Package 'rshift'

April 6, 2025

Type Package

Title Paleoecology Functions for Regime Shift Analysis

Version 3.1.2

Description Contains a variety of functions, based around regime shift analysis of paleoecological data.
Citations:
Rodionov() from Rodionov (2004) <doi:10.1029/2004GL019448>
Lanzante() from Lanzante (1996) <doi:10.1002/(SICI)1097-0088(199611)16:11%3C1197::AID-JOC89%3E3.0.CO;2-L>
Hellinger_trans from Numerical Ecology, Legendre & Legendre (ISBN 9780444538680)
rolling_autoc from Liu, Gao & Wang (2018) <doi:10.1016/j.scitotenv.2018.06.276>
Sample data sets lake_data & lake_RSI processed from Bush, Silman & Urrego (2004) <doi:10.1126/science.1090795>
Sample data set January_PDO from NOAA: <https://www.ncei.noaa.gov/access/monitoring/pdo/>.

Suggests R.rsp

VignetteBuilder R.rsp

Depends R (>= 4.2)

Imports grid, tibble, dplyr, ggplot2

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NeedsCompilation yes

SystemRequirements rustc & cargo if building from source

URL https://github.com/alexhroom/rshift

BugReports https://github.com/alexhroom/rshift/issues

Encoding UTF-8

LazyData true

RoxygenNote 7.3.1

Config/rextendr/version 0.3.1.9001

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Repository CRAN

Date/Publication 2025-04-06 18:40:02 UTC

Contents

`absolute_to_percentage` *Converts absolute abundance data to a percentage of total abundance for each site*

Description

Converts absolute abundance data to a percentage of total abundance for each site

Usage

```
absolute_to_percentage(data, col, site)
```

Arguments

`data`	The dataframe to be used.
`col`	The column that change is being measured on.
`site`	The column containing the site of each sample.

Value

The ‘data‘ dataframe with an added ’percentage’ column.

`Hellinger_trans` *Hellinger transform*

Description

Hellinger transforms data (Legendre and Legendre, Numerical Ecology)

Usage

```
Hellinger_trans(data, col, site)
```

Arguments

`data`	The dataframe to be used.
`col`	The column that change is being measured on.
`site`	The column containing the site of each sample.

Value

The ‘data‘ dataframe with an added ’hellinger_trans_vals’ column.

`January_PDO` *Pacific Decadal Oscillation in January*

Description

A dataset containing January PDO values. Subset of the data from NOAA: <https://www.ncei.noaa.gov/access/monitoring/pd

Usage

```
data(January_PDO)
```

Format

A data frame with 104 rows and 2 variables

Details

- PDO - Pacific Decadal Oscillation in January for the given year.
- Age - the year for which the PDO was measured.

lake_data *DCA-ordinated pollen data from Lake Consuelo*

Description

A dataset containing pre-processed DCA-ordinated data from Bush, Silman & Urrego (2004) <doi:10.1126/science.1090795>

Usage

```
data(lake_data)
```

Format

A data frame with 39 rows and 2 variables

Details

- DCA1 - DCA values for each timepoint from the raw dataset.
- Age - timepoint of each sample that has been DCA-ordinated.

lake_RSI *DCA-ordinated pollen data from Lake Consuelo with RSI values*

Description

A dataset containing pre-processed DCA-ordinated data from Bush, Silman & Urrego (2004) <doi:10.1126/science.1090795>
This data has been processed using Rodionov(lake_data, "DCA1", "Age", l=5, merge=TRUE)

Usage

```
data(lake_RSI)
```

Format

A data frame with 39 rows and 3 variables

Details

- DCA1 - DCA values for each timepoint from the raw dataset.
- Age - timepoint of each sample that has been DCA-ordinated.
- RSI - Regime Shift Index (see docs for Rodionov()) for each timepoint.

