A comparison of multiple luminescence chronometers at Voordrag, South Africa

Colarossi, D.; Duller, G. A.T.; Roberts, H. M.; Tooth, S.; Botha, G. A.

Published in:
Quaternary Geochronology

DOI:
10.1016/j.quageo.2020.101094

Publication date:
2020

Citation for published version (APA):
Colarossi, D., Duller, G. A. T., Roberts, H. M., Tooth, S., & Botha, G. A. (2020). A comparison of multiple luminescence chronometers at Voordrag, South Africa. *Quaternary Geochronology*, *60*, Article 101094. https://doi.org/10.1016/j.quageo.2020.101094

Supplementary information

Thomsen et al. (2016) suggested an alternative acceptance criterion, which excludes grains with low D_0 values (i.e. where D_0 is less than a sample average D_e). When applied to the Voordrag dataset it resulted in: (i) a significant decrease in n; (ii) the almost complete elimination of n_{sat}; (iii) an increase in OD; and (iv) no change in stratigraphic consistency for the resulting ages down section (Table S1).

Minimal change can be observed in the CAM ages for seven samples (Aber215/VRD08-VRD02) when applying the D_0 criterion; the ratio of ages calculated using the standard criteria to ages calculated using the standard and D_0 criteria lie between 0.91 and 1.03 (Table S1). Furthermore, the dose distribution for sample Aber215/VRD09 remains unchanged after applying the D_0 criterion. An interesting outcome was the exclusion of every D_e value in the, admittedly limited, dose distributions for the two lowermost samples (Aber215/VRD01 and Aber215/VRD10). However, several reasons to disregard the ages obtained from these two samples are discussed in the main text (i.e. low n, high n_{sat}, $D_e > 2D_0$, $D_e > 150$ Gy and $I_n/I_0 > 100\%$) and the exclusion of these grains serves to reinforce the decision that these samples are beyond the range of quartz OSL.

Since neither the SG ages nor their stratigraphic consistency changed, the application of the D_0 criterion was disregarded as an acceptance criterion for the Voordrag samples.

Table S1: Application of the D_0 criterion of Thomsen et al. (2016) to the single grain quartz OSL dataset. Standard criteria are those outlined at the end of Section 3.3.1. Values shown include the number of saturated grains (n_{sat}), the number of grains included in the dose distribution (n), the overdispersion (OD) and age. For comparison purposes, the equivalent dose (D_e) was calculated using the Central Age Model (CAM) for all samples.

	Standard criteria					Standard + D_0 criteria					Ratio
Sample	n_{sat}	n	OD (%)	$D_{e\text{-}CAM}$ (Gy)	Age (ka)	n_{sat}	n	OD (%)	$D_{e\text{-}CAM}$ (Gy)	Age (ka)	
VRD09	4	93	110	3.26 ± 0.39	1.14 ± 0.14	4	93	110	3.26 ± 0.39	1.14 ± 0.14	1.00
VRD08	20	82	31	59.6 ± 2.2	23.4 ± 1.3	0	29	34	65.4 ± 4.4	25.7 ± 2.0	0.91
VRD07	17	78	34	65.7 ± 2.8	23.2 ± 1.4	0	28	43	64.7 ± 5.5	22.8 ± 2.1	1.01
VRD06	35	115	23	75.8 ± 2.0	30.5 ± 1.5	0	33	24	73.5 ± 3.3	29.6 ± 1.8	1.03
VRD05	62	89	30	87.8 ± 3.3	31.1 ± 1.7	1	18	37	89.4 ± 8.2	31.7 ± 3.2	0.98
VRD04	69	90	24	106 ± 3	42.8 ± 2.3	0	16	34	102 ± 9	41.4 ± 4.1	1.03
VRD03	132	93	35	89.4 ± 3.8	35.6 ± 2.1	1	10	32	90.4 ± 9.7	35.9 ± 4.1	0.99
VRD02	47	31	36	94.4 ± 7.0	42.1 ± 3.6	0	8	50	98.5 ± 18.6	43.9 ± 8.5	0.96
VRD01	56	5	12	137 ± 20	55.3 ± 8.4	0	0	-	-	-	-
VRD10	28	5	34	195 ± 38	57.2 ± 11.5	0	0	-	-	-	-