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Assessment of luminescence ages for quartz signals near saturation

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In recent years, developments in single aliquot techniques applied to quartz have significantly improved accuracy and precision of dating results. However, the maximum age obtainable in luminescence dating is a function of the magnitude of the environmental radiation dose-rate, where age = equivalent dose (D_e) / dose-rate, and the proximity to saturation of the luminescence signal. With respect to the latter, the growth of luminescence with increased radiation dose is typically described by a saturating exponential function of the form $I = I_0$(1-exp$^{-D/D_0}$), where I is the luminescence intensity from dose D, I_0 is the luminescence saturation intensity and D_0 is the dose level that is characteristic of the saturating part of the dose response curve. For older samples that we know are close to the maximum age limit, it is difficult to assess whether signal saturation may be influencing the luminescence data and possibly leading to age underestimation. To ensure that saturation conditions are avoided, Wintle and Murray (2006) proposed the prerequisite that $D_e < 2D_0$, where the natural OSL level is about 15% lower than the saturated signal level obtained in the laboratory. Using this prerequisite, we have assessed the proximity to saturation for luminescence data from several quartz samples from different recent dating studies. We will present these results in combination with preliminary studies to examine the most readily bleached part, or "fast component", of the quartz OSL signal.

Wintle, A., Murray, A.S., 2006. A review of quartz optically stimulated luminescence characteristics and their relevance in single-aliquot regeneration dating protocols. Radiation Measurements 41, 369–391.