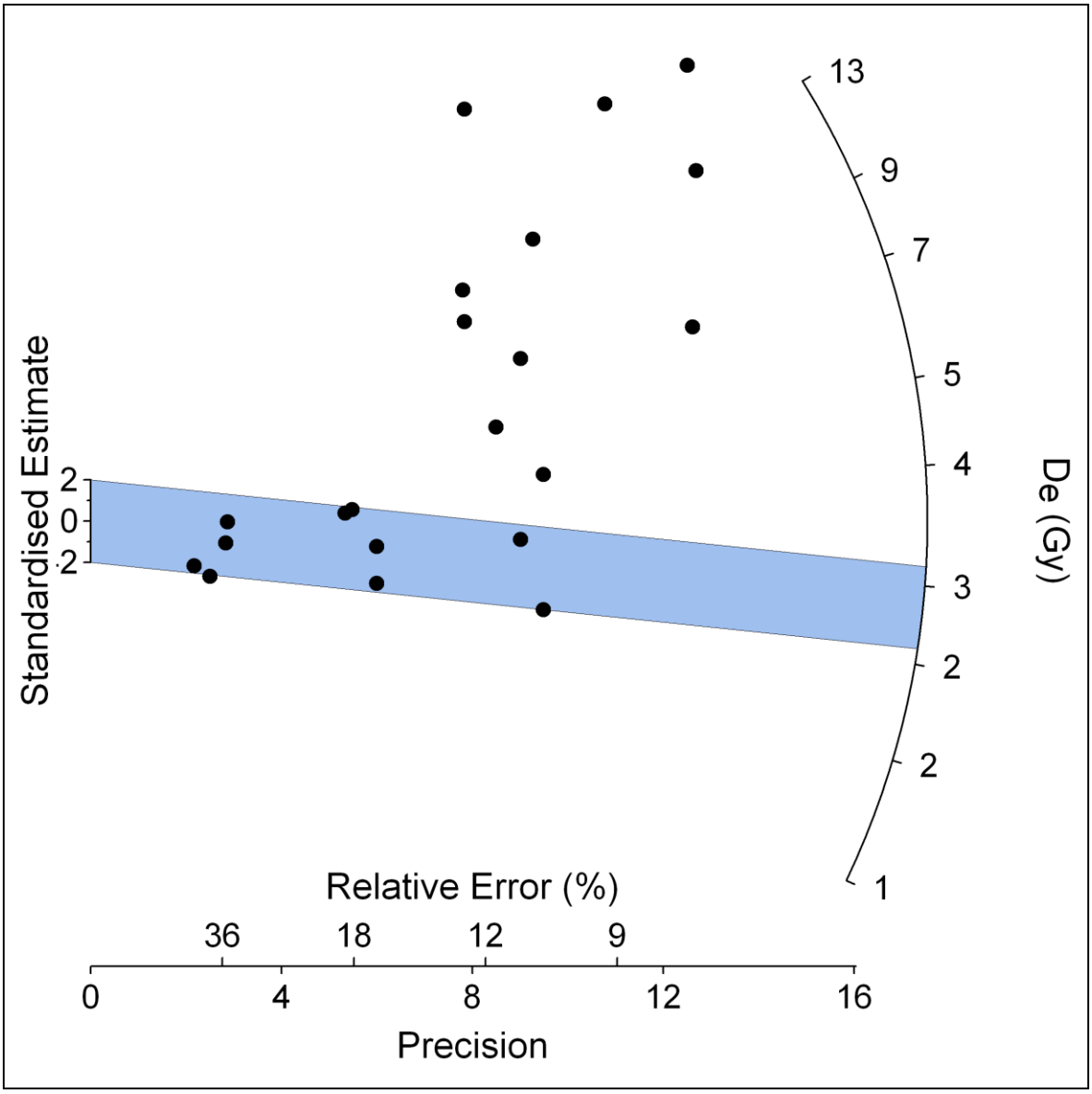

Figure 1. Statistical results are shown for the equivalent dose measurements of sample **AHME-21 (n =22 of 25)**. Radial plots allow plotting of each data point with its associated precision; any radius passing through the origin represents a line of constant dose, and the precision of the measurement increases from left to right. This graphical presentation allows visualization of dose distributions, where focus is drawn to the best-known results (Wallinga, 2002). Axis to the left is the standardized estimate within two sigma, axis to the right is the equivalent dose measured (in Gy). Although three outliers were discarded, there is excessive scatter in the data indicating overdispersion >50% (through mixing?). For this reason the minimum aliquot method was used to generate the final equivalent dose value.

