

Package ‘bootRes’

July 18, 2009

Type Package

Title Bootstrapped Response and Correlation Functions

Version 0.2

Date 2009-07-07

Author Christian Zang

Maintainer Christian Zang <christian.zang@gmail.com>

Depends base, stats, utils

Suggests dplR

Description Calculation of Bootstrapped Response and Correlation Functions for Use in Dendroclimatology

License GPL-3

LazyLoad yes

Repository CRAN

Date/Publication 2009-07-18 15:36:14

R topics documented:

bootRes-package	2
dcplot	2
dendroclim	4
muc.clim	6
muc.fake	6
muc.spruce	7

Index	8
--------------	----------

bootRes-package *The bootRes Package for Bootstrapped Response and Correlation Functions*

Description

This package contains functions for calculating bootstrapped response and correlation functions for use in dendroclimatology.

Details

Package: bootRes
Type: Package
Version: 0.1
Date: 2009-06-24
License: GPL-3
LazyLoad: yes

Function `dendroclim` is used to calculate response and correlation functions using tree-ring chronologies and monthly climatic data (Fritts, 1976, Cook and Kairiukstis, 1990), `dcplot` is a convenient plotting function for its output. In its current state this package is a clone of the computer programme DENDROCLIM2002 (Biondi and Waikul, 2004).

Author(s)

Christian Zang

Maintainer: Christian Zang <christian.zang@gmail.com>

References

Biondi, F. & Waikul, K. (2004) DENDROCLIM2002: A C++ program for statistical calibration of climate signals in tree-ring chronologies. *Computers & Geosciences* 30:303-311

Cook, E.R. and Kairiukstis, L.A. (1990) *Methods of Dendrochronology: Applications in the Environmental Sciences*. Springer

Fritts, H.C. (1976) *Tree ring and climate*. Academic Press

dcplot *Plotting Function for Response and Correlation Functions*

Description

A simple plotting function for response and correlation functions derived from `dendroclim`.

Usage

```
dcplot(x, ci = TRUE, sig = TRUE, labels = NULL, labstyle = 1)
```

Arguments

<code>x</code>	data.frame with coefficients derived from <code>dendroclim</code> .
<code>ci</code>	logical: should confidence intervals be plotted?
<code>sig</code>	logical: should significant coefficients be indicated by filled symbols?
<code>labels</code>	character vector with labels to use for coefficients. Defaults to <code>rownames(x)</code> .
<code>labstyle</code>	integer indicating the style to be used for labels. Options are 1 for verbose/verbatim labels or 2 for abbreviated month names. If custom labels are specified, selection reverts to 1.

Details

If less than 4 parameters are used in the response or correlation function, each parameter is represented with a distinct symbol.

Value

None. Invoked for side effect (plot).

Author(s)

Christian Zang

See Also

[dendroclim](#)

Examples

```
data(muc.clim)
data(muc.spruce)

# calculate and plot bootstrapped correlation function
dc <- dendroclim(muc.spruce, muc.clim, method = "corr")
dcplot(dc, labstyle = 2)
```

dendroclim

Calculation of bootstrapped response and correlation functions.

Description

This function calculates response and correlation functions from tree-ring chronologies and monthly climatic data. Function parameters are bootstrapped to calculate their significance and confidence intervals.

Usage

```
dendroclim(chrono, clim, method = "response", start = -6, end = 9, timespan = NULL,
```

Arguments

<code>chrono</code>	<code>data.frame</code> containing a tree-ring chronologies, e.g. as obtained by <code>chron</code> of package <code>dplR</code> .
<code>clim</code>	<code>data.frame</code> with climatic data in monthly resolution, with year, month and climate parameters in columns. All columns except year and month will be recognized as parameters for response or correlation function.
<code>method</code>	string specifying the calculation method. Possible values are “response” and “correlation”. Partial strings are ok.
<code>start</code>	integer value to determine the first month to be used as a predictor in the response or correlation function. A negative value denotes a start month from previous year, a positive value denotes a start month from current year.
<code>end</code>	integer value to determine the last month to be used as a predictor in the response or correlation function. A negative value denotes a end month from previous year, a positive value denotes a end month from current year.
<code>timespan</code>	integer vector of length 2 specifying the time interval (in years) to be considered for analysis. Defaults to the maximum possible interval.
<code>vnames</code>	character vector with variable names. defaults to corresponding column names of <code>data.frame clim</code> .
<code>sb</code>	logical flag indicating whether textual status bar should be suppressed. Suppression is recommended for e.g. Sweave files.

