Package ‘msdrought’

May 27, 2024

Title  Seasonal Mid-Summer Drought Characteristics
Version  0.1.0
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/Turner-SCU/msdrought,
     https://turner-scu.github.io/msdrought/

BugReports  https://github.com/Turner-SCU/msdrought/issues

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Author  Turner Uyeda [aut],
        Ed Maurer [aut, cre, cph],
        Kenneth Joseph [aut],
        Alex Avila [aut]
Maintainer  Ed Maurer <emaurer@scu.edu>
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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")
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)

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)
msdStats

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

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

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")

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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