



## **Using new luminescence methods to date the Palaeolithic: the example of Kalambo Falls**

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The Palaeolithic site of Kalambo Falls in the north of Zambia was the subject of detailed study by J.D. Clark in the 1950s with 4 excavations being located within 1 km of each other in a basin upstream of the falls. A rich palaeolithic tool record was recovered, but the value of this record was limited by the lack of chronological information available. In 2006, one of the excavation sites was re-investigated (Barham et al., 2009), including examination of the stratigraphic context and collection of samples for luminescence dating.

Many of the sediments in the Kalambo basin were deposited by fluvial activity. Dose distributions in the single grain quartz optically stimulated luminescence (OSL) measurements of the youngest sediments are consistent with incomplete bleaching. However, the residual doses obtained are typically less than 10 Gy, and so for older sediments the impact of incomplete bleaching becomes insignificant. The oldest samples are affected by a different problem, namely saturation of the OSL signal, and many grains are saturated. However in all cases some grains give finite equivalent dose values, making it feasible to calculate single grain quartz OSL ages, but it is difficult to assess whether these ages are reliable or not.

Thermally transferred OSL (TT-OSL) from quartz is able to date much older samples due to the high saturation dose of this signal (Duller and Wintle, 2012). Comparison of the TT-OSL and OSL demonstrates that the OSL signal yields age underestimates as samples near saturation. Only by using the two luminescence methods is it possible to create an absolute chronology for this key site stretching back over half a million years. This study demonstrates the potential of using these two luminescence signals together for dating Palaeolithic sites throughout Africa and beyond.

Barham, L., Duller, G. A. T., Plater, A. J., Tooth, S. and Turner, S. (2009). Recent excavations at Kalambo Falls, Zambia. *Antiquity* 83(322).

Duller, G. A. T. and Wintle, A. G. (2012). The potential of the thermally transferred optically stimulated luminescence signal from quartz for dating sediments. *Quaternary Geochronology* 7: 6-20.