

High Resolution Gamma Spectrometry

Files:

100g from Bulk, Detector 2, 2005.pdf
100g from Bulk, Detector 3, 2005.pdf
100g Recounts and Clasts, Detector 3, 2006.pdf
20g from Tubes, Detector 2, 2006 #1.pdf
20g from Tubes, Detector 2, 2006 #2.pdf

The files contain details of the high resolution gamma spectrometry (laboratory gamma spectrometry) measurements made as part of the gamma spectrometry survey of all the studied sites (Burbidge et al., 2007; In Prep) and for dating and related determinations (Burbidge et al., In Prep).

Each file represents a series of measurements on one of two instruments ("detector 2", "detector 3"). The data from each series of measurements were processed separately because each one relates to a different set of reference measurements. Page 1 of each file shows the reference values and details of the emissions measured. Each of the remaining pages in each file show data measured from a given sample, and dose rates calculated from this. Details of the instruments, methods and calculations can be found in Burbidge et al. (2007; In Prep).

In 2005, 100g samples taken from milled bulk samples from every sampling location were measured (Burbidge et al., 2007; In Prep). In 2006 some of these samples were recounted, and 100g samples of milled limestone clasts from some sites were also measured. Also measured in 2006 were smaller unmilled 20 g samples, from within each tube/tin from which material was excavated for luminescence dating.

Burbidge, C.I., Sanderson, D.C.W., Housley, R.A. *et al.* (In Prep) Luminescence geochronologies of sand and silt sediment fractions from Palaeolithic site North and East of the Black Sea, to be submitted in 2008 to a yet unspecified journal.

Burbidge, C.I., Sanderson, D.C.W., Housley, R.A., Allsworth-Jones, P. (2007) Survey of Palaeolithic sites by luminescence profiling, a case study from Eastern Europe, *Quaternary Geochronology* 2, 296-302.

Headings:

Page 1 of each file: Reference values and measurements

Background = summary of measurements with chamber empty

Shap Granite X g = summary of measurement with X g of shap granite mixed source reference material in the chamber, in the same geometry as the samples being measured.

Total time (ks) = total reference counting time (counts interspersed with samples to check instrument stability)

Wt Mean rate, Error (cts/ks) = Weighted mean count rate and external error in counts per kilosecond

Net Rate, error = Weighted mean count rate after subtraction of Weighted mean background count rate, and propagated error

Half Life (a/m/d/h) = half life of radioisotope in years/months/days/hours

Energy (keV) = energy of measured gamma emission (from decay of radioisotope), in kiloelectron volts

Intensity = mean number of emissions at this energy per disintegration (of radioisotope), i.e. probability of emission

Note: 226-Ra (235-U) indicates that the ROI used to measure emissions from 226-Ra also includes a weak emission from the 235-U series.

Page 2 etc of each file: Sample details and measurements

Detector = detector number

Sample = sample name

Filename = name of file in which a sample's spectrum was recorded

ROI file = name of regions of interest file used to analyse the spectrum

Date = date of measurement

Time (ks) = length of measurement in kiloseconds

Mass (g) = mass of sample material in grammes

Counts = gross counts measured in each ROI

Rate = gross count rate for each ROI, in counts per kilosecond

Net rate = gross count rate for each ROI minus weighted mean background count rate for the series of measurements (refer to page 1 of file), in counts per kilosecond

Specific Activity = Activity Concentration: radioactivity of radioisotope per unit mass of sample, based on comparison of net count rates per unit mass weighted mean count rate per unit mass from the shap granite reference sample (refer to page 1 of file), in Bequerels per kilogram.

Concentration = predicted elemental concentration of parent radioisotope based on results from individual ROIs (and weighted means in the lower table). K is converted to percent natural Potassium, 238-U to parts per million Natural Uranium, and 232-Th to parts per million natural Thorium.

Within 2 err of WM? = logic test to highlight ROIs with scattered results (values further than two times their expected errors from the weighted mean for each parent).

WM Calcs = components of weighted mean calculations

Full Series WM = weighted mean (with external error) across all the ROIs pertaining to a given parent radioisotope (K, 238-U, 232-Th).

Thfull/Ufull = full series weighted mean concentration of Th divided by that of U.

Pre 222Rn U = weighted mean (with external error) across the ROIs pertaining to pre-radon daughters of 238-U

Post 222Rn U = weighted mean (with external error) across the ROIs pertaining to post-radon daughters of 238-U

Difference = pre-radon minus post-radon values: may indicate radon loss if statistically significant.

Dose Rates (mGy/a) = infinite matrix Alpha, Beta and Gamma, and Total (Alpha plus Beta plus Gamma) dose rates, in milliGrays per annum, calculated from the estimates of parent elemental concentration.