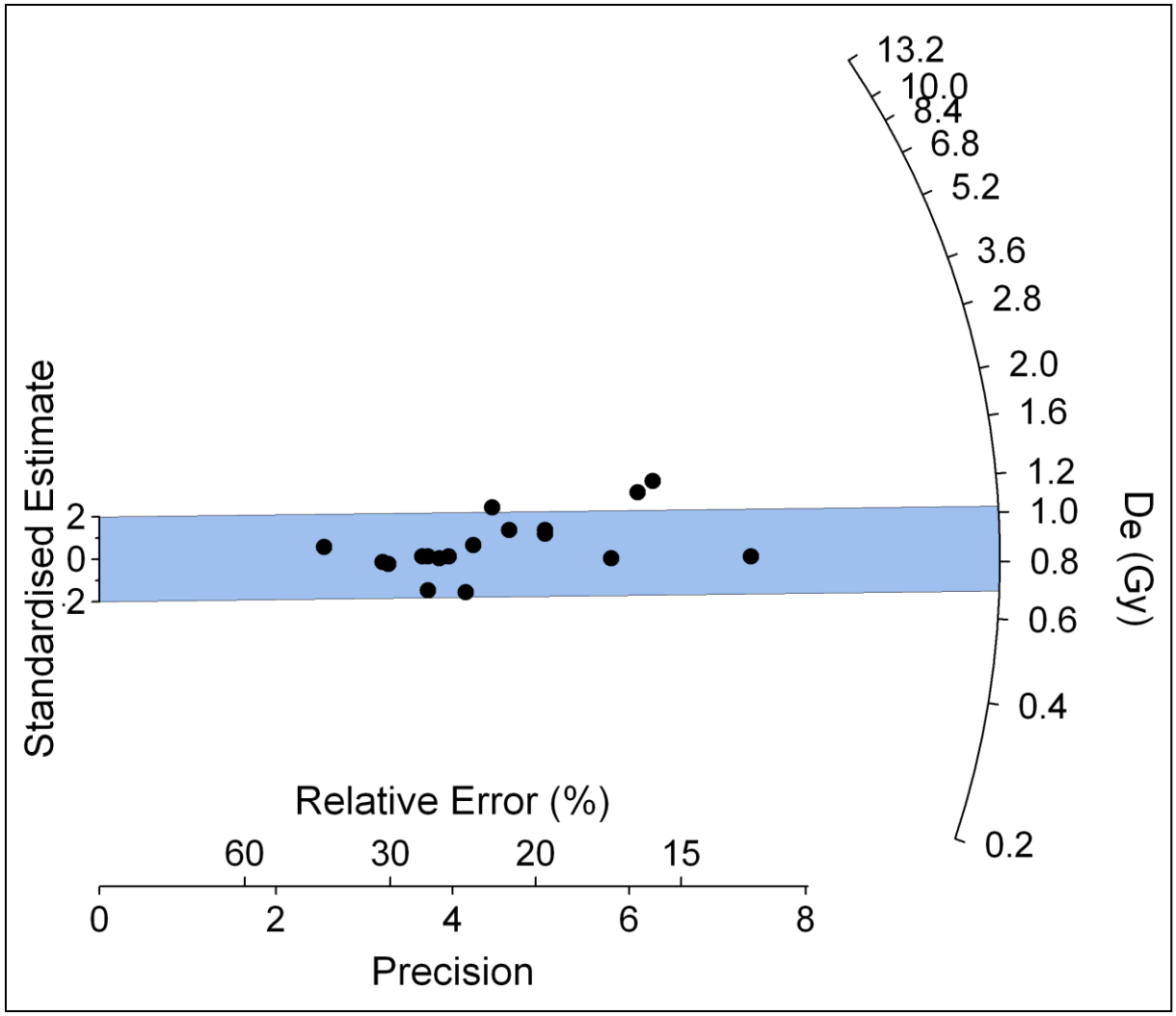

Figure 2. Statistical results are shown for the equivalent dose measurements of sample **AHME-23 (n =18 of 20)**. In contrast to the sample above, there is minimal overdispersion and indications are that the sample has not been mixed as much as the older samples. The larger error percentage is due to measurements of very small equivalent dose values (0.5 to 1.0 Gy).