Details

In its current state this function is a clone of programme DENDROCLIM2002 (Biondi and Waikul, 2004), and will calculate bootstrapped response and correlation functions in a similar manner as described in the above mentioned paper. In case of response function analysis 1000 bootstrap samples are taken from the original distribution and an eigen decomposition of the standardized predictor matrix is performed. Nonrelevant eigenvectors are removed using the PVP criterion (Guiot, 1990), principal component scores are then calculated from the matrices of reduced eigenvectors and standardized climatic predictors. Response coefficients are found via singular value decomposition, and

tested for significance using the 95% percentile range method (Dixon, 2001). In case of correlation function analysis, the coefficients are Pearson's correlation coefficients. The same method for significance testing is applied.

Input chronology data can be a `data.frame` such as produced by function `chron` of package `dplR`. It has to be a `data.frame` with at least one column containing the tree-ring indices, and the corresponding years as `rownames`. Input climatic data has to be a `data.frame` or `matrix` consisting of at least 3 rows for years, months and at least one climate parameter in the given order.

The window for response/correlation function analysis is specified via `start` and `end`, where e.g. `-4` means previous April etc.

Value

A `data.frame` with a response/correlation coefficient for each parameter, its significance (coded as 0/1) and its 95% confidence interval.

Author(s)

Christian Zang

References

- Biondi, F. & Waikul, K. (2004) DENDROCLIM2002: A C++ program for statistical calibration of climate signals in tree-ring chronologies. *Computers & Geosciences* 30:303-311
- Dixon, P.M. (2001) Bootstrap resampling. In: El-Shaarawi, A.H., Piegorisch, W.W. (Eds.), *The Encyclopedia of Environmetrics*. Wiley, New York.
- Guiot, J. (1991) The bootstrapped response function. *Tree-Ring Bulletin* 51:39-41

See Also

[dcplot](#)

Examples

```
data(muc.clim) # climatic data
data(muc.spruce) # spruce data

# calculate and plot response function
dc.resp <- dendroclim(muc.spruce, muc.clim)
dcplot(dc.resp)

# calculate and plot correlation function
dc.corr <- dendroclim(muc.spruce, muc.clim, method = "corr")
dcplot(dc.corr)

# use modelled data for better response ;- )
data(muc.fake)
dc.resp.fake <- dendroclim(muc.fake, muc.clim)
dcplot(dc.resp.fake)
```

`muc.clim`*Monthly Mean Temperature and Total Precipitation for Forstenrieder Park, Munich*

Description

This dataset gives the monthly mean temperature and total precipitation at Forstenrieder Park, Munich, Bavaria, Germany.

Usage`muc.clim`**Format**

A `data.frame` containing four columns with year, month, temperature and precipitation.

References

Kagerer, K. (2009) Wachstum von Fichte, Kiefer und Eiche in Abhaengigkeit von Klima und Kronenklasse im Forstenrieder Park, Muenchen. Diploma-Thesis, University of Applied Sciences Weihenstephan.

`muc.fake`*Modeled Tree-Ring Chronology of a Spruce Population near Munich*

Description

This dataset gives the modelled tree-ring widths for *Picea abies* at Forstenrieder Park, Munich, Bavaria, Germany. Tree growth was modeled as a response of low temperatures in previous and current July and August, high temperatures in current February and March, and high precipitation amounts in current July and August.

Usage`muc.fake`**Format**

A `data.frame` containing tree-ring indices with respective years as `rownames`. in rows.

References

Kagerer, K. (2009) Wachstum von Fichte, Kiefer und Eiche in Abhaengigkeit von Klima und Kronenklasse im Forstenrieder Park, Muenchen. Diploma-Thesis, University of Applied Sciences Weihenstephan.

`muc.spruce`*Tree-Ring Chronology of a Spruce Population near Munich*

Description

This dataset gives the tree-ring indices for *Picea abies* at Forstenrieder Park, Munich, Bavaria, Germany. The chronology represents 20 trees.

Usage

```
muc.spruce
```

Format

A `data.frame` containing tree-ring indices with respective years as `rownames`. in rows.

References

Kagerer, K. (2009) Wachstum von Fichte, Kiefer und Eiche in Abhaengigkeit von Klima und Kronenklasse im Forstenrieder Park, Muenchen. Diploma-Thesis, University of Applied Sciences Weihenstephan.

Index

*Topic **datasets**

muc.clim, 5

muc.fake, 6

muc.spruce, 6

*Topic **hplot**

dcplot, 2

*Topic **models**

dendroclim, 3

*Topic **multivariate**

dendroclim, 3

*Topic **nonparametric**

dendroclim, 3

*Topic **package**

bootRes-package, 1

*Topic **robust**

dendroclim, 3

bootRes (*bootRes-package*), 1

bootRes-package, 1

dcplot, 2, 2, 5

dendroclim, 2, 3, 3

muc.clim, 5

muc.fake, 6

muc.spruce, 6