Package ‘oxcAAR’

October 14, 2022

Type Package

Title Interface to 'OxCal' Radiocarbon Calibration

Version 1.1.1

Date 2021-06-06

Description A set of tools that enables using 'OxCal' from within R. 'OxCal' (<https://c14.arch.ox.ac.uk/oxcal.html>) is a standard archaeological tool intended to provide 14C calibration and analysis of archaeological and environmental chronological information. 'OxcAAR' allows simple calibration with 'Oxcal' and plotting of the results as well as the execution of sophisticated ('OxCal') code and the import of the results of bulk analysis and complex Bayesian sequential calibration.

License GPL-2 | file LICENSE

Imports stringi, stringr, jsonlite

Suggests knitr, testthat, rmarkdown, ggplot2, ggridges, methods

VignetteBuilder knitr

RoxygenNote 7.1.1

Encoding UTF-8

NeedsCompilation no

Author Hinz Martin [aut, cre],
   Clemens Schmid [aut],
   Daniel Knitter [aut],
   Carolin Tietze [aut]

Maintainer Hinz Martin <martin.hinz@iaw.unibe.ch>

Repository CRAN

Date/Publication 2021-07-05 17:20:02 UTC

R topics documented:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boundary</td>
<td>2</td>
</tr>
<tr>
<td>calcurve_plot</td>
<td>3</td>
</tr>
<tr>
<td>executeOxcalScript</td>
<td>3</td>
</tr>
<tr>
<td>get_bp</td>
<td>4</td>
</tr>
</tbody>
</table>
Boundary

Returns the Oxcal code for a Boundary

Description

Boundary returns the OxCal code for a Boundary. For details concerning the Oxcal simulation please consult the help page of Oxcal.

Usage

Boundary(names)

Arguments

names a optional vector of names for the resulting Phases dates. If given, for each name a boundary is returned. If not given, one Boundary without name is returned.

Value

a string containing the respective Oxcal code
**calcurve_plot**

Plots calibrated dates on the calibration curve

**Description**

Plots calibrated dates on the calibration curve

**Usage**

```r
calcurve_plot(
  x,
  dates_sigma_ranges = NULL,
  uncal_range = TRUE,
  cal_range = TRUE
)
```

**Arguments**

- `x` an object of class oxcAARCalibratedDate or oxcAARCalibratedDatesList
- `dates_sigma_ranges` character. The sigma range used for the error bars ("two_sigma", "one_sigma" or "three_sigma")
- `uncal_range` logical. If TRUE (default), the plot contains error bars for the the uncalibrated age
- `cal_range` logical. If TRUE (default), the plot contains error bars for the the calibrated age

**executeOxcalScript**

Executes an Oxcal Script

**Description**

Takes an Oxcal Script, hands it over to oxcal and receives the output that is read from the output file

**Usage**

```r
executeOxcalScript(oxcal_script)
```

**Arguments**

- `oxcal_script` A string containing the Oxcal commands that should be processed.

**Value**

The path to the js output file
get_bp

Author(s)

Martin Hinz

get_bp  get bp values (ages)

Description

queries values from date objects

Usage

get_bp(x)

## Default S3 method:
get_bp(x)

## S3 method for class 'oxcAARCalibratedDate'
get_bp(x)

## S3 method for class 'oxcAARCalibratedDatesList'
get_bp(x)

Arguments

x an object of class oxcAARCalibratedDate or oxcAARCalibratedDatesList

Value

an integer or a numeric vector

See Also

Other getter functions: get_cal_curve(), get_name(), get_posterior_probabilities(), get_posterior_sigma_ranges(), get_raw_probabilities(), get_sigma_ranges(), get_std()

Examples

## Not run:
x <- oxcalCalibrate(c(5000, 4500, 3000), c(20, 50, 60))
get_bp(x)
y <- oxcalCalibrate(5000, 20)[[1]]
get_bp(y)

## End(Not run)
**get_cal_curve**

**get calibration curve names**

### Description

Queries values from date objects

### Usage

```r
get_cal_curve(x)
```

- **Default S3 method:**
  ```r
get_cal_curve(x)
  ``
- **S3 method for class 'oxcAARCalibratedDate':**
  ```r
get_cal_curve(x)
  ``
- **S3 method for class 'oxcAARCalibratedDatesList':**
  ```r
get_cal_curve(x)
  ``

### Arguments

- **x**
  - An object of class `oxcAARCalibratedDate` or `oxcAARCalibratedDatesList`

### Value

A string or a character vector

### See Also

Other getter functions: `get_bp()`, `get_name()`, `get_posterior_probabilities()`, `get_posterior_sigma_ranges()`, `get_raw_probabilities()`, `get_sigma_ranges()`, `get_std()`

### Examples

