use workflow is required, which on the one hand enables fast and standardized data processing, but on the other hand also allows the user to monitor the running processes and intervene if this appears to be necessary.

This contribution presents a set of R-scripts trying to fulfill these requirements. The scripts combine several functions which are provided by the R package 'Luminescence' of KREUTZER ET AL. (2012) and are enhanced by further analyzing functions so far not included in the package.

After the specification of important basic parameters by the user, the data analysis is largely automated. At crucial points, however, the user has the opportunity to intervene in a controlling manner. Thereby, these scripts do not intend to provide a 'one click solution' that deprives the user of his specific responsibilities for ensuring adequate data analyzing. They rather are intended to provide all necessary information indispensable for a critical and meaningful interpretation of results.

References

KREUTZER, S., SCHMIDT, C., FUCHS, M.C., DIETZE, M., FISCHER, M. & FUCHS, M. (2012): Introducing an R package for luminescence dating analysis. – Ancient TL, 30, 1-8.