

# Package ‘oxcAAR’

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**Type** Package

**Title** Interface to 'OxCal' Radiocarbon Calibration

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**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

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Boundary	<i>Returns the Oxcal code for a Boundary</i>
----------	--

---

### 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	<i>Plots calibrated dates on the calibration curve</i>
---------------	--

---

**Description**

Plots calibrated dates on the calibration curve

**Usage**

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

**Arguments**

x	an object of class <code>oxcAARCalibratedDate</code> or <code>oxcAARCalibratedDatesList</code>
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	<i>Executes an Oxcal Script</i>
--------------------	---------------------------------

---

**Description**

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

**Usage**

```
executeOxcalScript(oxcal_script)
```

**Arguments**

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

**Value**

The path to the js output file

**Author(s)**

Martin Hinz

---

get_bp	<i>get bp values (ages)</i>
--------	-----------------------------

---

**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\\_range\(\)](#), [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	<i>get calibration curve names</i>
---------------	------------------------------------

---

## Description

queries values from date objects

## Usage

```
get_cal_curve(x)
```

```
## Default S3 method:
```

```
get_cal_curve(x)
```

```
## S3 method for class 'oxcAARCalibratedDate'
```

```
get_cal_curve(x)
```

```
## S3 method for class 'oxcAARCalibratedDatesList'
```

```
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

```
## 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	<i>get names (labcodes)</i>
----------	-----------------------------

---

## 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\(\)](#)

---

get\_posterior\_sigma\_ranges  
*get posterior sigma ranges*

---

**Description**

queries values from date objects

**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`



**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**

```
## 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)
```

---

*get\_sigma\_ranges*      *get sigma ranges*

---

**Description**

queries values from date objects

**Usage**

```
get_sigma_ranges(x)
```

```
## Default S3 method:
```

```
get_sigma_ranges(x)
```

```
## S3 method for class 'oxcAARCalibratedDate'
```

```
get_sigma_ranges(x)
```

```
## S3 method for class 'oxcAARCalibratedDatesList'
```

```
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

**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\(\)](#)

**Examples**

```
## 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)
```

---

get\_tidy\_oxcalresult *tidy output*

---

**Description**

Transforms oxcalAAR output to a tidy data format. See <http://vita.had.co.nz/papers/tidy-data.html> and <https://CRAN.R-project.org/package=broom>

**Usage**

```
get_tidy_oxcalresult(x)

## Default S3 method:
get_tidy_oxcalresult(x)

## S3 method for class 'oxcalAARCalibratedDate'
get_tidy_oxcalresult(x)

## S3 method for class 'oxcalAARCalibratedDatesList'
get_tidy_oxcalresult(x)
```

**Arguments**

x an object of class oxcalAARCalibratedDate or oxcalAARCalibratedDatesList

**Value**

a data.frame (with list columns)

**Examples**

```
## 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

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

### Arguments

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

---

oxcAARCalibratedDatesList  
*oxcAAR Calibrated Dates List*

---

**Description**

A List of [oxcAARCalibratedDate](#)

**Value**

an object of the class 'oxcAARCalibratedDatesList'

---

oxcalCalibrate      *Calibrates a 14C date using oxcal*

---

**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	<i>Simulates 14C dates using oxcal</i>
---------------	--

---

**Description**

Simulates 14C dates using oxcal

**Usage**

```
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	<i>Sum calibration for simulated dates</i>
-------------	--

---

**Description**

Sum calibration for simulated dates

**Usage**

```
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 *Parses 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        *Parses 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	<i>Returns the Oxcal code for Phase</i>
-------	---

---

### 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

```
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	<i>Quick OxCal setup</i>
-----------------	--------------------------

---

### Description

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

### Usage

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

### Arguments

os	The operating system of the workstation. Default: automatic determination. Options: <ul style="list-style-type: none"> <li>• <b>Linux</b></li> <li>• Windows</li> <li>• Darwin</li> </ul>
path	The path to the directory where Oxcal is or should be stored. Default: "tempdir()". I recommend thought to install it permanently.

**Author(s)**

Clemens Schmid

**Examples**

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

---

readOxcalOutput	<i>Reads the content of the Oxcal js output file</i>
-----------------	--

---

**Description**

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

**Usage**

```
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	<i>Returns the Oxcal code for the calibration of 14C dates</i>
--------	--

---

**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_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	<i>Returns the Oxcal code for the simulation of 14C dates</i>
------------	---

---

**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	<i>Returns the Oxcal code for Sequence</i>
----------	--

---

**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 = "")
```

**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	a 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**

```
setOxcalExecutablePath(path)
```

**Arguments**

path	The path to the Oxcal executable
------	----------------------------------

**Author(s)**

Martin Hinz

**Examples**

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

## End(Not run)
```

---

wrap\_in\_boundaries      *Wrap OxCal commands in Boundary commands*

---

**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

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