```r
## Not run:
x <- oxcalCalibrate(c(5000, 4500, 3000), c(20, 50, 60))
get_cal_curve(x)
y <- oxcalCalibrate(5000, 20)[[1]]
get_cal_curve(y)
## End(Not run)
```
get_name  

get names (labcodes)

Description
queries values from date objects

Usage
get_name(x)

## Default S3 method:
get_name(x)

## S3 method for class 'oxcAARCalibratedDate'
get_name(x)

## S3 method for class 'oxcAARCalibratedDatesList'
get_name(x)

Arguments
x an object of class oxcAARCalibratedDate or oxcAARCalibratedDatesList

Value
a string or a character vector

See Also
Other getter functions: get_bp(), get_cal_curve(), get_posterior_probabilities(), get_posterior_sigma_ranges(), get_raw_probabilities(), get_sigma_ranges(), get_std()

Examples
## Not run:
x <- oxcalCalibrate(c(5000, 4500, 3000), c(20, 50, 60))
get_name(x)
y <- oxcalCalibrate(5000, 20)[[1]]
get_name(y)

## End(Not run)
get_posterior_probabilities

get posterior raw probabilities

Description
queries values from date objects

Usage
get_posterior_probabilities(x)

## Default S3 method:
get_posterior_probabilities(x)

## S3 method for class 'oxcAARCalibratedDate'
get_posterior_probabilities(x)

## S3 method for class 'oxcAARCalibratedDatesList'
get_posterior_probabilities(x)

Arguments
x               an object of class oxcAARCalibratedDate or oxcAARCalibratedDatesList

Value
a list of three data.frames or a list of those lists

See Also
Other getter functions: get_bp(), get_cal_curve(), get_name(), get_posterior_sigma_ranges(), get_raw_probabilities(), get_sigma_ranges(), get_std()
Usage

get_posterior_sigma_ranges(x)

## Default S3 method:
get_posterior_sigma_ranges(x)

## S3 method for class 'oxcAARCalibratedDate'
get_posterior_sigma_ranges(x)

## S3 method for class 'oxcAARCalibratedDatesList'
get_posterior_sigma_ranges(x)

Arguments

x an object of class oxcAARCalibratedDate or oxcAARCalibratedDatesList

Value

a list of three data.frames or a list of those lists

See Also

Other getter functions: get_bp(), get_cal_curve(), get_name(), get_posterior_probabilities(), get_raw_probabilities(), get_sigma_ranges(), get_std()

get_raw_probabilities

get raw probabilities

Description

queries values from date objects

Usage

get_raw_probabilities(x)

## Default S3 method:
get_raw_probabilities(x)

## S3 method for class 'oxcAARCalibratedDate'
get_raw_probabilities(x)

## S3 method for class 'oxcAARCalibratedDatesList'
get_raw_probabilities(x)

Arguments

x an object of class oxcAARCalibratedDate or oxcAARCalibratedDatesList
get_sigma_ranges

Value

a data.frame or a list of data.frames

See Also

Other getter functions: `get_bp()`, `get_cal_curve()`, `get_name()`, `get_posterior_probabilities()`, `get_posterior_sigma_ranges()`, `get_sigma_ranges()`, `get_std()`

Examples

```r
## Not run:
x <- oxcalCalibrate(c(5000, 4500, 3000), c(20, 50, 60))
get_raw_probabilities(x)
y <- oxcalCalibrate(5000, 20)[[1]]
get_raw_probabilities(y)
## End(Not run)
```

Description

queries values from date objects

Usage

