

# DRAC age calculations for Opel et al. (2026)

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**Input file:** B19-LU\_sample\_attributes for Opel2026.csv

## 1 Introduction

For estimating environmental dose rates and calculating sample ages, the function `use_DRAC()` from the R Luminescence package is used. This function is a wrapper function which connects to the online available Dose rate and age calculator (DRAC) at [Aberystwyth University | Department of Geography & Earth Sciences | DRAC — Calculator](#).

## 1.1 Input values

### 1.1.1 General parameters

The environmental dose rate depends highly on the DRAC template which is used. Ages from the “feldspar\_coarse” template defined by Burow & Kreutzer are around 9 % older than those from the original “DRAC-example\_feldspar” template,. These differences arise partly from the different a-values (Burow & Kreutzer: 0.08 vs. DRAC: 0.15) which are used in both templates. Here, the `feldspar_coarse` by Burow & Kreutzer is used but with an a-value of 0.14 % given in the gamma spectrometry protocol of Detlev Deggering (VKTA) is used. This leads to ages which are in the middle of those returned by the two templates.

```
# Create a template: "DRAC-example_feldspar" or "feldspar_coarse"
input <- template_DRAC(preset = "feldspar_coarse", notification = FALSE)

# Fill the template with values
input$`Project ID` <- "B19 feldspar"
input$`a-value` <- 0.14 # taken from the VKTA Prüfbericht
input$`Conversion factors` <- "AdamiecAitken1998"
input$`Calculate external Rb from K conc?` <- "N"
input$`Calculate internal Rb from K conc?` <- "N"
input$`Scale gammadoserate at shallow depths?` <- "N"
input$`Grain size min (microns)` <- 63
input$`Grain size max (microns)` <- 100
input$`Overburden density (g cm-3)` <- 1.8
input$`errOverburden density (g cm-3)` <- 0.1
input$`Altitude (m)` <- 300
input$`errDepth (m)` <- 0
```

### 1.1.2 Sample-specific parameters

Radionuclide concentrations were measured using low-level  $\gamma$  spectrometry carried out by Detlev Degering of VKTA in the Felsenkeller laboratory in Dresden.

Cosmic ray dose rates were estimated from the sample settings on side.

Water contents were estimated *in situ* from frozen sample blocks.

Table 1: Radionuclide concentrations according to the VKTA Prüfbericht

sample	U	U_err	Th	Th_err	K	K_err
B19-LU-05	2.7	0.3	9.1	0.6	1.72	0.14
B19-LU-06	2.5	0.3	8.5	0.5	1.69	0.14
B19-LU-13	2.4	0.3	9.0	0.6	1.89	0.12
B19-LU-14	2.6	0.3	9.7	0.6	1.86	0.19

Table 2: Other sample-dependent DRAC input values

sample	longitude	latitude	sampling_depth	water	water_std	de	de_err
B19-LU-05	67.58004	134.7613	34.5	84.14	31.56	296.066	16.505
B19-LU-06	67.58004	134.7613	32.5	60.84	5.93	245.994	12.904
B19-LU-13	67.58300	134.7644	20.0	33.54	9.73	156.270	8.221
B19-LU-14	67.58300	134.7644	20.8	53.55	3.98	163.889	9.230

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## 1.2 Results

Table 3: DRAC calculation results.

	Env. Dose Rate (Gy/ka)	error (Gy/ka)	De (Gy)	error (Gy)	Age (ka)	error (ka)
B19-LU-05	1.988	0.232	296.066	16.505	148.941	19.238
B19-LU-06	2.181	0.115	245.994	12.904	112.767	8.400
B19-LU-13	2.801	0.179	156.270	8.221	55.782	4.624
B19-LU-14	2.490	0.132	163.889	9.230	65.828	5.087