Exploring multiple-aliquot methods for quartz violet stimulated luminescence dating - DTU Orbit (16/10/2019)

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In the pursuit of extending the dating range of quartz, violet stimulated luminescence (VSL) has been proposed as a possible candidate. VSL samples traps deeper than those accessible by blue stimulated luminescence (BSL), the latter often limited to the past 100 ka. This study investigates 51 samples from three different type sections in the central part of the Chinese Loess Plateau with depositional ages between 1 and 2500 ka. Results indicate that the natural VSL signal grows to ~2700 Gy, is best fitted with a double saturating exponential plus a constant, and its shape can be reproduced with the MAAD protocol. Using a ~900 ka sample, the bleaching decay is recorded over 53 days of light exposure in a solar simulator to further understand the origin of the VSL signal, and to test a multiple-aliquot regenerative (MAR) protocol. The results of the MAAD and the MAR protocols are evaluated against the independent age control. For samples between 20 and 900 ka, 74% were in agreement with expected age using the MAAD protocol. The MAR protocol was tested by building dose response curves (DRCs) using two samples with ages of ~75 ka and ~900 ka. Ages calculated by interpolating natural signals onto these two DRCs for all samples within the same 20–900 ka range show 45% and 81% agreement, respectively, with independent age control. The MAR protocol obtained a ~900 ka VSL age in agreement with independent age control within 1σ of joint uncertainties.

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