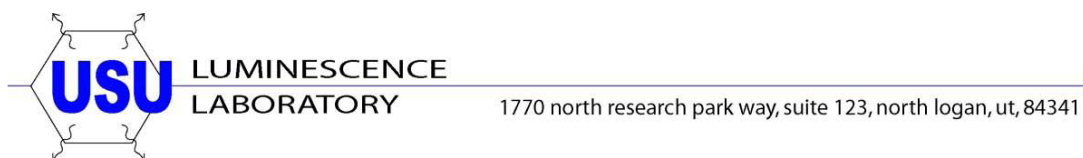


FINAL OSL AGE REPORT

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Project: Las Capas Archaeology
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Report by: Tammy Rittenour
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Project #: 115

OSL Age Information¹

USU num.	Sample num.	Num. of grains ²	Equivalent Dose ³ , De (Gy)	Overdispersion ⁴ (%)	Dose Rate (Gy/ka)	OSL Age ⁵ (ka)
USU-964	LCA 210.01 (FN112)	96 (700)	12.12 ± 1.08	25.4 ± 3.4	4.37 ± 0.19	2.78 ± 0.36
USU-965	LCA 213.01 (FN113)	123 (1200)	12.94 ± 0.88	26.0 ± 2.6	4.77 ± 0.22	2.71 ± 0.32
USU-966	LCA 236.01 (FN116)	117 (1200)	11.87 ± 1.74	26.3 ± 2.8	4.45 ± 0.20	2.67 ± 0.47
USU-967	LCA 236.02 (FN 117)	139 (1200)	14.49 ± 2.27	26.2 ± 2.3	4.47 ± 0.21	3.24 ± 0.60
USU-968	LCA 236.03 (FN 118)	132 (2200)	17.11 ± 3.04	19.6 ± 2.2	4.39 ± 0.20	3.90 ± 0.79

¹Age analysis using the single-aliquot regenerative-dose procedure of Murray and Wintle (2000) on single-grains of quartz sand. Preheat temperature was 240°C based on preheat plateau test results (see below).

²Number of grains used for age calculation, number of grains measured in parentheses. Rejection of grains follows standard rejection criteria (see Rittenour 2005 for example).

³De calculated using the Minimum Age Model of Galbraith et al (1999), error on De is 2-sigma standard error.

⁴Overdispersion represents scatter in De beyond calculated uncertainties in data, OD >20% is considered significant.

⁵Error on age is 2-sigma standard error.

Dose Rate Information¹

USU num.	Sample num.	Location	Depth (m)	Grain size (µm)	<i>In-situ</i> H ₂ O ² (%)	U (ppm)	Th (ppm)	%K	Rb (ppm)	Cosmic ³ (Gy/ka)
USU-964	LCA 210.01 (FN112)	Stratum 503	0.75	90-150	0.62%	2.6±0.2	12.3±1.1	2.75±0.07	156.0±6.2	0.21±0.02
USU-965	LCA 213.01 (FN113)	Stratum 503	0.75	90-150	0.89%	3.0±0.2	18.7±1.7	2.62±0.07	134.5±5.4	0.21±0.02
USU-966	LCA 236.01 (FN116)	Stratum 503	1.1 ⁴	90-150	0.53%	2.3±0.2	14.7±1.3	2.75±0.07	155.5±6.2	0.20±0.02
USU-967	LCA 236.02 (FN 117)	Stratum 505	2.2 ⁴	75-125	0.36%	2.8±0.2	17.8±1.6	2.43±0.06	130.5±5.2	0.17±0.02
USU-968	LCA 236.03 (FN 118)	Stratum 507	3.9 ⁴	90-150	0.46%	2.4±0.2	16.7±1.5	2.58±0.06	141.0±5.6	0.14±0.01

¹Radioelemental concentrations determined by ICP-MS and ICP-AES techniques from ALS Chemex, dose rate is derived from concentrations by conversion factors from Guerin et al. 2011.

²Assume 3±3%wt H₂O is representative of burial history.

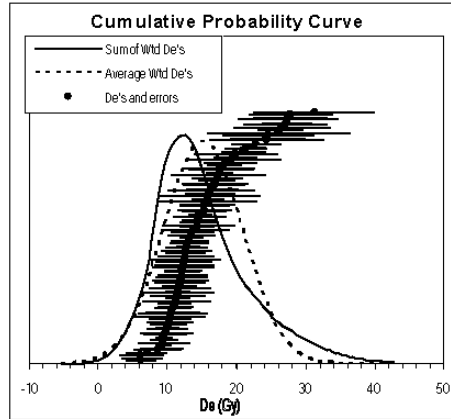
³Contribution of cosmic radiation to the dose rate was calculated by using sample depth, elevation, and longitude/latitude following Prescott and Hutton (1994).

⁴Depth below ca. 1950 surface.

