



CENIEH

Centro Nacional de Investigación
sobre la Evolución Humana

Results Report

Luminescence Dating Laboratory

Location/Site: Zagros - Ja Fault

Authors:

Miren del Val
Luminescence Dating Technician
miren.delval@cenieh.es

Paseo Sierra de Atapuerca, 3
Burgos 09002, Spain

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| Report type: | Results |
| Method: | Optically Stimulated Luminescence (OSL) |

SUMMARY

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|--------------------------|-------------------------|
| Contact | Francisco Gutiérrez |
| Institution | Universidad de Zaragoza |
| Project | Zagros |
| Site location | Irán |
| Number of samples | 2 (2/5) |

The following table summarizes the Optically Stimulated Luminescence (OSL) dating results of 2 sample collected in Zagros Mountain, Iran, by the user. This includes the field and CENIEH laboratory codes, the calculated dose rate (Gy/ka), the estimated equivalent dose (Gy) and the derived age, expressed in ka (kiloyears).

| Sample | Lab code CENIEH | Dose rate (Gy/ka) | Equivalent dose (Gy) | Age (ka) |
|---------------|--------------------|----------------------|-------------------------|-------------|
| Ja-Fault-Up | LM23233-03 | 1.34 ± 0.05 | 17.9 ± 1.6 | 13.4 ± 1.3 |
| Ja-Fault-Down | LM23233-04 | 1.80 ± 0.08 | 26.5 ± 2.9 | 14.8 ± 1.7 |

Ages presented in this summary table are quoted at 1-sigma.

METHODOLOGY

Ages are based on the relation

$$Age (ka) = \frac{D_e (Gy)}{D_R (Gy/ka)}$$

where D_e is the equivalent dose in Gray and D_R is the environmental dose rate in Gray per kiloyear.

Principles of luminescence dating can be found in Aitken 1998.

Luminescence measurements were carried out on quartz grains of sizes 180-250 μ m, extracted from each sample under controlled light conditions. The measurements were performed using automated Risø TL/OSL DA-20 luminescence readers, equipped with $^{90}\text{Sr}/^{90}\text{Y}$ beta sources providing doses rates of ~ 0.10 Gy/s at the sample position. Quartz multi-grain aliquots were measured following the Single-Aliquot Regenerative-Dose (SAR) protocol (Murray and Wintle, 2000; 2003) to obtain representative dose distributions. The derived dose populations have been reduced by removing the outliers, identified as those out of 1.5 times the interquartile range. The equivalent dose, D_e , was estimated applying the Central Age Model (CAM, Galbraith et al., 1999) on the reduced population.

Environmental dose rates, D_R , are calculated as a contribution of beta, gamma and cosmic radiation. They are derived from radionuclide activity concentration determined by ICP-MS.

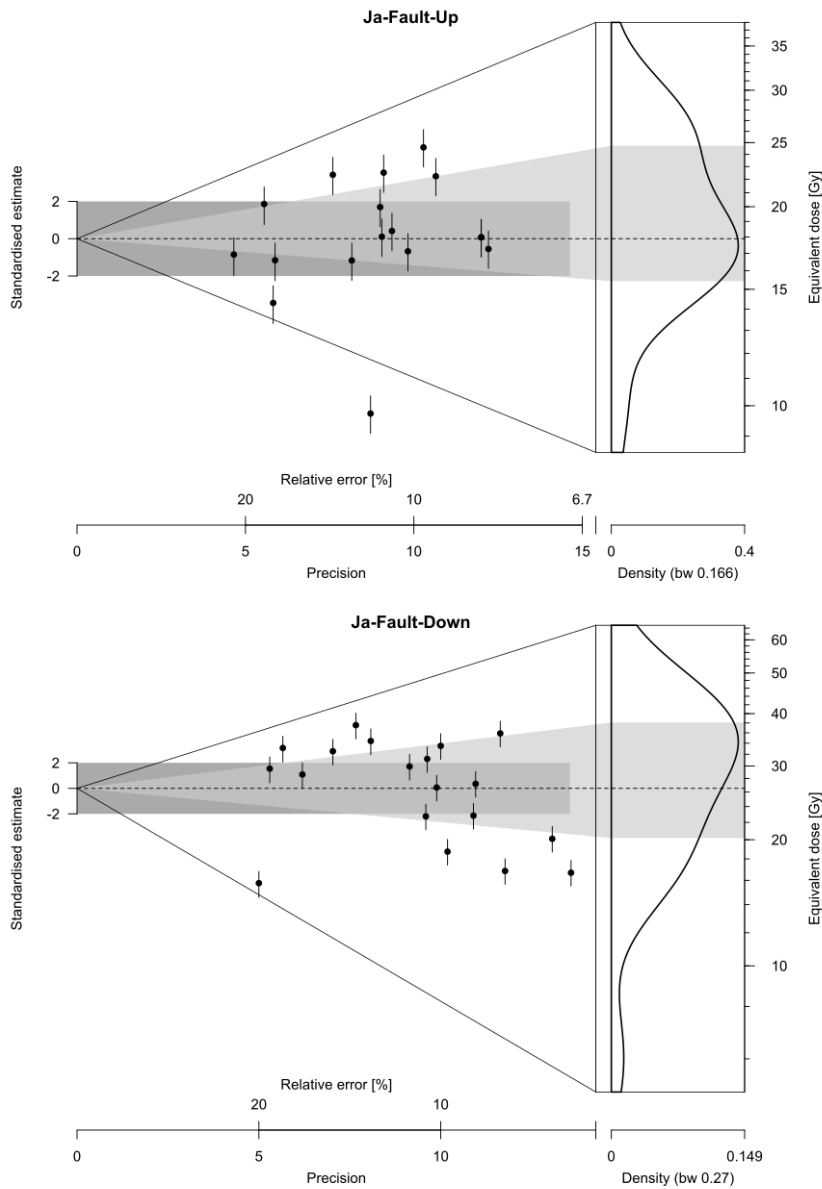
The doses received by the samples as a result of the radionuclide concentration present in the sample's matrix have been calculated using appropriate conversion factors (Guerin et al., 2011). A linear accumulation of deposits has been assumed in order to calculate the contribution of cosmic radiation according to the burial depth, latitude, altitude and average over-burden density (Prescott and Hutton, 1994). The total dose rates have been corrected according to attenuation caused by moisture and grain size. A 5% error has been added to the estimated water content used for the correction. Environmental dose rates to an infinite matrix values have been calculated using the Dose Rate & Age Calculator (DRAC, Durcan et al., 2015).

Activity concentration of radioelements, water content used for attenuation correction and sampling depth used to calculate the cosmic radiation contribution are summarized in the following table.

| Sample | Depth (m) | w (%) | ^{40}K (%) | Th (ppm) | U (ppm) | Rb (ppm) |
|------------|-----------|-------|---------------------|-----------------|-----------------|----------------|
| LM23233-03 | 3.4 | 5 | 0.69 ± 0.01 | 2.43 ± 0.09 | 1.79 ± 0.05 | 18.4 ± 0.6 |
| LM23233-04 | 4.3 | 5 | 1.14 ± 0.02 | 2.97 ± 0.11 | 1.88 ± 0.05 | 29.4 ± 0.9 |

RESULTS

The dose distributions derived from OSL measurements of multi-grain aliquots (2 mm ϕ) of quartz including the individual values and their corresponding uncertainties are shown the plots below.



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