```r
get_sigma_ranges(x)
```

Arguments

- `x` an object of class `oxcAARCalibratedDate` or `oxcAARCalibratedDatesList`

Value

a list of three data.frames or a list of those lists
get_std

See Also

Other getter functions: get_bp(), get_cal_curve(), get_name(), get_posterior_probabilities(),
get_posterior_sigma_ranges(), get_raw_probabilities(), get_std()

Examples

## Not run:
x <- oxcalCalibrate(c(5000, 4500, 3000), c(20, 50, 60))
get_sigma_ranges(x)
y <- oxcalCalibrate(5000, 20)[[1]]
get_sigma_ranges(y)
## End(Not run)

get_std

get std values (standard deviations)

Description

queries values from date objects

Usage

get_std(x)

## Default S3 method:
get_std(x)

## S3 method for class 'oxcAARCalibratedDate'
get_std(x)

## S3 method for class 'oxcAARCalibratedDatesList'
get_std(x)

Arguments

x an object of class oxcAARCalibratedDate or oxcAARCalibratedDatesList

Value

an integer or a numeric vector

See Also

Other getter functions: get_bp(), get_cal_curve(), get_name(), get_posterior_probabilities(),
get_posterior_sigma_ranges(), get_raw_probabilities(), get_sigma_ranges()
get_tidy_oxcalresult

Examples

```r
## Not run:
x <- oxcalCalibrate(c(5000, 4500, 3000), c(20, 50, 60))
get_std(x)
y <- oxcalCalibrate(5000, 20)[[1]]
get_std(y)

## End(Not run)
```

tidy output

Description

Transforms oxAAR output to a tidy data format. See [http://vita.had.co.nz/papers/tidy-data.html](http://vita.had.co.nz/papers/tidy-data.html) and [https://CRAN.R-project.org/package=broom](https://CRAN.R-project.org/package=broom)

Usage

```r
get_tidy_oxcalresult(x)
```

Arguments

- `x` an object of class oxAARCalibratedDate or oxAARCalibratedDatesList

Value

a data.frame (with list columns)

Examples

```r
## Not run:
x <- oxcalCalibrate(c(5000, 4500, 3000), c(20, 50, 60))
get_tidy_oxcalresult(x)
y <- oxcalCalibrate(5000, 20)[[1]]
get_tidy_oxcalresult(y)

## End(Not run)
```
is.oxcAARCalibratedDate

*Checks if a variable is of class oxcAARCalibratedDate*

**Description**
Checks if a variable is of class oxcAARCalibratedDate

**Usage**
```
is.oxcAARCalibratedDate(x)
```

**Arguments**
- `x` a variable

**Value**
true if `x` is a oxcAARCalibratedDate, false otherwise

is.oxcAARCalibratedDatesList

*Checks if a variable is of class oxcAARCalibratedDatesList*

**Description**
Checks if a variable is of class oxcAARCalibratedDatesList

**Usage**
```
is.oxcAARCalibratedDatesList(x)
```

**Arguments**
- `x` a variable

**Value**
true if `x` is a oxcAARCalibratedDatesList, false otherwise
oxcAARCalibratedDate  

oxcAAR Calibrated Dates Object

Description

The function `oxcAARCalibratedDate` is used to create an object for a calibrated date.

Usage

```r
oxcAARCalibratedDate(
  name,
  type,
  bp,
  std,
  cal_curve,
  sigma_ranges,
  raw_probabilities,
  posterior_probabilities = NA,
  posterior_sigma_ranges = NA
)
```

Arguments

- **name**: a string giving the name of the date (usually the lab number)
- **type**: a string giving the type of the date in OxCal terminology ("R_Date", "R_Simulate", ...)
- **bp**: a integer giving the BP value for the date
- **std**: a integer giving the standard deviation for the date
- **cal_curve**: a list containing information about the calibration curve (name, resolution, bp, bc, sigma)
- **sigma_ranges**: a list of three elements (one, two, three sigma), each a data frame with start, end and probability giving
- **raw_probabilities**: a data frame of dates and the related probabilities for each date
- **posterior_probabilities**: a data frame of dates and the related posterior probabilities for each date
- **posterior_sigma_ranges**: a list of three elements (one, two, three sigma), each a data frame with start, end and probability giving for the posterior probabilities

Value

An object of the class 'oxcAARCalibratedDate'
oxcalCalibrate

Description

Calibrates a 14C date using oxcal

Usage

oxcalCalibrate(bp, std, names = 1:length(bp))

Arguments

bp A vector containing the bp dates of the measurements
std A vector containing the standard deviations of the measurements
names The names of the measurements, usually the Laboratory numbers

Value

An object of class oxcAARCalibratedDatesList
**oxcalSimulate**

*Simulates 14C dates using oxcal*

---

**Description**

Simulates 14C dates using oxcal

**Usage**