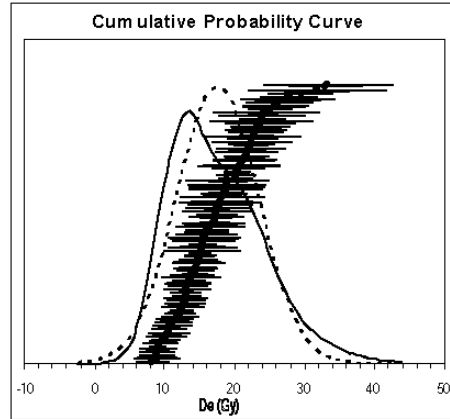


Equivalent dose distributions: Probability density functions

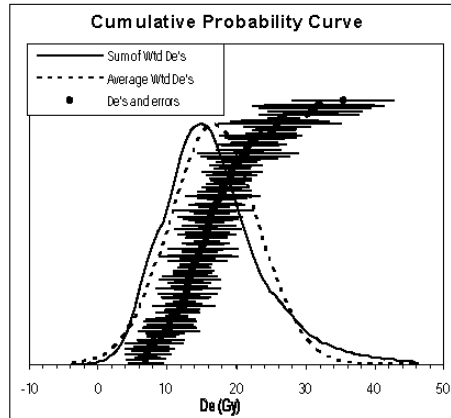
USU-964, LCA 210.01 (FN112)



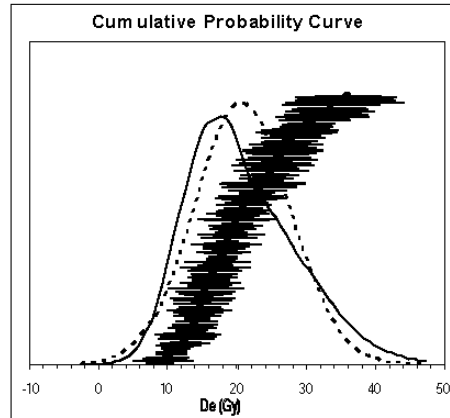
USU-965, LCA 213.01 (FN 113)



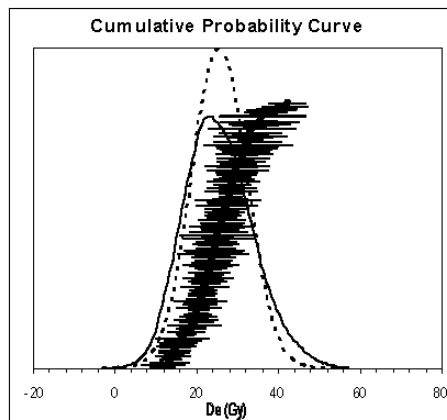
USU-966, LCA 236.01 (FN 116)



USU-967, LCA 236.02 (FN 117)

