

Finding a good place to date

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The luminescence characteristics of quartz, one of the main minerals used for luminescence dating, vary greatly from region to region, and this is reflected in how easy Quaternary sediments from different areas are to date with optically stimulated luminescence (OSL), and in the accuracy or precision of final ages. The cause of ‘good’ or ‘bad’ luminescence characteristics seems to largely be the geological history of the quartz, e.g. the number of erosional-depositional cycles it has been through.

Large parts of Scandinavia unfortunately seem to provide quartz with less than ideal luminescence characteristics, but a few years ago Alexanderson & Murray (2012) put up a hypothesis that the Proterozoic Dala sandstone in Sweden was a source of ‘good quality quartz’ for OSL dating of Quaternary deposits. This hypothesis has now been tested and preliminary results suggest that the hypothesis is correct. Sediments derived largely from the Dala sandstone (Late Quaternary glaciﬂuvial and aeolian deposits near Mora, Dalarna; see presentation by Bernhardson & Alexanderson) as well as large clasts of Dala sandstone have been analysed with OSL. Crushed Dala sandstone, untreated and treated Quaternary sediment all showed excellent luminescence characteristics. The good agreement between measurements of untreated material (so called range-finder OSL; Roberts et al. 2009) and fully treated material (standard OSL) show that relative chronologies, based on range-finder OSL, can rapidly (a few days of measurement) be established in areas such as this.

To identify other areas of potentially good or bad luminescence source rocks, and ideally to provide some insight into the origin of good OSL, quartz-rich rocks from other parts of Sweden and from Svalbard, ranging in age from Proterozoic to Paleogene, have been tested and compared with results of OSL analysis of sediments derived largely from these rocks. The results may give some hints of areas where OSL dating may be easier, and which areas to preferably avoid!

References:

- Alexanderson, H. & Murray, A. S. 2012: Problems and potential of OSL dating Weichselian and Holocene sediments in Sweden. *Quat. Sci. Rev.* 44, 37-50.
Roberts, H. M., Durcan, J. A. & Duller, G. A. 2009: Exploring procedures for the rapid assessment of optically stimulated luminescence range-finder ages. *Rad. Meas.* 44, 582-587.