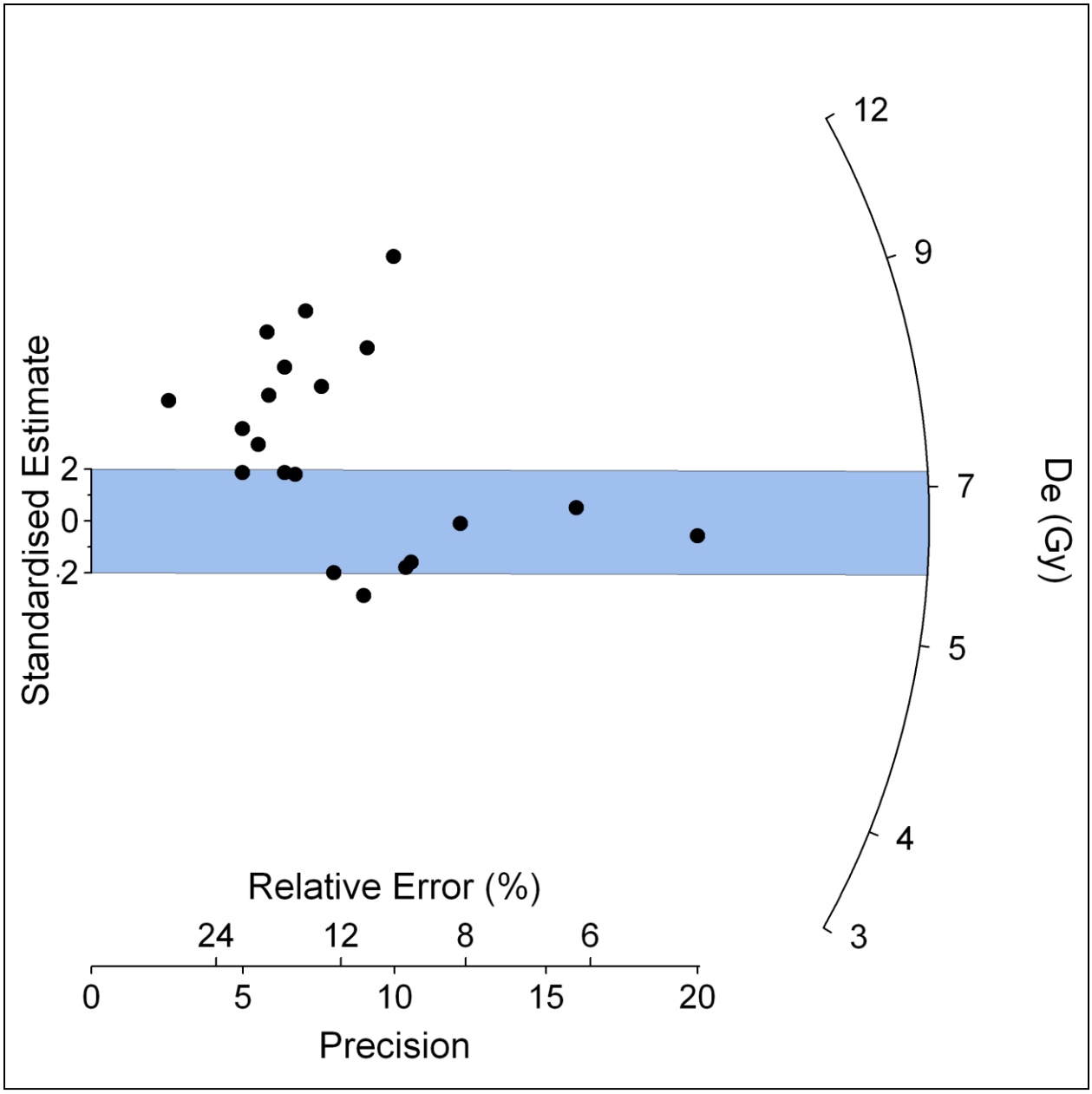

Figure 3. Statistical results are shown for the equivalent dose measurements of sample **AHME-24 (n =21 of 22)**. Although three outliers were discarded, there is excessive scatter in the data indicating overdispersion >50% (through mixing?). There is probably another grain equivalent dose population centered at 12 Gray but this is not highlighted in the figure. For these reasons the minimum aliquot method was used to generate the final equivalent dose value.