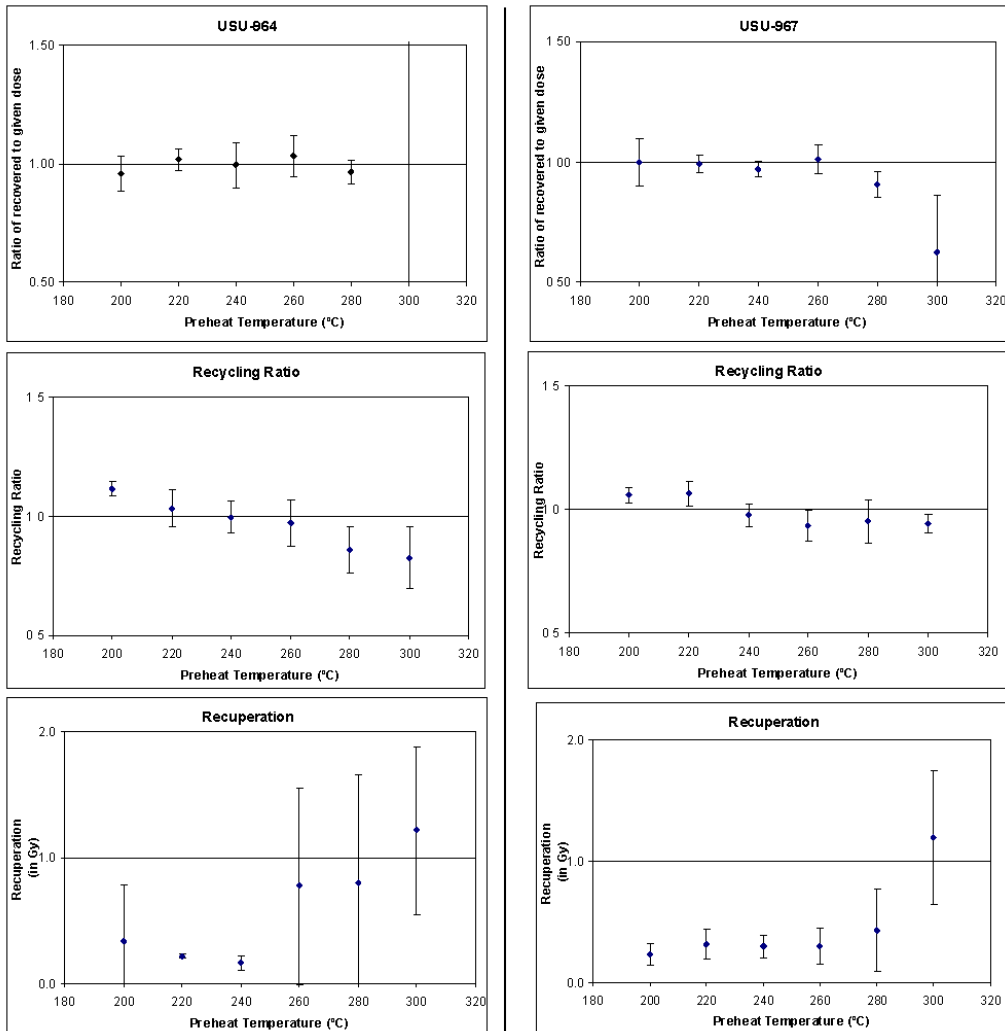


USU-968, LCA 236.03 (FN 118)

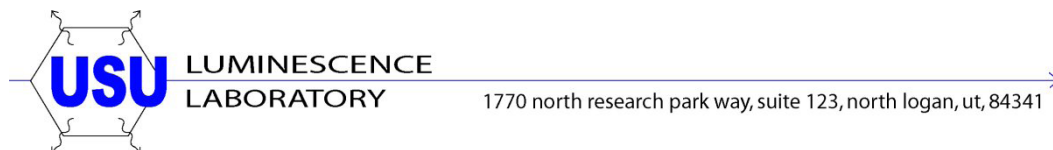




Preheat Plateau Test Results: USU-964 Preheat Plateau Test Results: USU-967



Preheat plateau tests were performed on USU-964 and USU-967 to determine the proper temperature used in the single-aliquot regenerative (SAR) protocol (Murray and Wintle, 2000). The recovered to given dose ratio closest to unity suggest the best preheat for the Las Capas samples. In addition, the recycling ratio (repeat of first laboratory dose at the end of the SAR cycle) closest to unity is preferable. The lowest amount of recuperation (signal measured when no laboratory dose is given) is also preferable. Based on these criteria and the results from these two tests, 240°C was the chosen preheat temperature for Las Capas samples.



Procedures for sample processing and age analysis:

All samples were opened and processed under dim amber safelight conditions within the lab. Sample processing follows standard procedures involving sieving, gravity separation and acid treatments with HCl and HF to isolate the quartz component of a narrow grain-size range, usually 90-150 μm^* . The purity of the samples is checked by measurement with infra-red stimulation to detect the presence of feldspar. Sample processing procedures follow those outlined in Aitken (1998) and described in Rittenour et al. (2003, 2005).

The USU Luminescence Lab follows the latest single-aliquot regenerative-dose (SAR) procedures for dating quartz sand (Murray and Wintle, 2000, 2003; Wintle and Murray, 2006). The SAR protocol includes tests for sensitivity correction and brackets the equivalent dose (D_e) the sample received during burial by irradiating the sample at five different doses (below, at, and above the D_e , plus a zero dose and a repeated dose to check for recuperation of the signal and sensitivity correction). The resultant data are fit with a saturating exponential curve from which the D_e is calculated on the mean, Central Age Model (CAM) or the Minimum Age Model (MAM) of Galbraith et al. (1999) or Juyal et al. (2006), depending on the distribution of D_e results and evidence for partial bleaching*. In cases where the samples have significant positive skew, ages are calculated based on a MAM. OSL age is reported at 1σ or 2σ standard error* and is calculated by dividing the D_e (in grays, gy) by the environmental dose rate (gy/ka) that the sample has been exposed to during burial.

Dose-rate calculations were determined by chemical analysis of the U, Th, K and Rb content using ICP-MS and ICP-AES techniques by ALS Chemex, Elko NV and conversion factors from Guerin et al. (2011). The contribution of cosmic radiation to the dose rate was calculated using sample depth, elevation, and latitude/longitude following Prescott and Hutton (1994). Dose rates are calculated based on water content, sediment chemistry, and cosmic contribution (Aitken, 1998).

Under the collaborative agreement to analyze samples at the USU Luminescence Lab, please consider including Dr. Rittenour as a co-author on resultant publications. Contact me for additional information and help with describing the OSL technique when you plan your publication.

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* these parameters are sample dependant, see first page of report for specific sample information

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