**Diring Yuriakh**

Guide to reproduce results reported in the supplementary material.

**Overview**

- Results obtained with the regular P-PINI code (Supp. Mat. section 3.2.3)

- Results obtained with the modified P-PINI code (Supp. Mat. section 3.3)

- Calculate the burial age with the OSL constraint (burial age >270 ka)

- Make figure 4

**1. Results obtained with the regular P-PINI code (Supp. Mat. section 3.2.3)**

To obtain the regular P-PINI results for cultural layer at Diring Yuriakh, you need to execute the three Matlab codes associated with the P-PINI model in the correct order. These are: “*MC\_AlBe\_source\_Diring.m*”, “*MC\_AlBe\_sink\_Diring.m*” and “*PPINI\_analysis\_Diring.m*”.

To run the P-PINI model, you need to download the three files listed above along with the folders “code” and “samples”. To run the P-PINI model you need to have a Matlab license.

Note that the Diring10Be-26Al data are located in a folder named “other/samples”.

Run the following files in the order below.

1. **Open “*MC\_AlBe\_source\_Diring.m*”**

Enter name of output file containing simulation results. (Line 19)

Enter number of simulations. More than 1e7 simulations should rarely be necessary. (Line 20)

Enter all the parameter ranges of the source region. (Line 23-39)

Run code.

1. **Open “*MC\_AlBe\_sink \_Diring.m*”**

Enter name of source output file to load. (Line 20)

Enter desired name for sink output file. (Line 21)

Consider whether the sampling site has experienced primarily accumulation or erosion since the sampled unit was deposited.

If another unit is overlying the sampled unit, most likely some accumulation has taken place post-deposition.

Set “ero = 0” in the MATLAB code. (Line 24)

If no other units are present above the sampled layers, most likely the layer has been eroding since deposition.

Set “ero = 1” in the MATLAB code. (Line 24)

Enter all parameter ranges of the sink region. (Line 27-37)

Run code.

1. **Open “*PPINI\_analysis\_Diring*”**

Enter site name, library name and excel file name. (Line 5-7)

Note that the excel file contains the data. You can choose to run the samples together or individually.

Run code – your results should be displayed if parameter ranges were chosen correctly. If not:

* 1. Check the individual probability plots, did you chose the correct burial age ranges and/or accumulation/erosion ranges? Is the uncertainty of your samples realistic?
  2. Check library plot (orange on black dots). Does the distribution look correct? Does the samples concentrations fall within the simulation space? Otherwise try to rewise model inputs. Did you input with the correct units? yr or Ma, g/cm2/yr or m/yr. Check green comments in the Matlab code to see what the correct unit is.
  3. If you are still not able to produce results after *a* and *b*, consider the probability plots and library plot again. Consider if any samples are outliers are not compatible with the rest of the samples.

**Results obtained with the modified P-PINI code (Supp. Mat. section 3.3)**

To reproduce the results obtained with the modified P-PINI code, you must follow the steps outlined above for the regular P-PINI code, but this time you should use the following files: “*MC\_AlBe\_source\_Diring\_Modified.m*”, “*MC\_AlBe\_sink\_Diring\_Modified.m*” and “*PPINI\_analysis\_Diring\_Modified.m*”.

The reworking and post-burial exposure times are inserted in lines 50 and 51 of the file “*MC\_AlBe\_source\_Diring\_Modified.m*”,.

The post-LGM sensitivity tests can be carried by changing “0” in line 51 of the file “*MC\_AlBe\_sink\_Diring\_Modified.m*” to e.g. “1000” years.

**Calculate the burial age with the OSL constraint (burial age >270 ka)**

In order to reproduce the burial age constraints with the Bayesian constraint that the age must be older than the OSL-derived age of the overlying unit (>270 ka), you must run the file “Bayesian\_P\_PINI\_Diring.m”. You must enter the burial age and associated uncertainty in lines 4 and 5.

**Make figure 4**

In order to reproduce figure 4 of the main text, you must run the file “Elgygytgyn\_plot.m”.