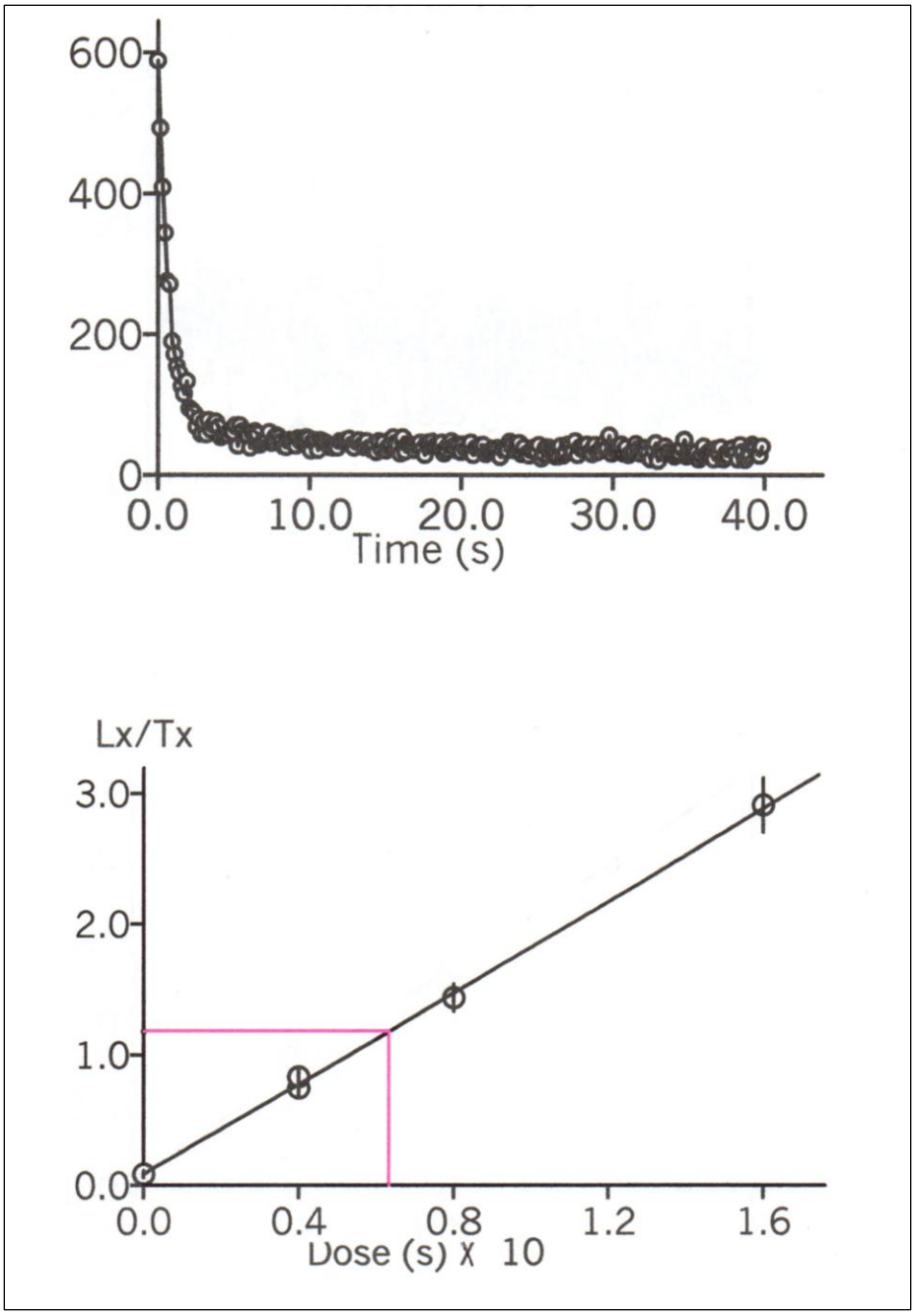

Figure 4. (A) OSL decay curve for AHME-21 showing the quartz signal as measured with blue-light wavelength emitting diodes. Time is measured in seconds (s) and OSL is measured in photons counts (starting at 600 photons) for a total time of 40 seconds. (B) AHME-21 growth curve, with the natural plotted on the Lx/Tx axis. Regeneration proceeded "optimally" with a recycle within 8% of the first measurement and circles show increases in response to increasing beta radiation (source strength at 0.087 Gy/sec). Fit is to an exponential + linear function. Dose is measured in Gray (absorbed radiation) and OSL is measured in unitless normalized OSL sensitivity measurements (Lx/Tx).

