Package 'msdrought'

March 8, 2025

Title Seasonal Mid-Summer Drought Characteristics

Version 0.1.1

Description Characterization of a mid-summer drought (MSD) with precipitation based statistics. The MSD is a phenomenon of decreased rainfall during a typical rainy season. It is a feature of rainfall in much of Central America and is also found in other locations, typically those with a Mediterranean climate. Details on the metrics are in Maurer et al. (2022) <doi:10.5194/hess-26-1425-2022>.

URL https://github.com/EdM44/msdrought/, https://edm44.github.io/msdrought/

BugReports https://github.com/EdM44/msdrought/issues

Depends R (>= 3.6.0)

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Encoding UTF-8

LazyData true

Imports ggplot2, lubridate, quantmod, signal, stats, xts

Suggests dplyr, knitr, rmarkdown, stringr, terra, tidyr, tools, zoo

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VignetteBuilder knitr

NeedsCompilation no

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Contents

`f.which.max` *Change behavior of which.max to work as if it had an na.rm=TRUE option*

Description

Change behavior of which.max to work as if it had an na.rm=TRUE option using https://gis.stackexchange.com/questions/392 function-returns-a-wrong-output-format answer recommended by R Hijmans.

Usage

```
f.which.max(i)
```

Arguments

i	A vector

Examples

```
## Not run:
f.which.max(1:5)
f.which.max(NA)

## End(Not run)
```

`msdDates` *Finding indices for Dates Relevant to the MSD Calculations*

Description

This function pulls the indices associated with the dates that correspond with the Mid Summer Drought, as well as the indices that indicate first and last day of each year. This function is used in conjunction with the MSD function.

Usage

```
msdDates(x, peakwindow1, minwindow1, minwindow2, peakwindow2)
```

Arguments

x	Date vector
peakwindow1	desired date in MMDD format to begin search for early peak
minwindow1	desired date in MMDD format to begin search for minimum
minwindow2	desired date in MMDD format to end search for minimum
peakwindow2	desired date in MMDD format to end search for late peak

Value

Vector containing the indices corresponding to each year's beginning date, end date, and the critical MSD dates

Examples

```
x <- seq(from = as.Date("1981-01-01"), to = as.Date("1985-12-31"), by = "day")
output <- msdDates(x, peakwindow1 = "05-01", minwindow1 = "06-01",
                   minwindow2 = "08-31", peakwindow2 = "10-31")
```

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msdFilter *msdFilter – A triangular Filter for smoothing data*

Description

The filter will take a weighted average of a specified number of points around the point of interest to create a smoother time series. For example, if the size of the filter is set to 31, the filter will take the 15 points before and after the point of interest (for a total of 31 points), and calculate a weighted average based on how far away the points are from the point of interest.

Usage

```
msdFilter(x, window = 31, quantity = 2)
```

Arguments

x	TimeSeries or numeric vector
window	Size of Filter [Default = 31]
quantity	Number of passes to apply filter [Default = 2]

Value

Vector of Yearly data

Examples

```
dates <- seq(from = as.Date("1981-01-01"), to = as.Date("1982-12-31"), by = "day")
ts <- xts::xts(runif(length(dates), 0, 50),dates)
filteredData <- msdrought::msdFilter(ts, window = 31, quantity = 2)
```

`msdGraph` *Mid Summer Drought Time Series Graphs*

Description

Plots the Time Series of Mid Summer Drought data. The input must be in the form of daily data, with the first data point being January 1st of a respective year.

Usage

```
msdGraph(x, year, peakwindow1, minwindow1,
minwindow2, peakwindow2, quantity,
window, timeVector)
```

Arguments

`x`	vector of data or xts
`year`	year of interest
`peakwindow1`	date in MMDD format to begin analysis (window 1)
`minwindow1`	date in MMDD format to end analysis (window 1)
`minwindow2`	date in MMDD format to begin analysis (window 2)
`peakwindow2`	date in MMDD format to end analysis (window 2)
`quantity`	number of times the filter is to be run
`window`	size of filter
`timeVector`	vector of dates (not needed for xts inputs)

Value

Graph of Time Series Data

Examples

```
## Not run:
data("timeseries")
ts <- timeseries
msdrought::msdGraph(ts, 1982)

## End(Not run)
```

msdMain *Mid Summer Drought Function*

Description

Generates all relevant statistics for the Mid Summer Drought by running the msdStats function for every applicable metric. The output of msdMain is a dataframe containing every msdStats output for the available years of data.

Usage

```
msdMain(x, peakwindow1, minwindow1,
minwindow2, peakwindow2, quantity,
window, timeVector)
```

Arguments

x	xts or vector of data
peakwindow1	desired date in MMDD format to begin analysis (window 1)
minwindow1	desired date in MMDD format to end analysis (window 1)
minwindow2	desired date in MMDD format to begin analysis (window 2)
peakwindow2	desired date in MMDD format to end analysis (window 2)
quantity	amount of times the filter is run
window	size of filter
timeVector	vector of dates (not needed for xts inputs)

Value

Data frame of all relevant MSD Statistics

Examples

```
data("timeseries")
ts <- timeseries
df <- msdrought::msdMain(ts)
```

msdStats *Main Mid Summer Drought Calculation Function*

Description

This function calculates the different statistics of the mid summer drought from a Time Series. The input must be in the form of daily data, with the first data point being January 1st of a respective year.

Usage

```
msdStats(x, dates, fcn)
```

Arguments

x	Filtered xts data (from msdFilter)
dates	Vector of Dates (from the msdDates function)
fcn	Specify what values to be pulled from the function. Options are 'duration', 'intensity', 'firstMaxValue', 'secondMaxValue', 'min', 'mindex'.

Value

SpatRaster or TimeSeries of Yearly data

Examples

```
data("timeseries")
ts <- timeseries
dates <- zoo::index(ts)
filteredData <- msdrought::msdFilter(ts, window = 31, quantity = 2)
keyDates <- msdDates(dates)
msdrought::msdStats(filteredData, keyDates, fcn = "duration")
```

timeseries *msdrought package included timeseries data*

Description

A subset of data from the UCSB CHIRPS data set

Usage

```
timeseries
```

Format

‘timeseries‘ An xts object with precipitation data over a series of five years:

Date date in YYYY-MM-DD format

Precipitation daily precipitation in millimeters (mm) ...

Source

<https://www.chc.ucsb.edu/data/chirps>

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