```r
oxcalSimulate(c_date, std, names = 1:length(c_date))
```

**Arguments**

- `c_date` A vector containing the calendar dates to be simulated
- `std` A vector containing the standard deviations for the simulated dates
- `names` The names of the measurements, usually the Laboratory numbers

**Value**

An object of class `oxcAARCalibratedDatesList`

---

**oxcalSumSim**

*Sum calibration for simulated dates*

---

**Description**

Sum calibration for simulated dates

**Usage**

```r
oxcalSumSim(
  timeframe_begin,
  timeframe_end,
  n,
  stds,
  date_distribution = c("equidist", "uniform")
)
```
Arguments

timeframe_begin, timeframe_end
beginning and end of the time frame for which dates should be simulated

n
the number of dates that should be simulated

stds
either one standard deviation for all dates or a vector of standard deviations with length n

date_distribution
a character string indicating which method should be used to distribute the dates in the given time frame, can be abbreviated

Details

The dates can be distributed using one of the following methods: ‘equidist’ distributed the n dates within the time frame with equal distance, ‘uniform’ random samples n dates from the given time interval with uniform distribution

Value

A list containing the following components:

dates the dates for the simulated sum calibration
probabilities the probabilities for the simulated sum calibration
date_distribution the distribution method used for the dates

oxcal_Sum
Wraps an Oxcal string into a Oxcal sum function

Description

Wraps an Oxcal string into a Oxcal sum function

Usage

oxcal_Sum(oxcal_string, name = "Sum")

Arguments

oxcal_string The Oxcal script that should be wrapped
name The name attribute for the resulting sum function

Value

A new oxcal script as string
parseFullOxcalOutput  Pures an Oxcal Output File completely into R

Description
Takes the output of Oxcal as vector of strings (one string per line) and parse it as list.

Usage
parseFullOxcalOutput(output)

Arguments
output  The output of Oxcal as vector of strings (one string per line).

Value
A list containing all informations provided by Oxcal as list.

parseOxcalOutput  Pures an Oxcal Output File into R

Description
Takes the output of Oxcal as vector of strings (one string per line) and parse it as list.

Usage
parseOxcalOutput(result, first = FALSE, only.R_Date = T)

Arguments
result  The output of Oxcal as vector of strings (one string per line).
first  Return the first date only
only.R_Date  Return the informations for R_Dates

Value
A list containing all informations provided by Oxcal as list.
Phase

*Returns the Oxcal code for Phase*

**Description**

Phase takes a set of R_Dates as vectors, and returns a bit of oxcal code that can be used to feed it into oxcal. In this code the R_Dates are encapsulated in an OxCal Phases, one Phase for each string. For details concerning the Oxcal simulation please consult the help page of Oxcal.

**Usage**

```r
Phase(r_dates_strings, names = "")
```

**Arguments**

- `r_dates_strings` a vector containing strings of OxCal code, usually consisting of R_Date commands, but any other code strings might be used that can be interpreted by OxCal within a Phase
- `names` a optional vector of names for the resulting Phases

**Value**

a string containing the respective Oxcal code

---

quickSetupOxcal

*Quick OxCal setup*

**Description**

Downloads the latest version of Oxcal and sets the executable path correctly

**Usage**

```r
quickSetupOxcal(os = Sys.info()["sysname"], path = tempdir())
```

**Arguments**

- `os` The operating system of the workstation. Default: automatic determination. Options:
  - **Linux**
  - Windows
  - Darwin
- `path` The path to the directory where Oxcal is or should be stored. Default: "tempdir()". I recommend thought to install it permanently.
**readOxcalOutput**

**Author(s)**

Clemens Schmid

**Examples**

```r
## Not run:
quickSetupOxcal()

## End(Not run)
```

---

**readOxcalOutput**  
*Reads the content of the Oxcal js output file*

**Description**

Reads the content of the Oxcal js output file as vector of strings for each line.

**Usage**

```r
readOxcalOutput(output_file)
```

**Arguments**

- `output_file`  
The path to a Oxcal js output file.

**Value**

The content of the Oxcal js output file as vector of strings for each line.

**Author(s)**

Martin Hinz

---

**R_Date**  
*Returns the Oxcal code for the calibration of 14C dates*

**Description**

R_Date takes names, BP dates and standard deviation for those dates as vectors, and returns a bit of oxcal code that can be used to feed it into oxcal. For details concerning the Oxcal calibration please consult the help page of Oxcal.

**Usage**