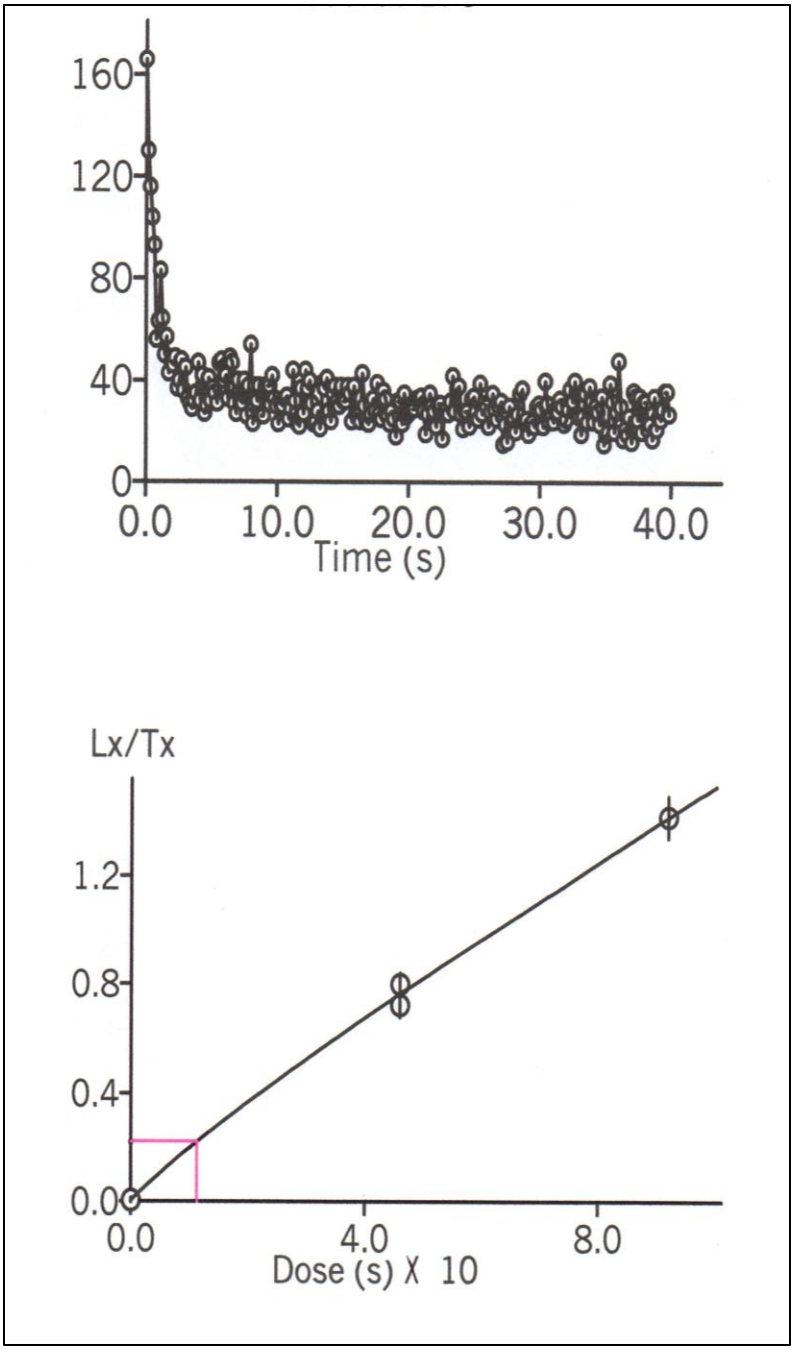

Figure 5. (A) OSL decay curve for AHME-23 showing the quartz signal as measured with blue-light wavelength emitting diodes. Time is measured in seconds (s) and OSL is measured in photons counts (starting at 160 photons) for a total time of 40 seconds. (B) AHME-23 growth curve, with the natural plotted on the Lx/Tx axis. Regeneration proceeded "optimally" with a recycle within 10% of the first measurement and circles show increases in response to increasing beta radiation (source strength at 0.087 Gy/sec). Fit is to an exponential + linear function. Dose is measured in Gray (absorbed radiation) and OSL is measured in unitless normalized OSL sensitivity measurements (Lx/Tx).