Lanzante *Lanzante L-test*

Description

performs the L-method for detection of regime shifts (Lanzante, 1996)

Usage

```
Lanzante(data, col, time, p = 0.05, merge = FALSE)
```

Arguments

data	The dataframe to be used.
col	The column we are measuring change on.
time	The column containing time units (e.g. age of a subsample)
p	The largest p-value you want to check regime shifts for. Defaults to p = 0.05.
merge	Sets the result to be either a regime-shift only table (if FALSE), or an addition to the original table (if TRUE)

Value

If merge = FALSE (default), produces a 2-column table of time (the time value for each regime shift) and p (the p-value for each regime shift). If merge = TRUE, returns the original dataset with an extra p-value column, giving the p-value for each time unit - 0 for non-shift years.

Examples

```
Lanzante(lake_data, "DCA1", "Age")
Lanzante(lake_data, "DCA1", "Age", p=0.10, merge=TRUE)
```

regime_means *Calculate means for each regime*

Description

calculates the mean for each regime in a regime shift analysis.

Usage

```
regime_means(data, col, rsi)
```

Arguments

data	The dataframe that will be used.
col	The column we are measuring change on.
rsi	The column containing RSI values.

Value

A vector of the mean value for each regime.

Examples

```
regime_means(lake_RSI, "DCA1", "RSI")
```

Rodionov *Rodionov (2004)'s STARS algorithm*

Description

performs STARS analysis (Rodionov, 2004) on a dataset

Usage

```
Rodionov(data, col, time, l, prob = 0.05, startrow = 1, merge = FALSE)
```

Arguments

data	The dataframe to be used.
col	The column we are measuring change on.
time	The column containing time units (e.g. age of a subsample)
l	The cut-off length of a regime; affects sensitivity (see Rodionov, 2004)
prob	The p-value for significance of a regime shift. Defaults to p = 0.05.
startrow	What row the analysis starts at. Defaults to 1.
merge	Sets the result to be either a regime-shift only table (if FALSE), or an addition to the original table (if TRUE)

Value

If merge = FALSE (default), produces a 2-column table of time (the time value for each regime shift) and RSI (the regime shift index for each regime shift). If merge = TRUE, returns the original dataset with an extra RSI column, giving the regime shift index for each time unit - 0 for non-shift years.

Examples

```
Rodionov(lake_data, "DCA1", "Age", l=5)
Rodionov(lake_data, "DCA1", "Age", l=5, prob=0.01, startrow=2, merge=TRUE)
```

rolling_autoc *Rolling autocorrelation*

Description

finds lag-1 autocorrelation in a rolling window; can be used to predict resilience (Liu, Gao, & Wang, 2018)

Usage

```
rolling_autoc(data, col, l)
```

Arguments

data	The dataframe that will be used.
col	The column we are measuring change on.
l	The time interval (no. of columns) used in the autocorrelation.

Value

A table of rolling lag-1 autocorrelation values.

RSI_graph *Regime Shift Index graph*

Description

creates two graphs, one of data and one of the RSI, as seen in Rodionov (2004)

Usage

```
RSI_graph(data, col, time, rsi, mean_lines = FALSE)
```

Arguments

data	The dataframe that will be used.
col	The column we are measuring change on.
time	The column containing time units (e.g. age of a subsample)
rsi	The column containing RSI values (for best visualisation use Rodionov() with merge=TRUE)
mean_lines	If true, add lines over the data indicating the mean of each regime.

Value

Two graphs, one on top of the other; one of col against time and one of RSI against time.

Examples

```
RSI_graph(lake_RSI, "DCA1", "Age", "RSI")
```

`rust_regime_means` *Calculates the mean for each regime in a regime shift analysis.*

Description

Calculates the mean for each regime in a regime shift analysis.

Usage

```
rust_regime_means(col, rsi)
```

Arguments

`col`	The column we are measuring change on.
`rsi`	The column containing RSI values.

`rust_rodionov` *Calculate STARS RSI points and return to R as a vector*

Description

Calculate STARS RSI points and return to R as a vector

Usage

```
rust_rodionov(vals, t_crit, l)
```

Arguments

`vals`	The column we are measuring change on
`t_crit`	The critical value of a t-distribution at the desired p-value
`l`	The cut-off length of a regime; affects sensitivity

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