```r
R_Date(names, r_dates, stds)
```
Arguments

- names: a vector of names for the dates
- r_dates: a vector containing the BP dates that should be calibrated
- stds: a vector containing the standard deviation that should be calibrated

Value

- a string containing the respective Oxcal code

R_Simulate

Returns the Oxcal code for the simulation of 14C dates

Description

R_Simulate takes names, calendar dates and standard deviation for those dates as vectors, and returns a bit of oxcal code that can be used to feed it into oxcal. For details concerning the Oxcal simulation please consult the help page of Oxcal.

Usage

R_Simulate(c_dates, stds, names = 1:length(c_dates))

Arguments

- c_dates: a vector containing the calendar dates that should be simulated
- stds: a vector containing the standard deviation that should be simulated
- names: a vector of names for the resulting simulated dates

Value

- a string containing the respective Oxcal code

Sequence

Returns the Oxcal code for Sequence

Description

Sequence takes a set of Phases or R_Dates as vectors, and returns a bit of oxcal code that can be used to feed it into OxCal. In this code the Phases and/or R_Dates are encapsulated in an OxCal Phases, one Phase for each string. For details concerning the Oxcal simulation please consult the help page of Oxcal.

Usage

Sequence(sequence_elements, names = "")
setOxcalExecutablePath

**Arguments**

- `sequence_elements`  
  a vector containing strings of OxCal code, usually consisting of Phase or R_Date commands, but any other code strings might be used that can be interpreted by OxCal within a Sequence

- `names`  
  an optional vector of names for the resulting Sequences

**Value**

a string containing the respective Oxcal code

---

setOxcalExecutablePath

*Setting the Oxcal program path for further use*

---

**Description**

Stores the path to the oxcal executable it in internally for other functions.

**Usage**

```r
setOxcalExecutablePath(path)
```

**Arguments**

- `path`  
  The path to the Oxcal executable

**Author(s)**

Martin Hinz

**Examples**

```r
## Not run:
connectOxcal('/home/martin/Documents/scripte/OxCal/bin/OxCalLinux')

## End(Not run)
```
Description

wrap_in_boundaries takes a set of Phases or R_Dates as vectors, and returns a bit of oxcal code that can be used to feed it into OxCal. In this code the Phases and/or R_Dates are interleaved and wrapped in OxCal Boundaries, the number of Boundaries is equal to the number of strings + 1. The resulting string starts with a boundary, than the OxCal strings from the vector are interleaved with Boundary commands. For details concerning the Oxcal simulation please consult the help page of Oxcal.

Usage

wrap_in_boundaries(phases_strings, boundary_names = NA)

Arguments

phases_strings  a vector containing strings of OxCal code, usually consisting of Phase or R_Date commands, but any other code strings might be used that can be interpreted by OxCal inbetween a Boundary

boundary_names  a optional vector of names for the resulting Boundaries (length of phases_strings + 1). If not given, the boundaries are named with consecutive numbers.

Value

a string containing the respective Oxcal code
Index

* getter functions
  get_bp, 4
  get_cal_curve, 5
  get_name, 6
  get_posterior_probabilities, 7
  get_posterior_sigma_ranges, 7
  get_raw_probabilities, 8
  get_sigma_ranges, 9
  get_std, 10

quickSetupOxcal, 18
R_Date, 19
R_Simulate, 20
readOxcalOutput, 19
Sequence, 20
setOxcalExecutablePath, 21
wrap_in_boundaries, 22

Boundary, 2

calcurve_plot, 3
executeOxcalScript, 3

get_bp, 4, 5–10
get_cal_curve, 4, 5, 6–10
get_name, 4, 5, 6–10
get_posterior_probabilities, 4–6, 7, 8–10
get_posterior_sigma_ranges, 4–7, 7, 9, 10
get_raw_probabilities, 4–8, 8, 10
get_sigma_ranges, 4–9, 9, 10
get_std, 4–10, 10
get_tidy_oxcalresult, 11

is.oxcAARCalibratedDate, 12
is.oxcAARCalibratedDatesList, 12

oxcAARCalibratedDate, 13, 14
oxcAARCalibratedDatesList, 14, 14, 15
oxcal_Sum, 16
oxcalCalibrate, 14
oxcalSimulate, 15
oxcalSumSim, 15

parseFullOxcalOutput, 17
parseOxcalOutput, 17
Phase, 18