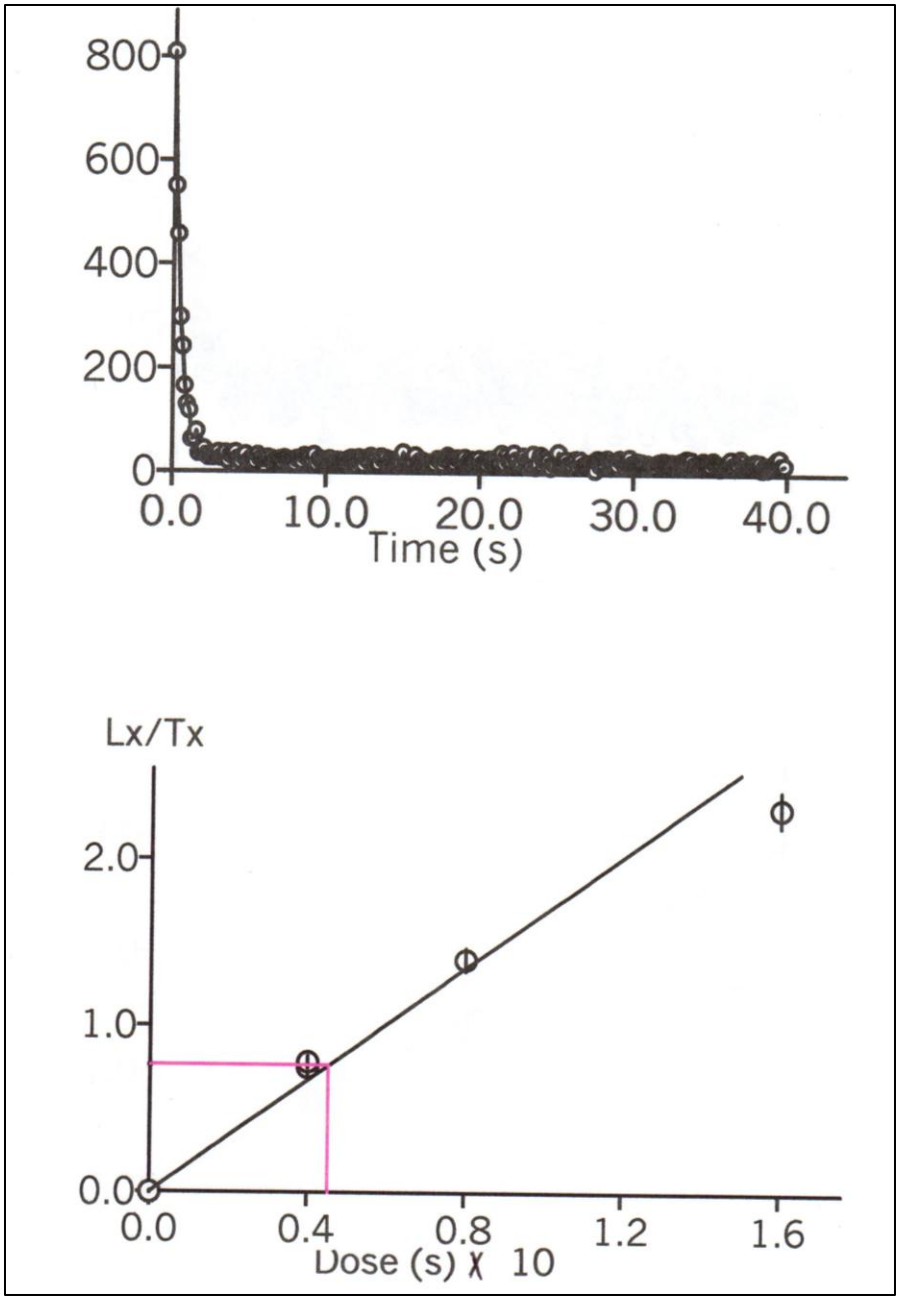

Figure 6. (A) OSL decay curve for AHME-24 showing the quartz signal as measured with blue-light wavelength emitting diodes. Time is measured in seconds (s) and OSL is measured in photons counts (starting at 800 photons) for a total time of 40 seconds. (B) AHME-24 growth curve, with the natural plotted on the Lx/Tx axis. Regeneration proceeded "optimally" with a recycle within 2% of the first measurement and circles show increases in response to increasing beta radiation (source strength at 0.087 Gy/sec). Fit is to an linear function, although calculations were taken from an exponential + linear function. Dose is measured in Gray (absorbed radiation) and OSL is measured in unitless normalized OSL sensitivity measurements (Lx/Tx).

TABLE 1: Luminescence parameters used in preparation and analyses of samples for quartz OSL

Measurement parameters:	
Machine	Automated Risø TL/luminescence-DA-15
Mineral; grain size:	quartz: 125-90 μm
Stimulation source:	blue LED diodes, emission centered on 470 nm
Power delivered to aliquot:	13 mW/cm^2 (90% power)
Duration of stimulation:	40 seconds
Final signal level:	1% of initial
Photomultiplier:	Thorn-EMI 9235Q
Aliquot temperature:	125 °C
Detection filters:	two Hoya U340 filters
Normalization:	none
Preheat:	200 °C (samples <5 ka) for 10 secs
Delay before measurement:	120 sec
Equivalent dose evaluation:	single aliquot regeneration (Murray and Wintle, 2000, 2003)
Background evaluation:	black body counts <35 ct/sec, BG counts <40 ct/sec
Alpha effectiveness:	n/a
Dose-rate evaluation:	ICP-MS
Dose rate range:	3.62-3.98 Gy/ka (Grays per thousand years)
Water content:	0%
Cosmic-ray contribution:	5-7% of total dose rate

Table 2. Single Aliquot Regeneration Protocol for Optical Dating.

1. Preheat (200 °C) for 10 seconds (preheat range is specific to Ash Meadows samples)
