Reliability of equivalent-dose determination and age-models in the OSL dating of historical and modern palaeoflood sediments - DTU Orbit (14/12/2018)

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The challenge of accurately estimating the deposition age of incompletely-bleached samples in luminescence dating has motivated developments in the analysis of single grain dose distributions, and a number of statistical approaches have been proposed over the last few years. In this study, we compare the behaviour of the arithmetic average, so-called 'robust statistics', the Central Age Model (CAM), the Minimum Age Model (MAM) and the Internal External Consistency Criterion (IEU) and lowest 5% method, when applied to single-grain dose distributions from a sequence of eight recent (40-1000 years) flash-flood deposits. These sediments are expected to be incompletely bleached, but all have age control from historical records. Modifications were made to allow the use of the standard CAM and MAM models with dose distributions containing near zero and negative dose values. An assessment of minimum over-dispersion (OD) is based on dose recovery tests based on gamma-irradiated samples. We then present a detailed analysis of the effect of an additional uncertainty added to the individual dose estimates on the burial dose estimates from the MAM and the IEU approach. The results of the various models are discussed in terms of the accuracy of the resulting age, and we conclude that, overall, the IEU approach generates the most accurate ages. We also demonstrate that accurate doses can be obtained for those older samples for which uncertainties of 40 years are unimportant by applying the IEU model to small aliquot (similar to 30 grains) dose distributions. From our study we conclude that these and similar young slack-water flood deposits can be accurately dated using quartz OSL, opening up the possibility of establishing time series of flood discharge in catchments for which no instrumental or historical record exists. (c) 2014 Elsevier B.V. All rights reserved.