2. OSL stimulation with blue light (470 nm) at 125 °C for 40 seconds (L_n)
3. Test dose beta irradiation
4. Cut heat (same temp as preheat) for 0 sec
5. OSL stimulation with blue light (470 nm) at 125 °C for 40 seconds (T_n)
6. Beta irradiation of regeneration dose
7. Preheat (200 °C) for 10 seconds

8. OSL stimulation with blue light (470 nm) at 125 °C for 40 seconds (L_x)
9. Test dose beta irradiation
10. Cut heat (same temp as preheat) for 0 sec
11. OSL stimulation with blue light (470 nm) at 125 °C for 40 seconds (T_x)
12. Repeat Steps 6-11 with further regeneration doses

Sample information	% Water content[a]	K (%)[b]	U (ppm)[b]	Th (ppm)[b]	Cosmic dose[c] additions (Gy/ka)	Total Dose Rate (Gy/ka)	Equivalent Dose (Gy)	n[d]	Age (yrs)[e]
AHME-24	0 (23)	2.82 ± 0.06	0.98 ± 0.25	4.64 ± 0.16	0.18 ± 0.01	3.83 ± 0.14	6.04 ± 0.31	21 (24)	1,580 ± 100
AHME-23	0 (22)	2.75 ± 0.06	1.38 ± 0.35	7.97 ± 0.28	0.26 ± 0.02	3.98 ± 0.14	0.79 ± 0.04	18 (20)	200 ± 15
AHME-21	0 (24)	2.82 ± 0.06	1.01 ± 0.25	4.17 ± 0.15	0.21 ± 0.02	3.62 ± 0.13	3.12 ± 0.21	22 (25)	860 ± 65

[a]Field moisture, with figures in parentheses indicating the complete sample saturation %. Ages calculated using approximately 10% of saturation values.

[b]Analyses obtained using ICP-MS. All are total digests with HF and HNO3. Equilibration was done with HCl (9N).

[c]Cosmic doses and attenuation with depth were calculated using the methods of Prescott and Hutton (1994). See text for details.

[d]Number of replicated equivalent dose (De) estimates used to calculate the mean. Figures in parentheses indicate total number of measurements made including failed runs with unusable data.

[e]Dose rate and age for fine-grained 125-90 microns quartz sand. Linear + exponential fit used on equivalent dose, errors to one sigma.