Package ‘RClimMAWGEN’

February 25, 2013

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License GPL (>= 2)
Title RClimMAWGEN (R Climate Index Multi-site Auto-regressive Weather GENerator): a package to generate time series of climate indices from RMAWGEN generations.
Type Package
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Description This package contains wrapper functions and methods which allow to use ‘climdex.pcic’ and ‘RMAWGEN’ packages. With this simple approach it is possible to calculate climate change indices, suggested by the WMO-CCL, CLIVAR, ETCCDMI(http://www.climdex.org),on stochastic generations of temperature and precipitation time series, obtained by the application of RMAWGEN. Each index can be applied to both observed data and to synthetic time series produced by the Weather Generator, over a reference period (e.g. 1981-2010, as in the example). It contains also functions and methods to evaluate the generated time series of climate change indices consistency by statistical tests.Bugs/comments/questions/collaboration of any kind are warmly welcomed.
Version 1.0
Repository CRAN
Date 2013-02-25
Depends R (>= 2.10),climdex.pcic,RMAWGEN
Collate 'accepted.R' 'as.clindex.data.frame.R' 'as.data.frame.R' 'clindex.data.frame.R' 'ks.test.R' 'RClimMAWGEN-package.R' 'temperature_max.R' 'temperature_min.R' 'wilcox.test.R'
NeedsCompilation no
Date/Publication 2013-02-25 20:16:31
R topics documented:

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Description

This package contains wrapper functions and methods which allow to use "climdex.pcic" and "RMAWGEN" packages.

Details

Package: RClimMAWGEN
Type: Package
Version: 1.0
Date: 2013-02-21
License: GPL (>= 2)
LazyLoad: yes
Depends: climdex.pcic,RMAWGEN

Note

RClimMAWGEN has been created in the frame of CLI3 project and ACE-SAP (http://www.ace-sap.it/) and ENVIROCHANGE (http://www.envirochange.eu/) projects funded by Provincia Autonoma di Trento (http://www.provincia.tn.it/).

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<table>
<thead>
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Description
This function lists the realizations which pass successfully Ks or Wilcoxon test.

Usage
accepted(tests, significance = 0.05)

Arguments
- tests: list of objects returned by `wilcox.test` and `ks.test`
- significance: significance for statistical tests (maximum accepted p-Value). Default is 0.05.

Value
Vector with names of successful realizations.

See Also
`climdex.data.frame`, `ks.test`, `ks.test.climdex.data.frame`, `wilcox.test`

Examples
# See the example of 'climdex.data.frame' function
as.climdex.data.frame  Coercion to a ClimDex Data Frame

Description
This function transforms a generic data object data into a clindex.data.frame-type S3 object.

Usage
as.climdex.data.frame(data)

Arguments
- data: the object to be transformed

Author(s)
Emanuele Cordano, Annalisa Di Piazza

See Also
climdex.data.frame
climdex.data.frame

as.data.frame  Transformation of a ClimDex Data Frame to a Data Frame

Description
This method transforms a clindex.data.frame-type S3 object into a data.frame object.

Usage
## S3 method for class 'climdex.data.frame'
as.data.frame(x, ...)

Arguments
- x: the object to be transformed
- ...: further arguments

Author(s)
Emanuele Cordano, Annalisa Di Piazza
Emanuele Cordano, Annalisa Di Piazza
climdex.data.frame  

ClimDex Data Frame

Description
Create input object for clim.ete index analysis from RMAWWGEN output.

Usage

climdex.data.frame(data, station, realization_TN, realization_TX, realization_PREC, start_date = "1981-01-01", end_date = "2010-12-31", climate_index = "climdex.gsl", frequency = c("yearly", "monthly", "daily"), date.series = seq(as.PCICt(start_date, cal = "gregorian"), as.PCICt(end_date, cal = "gregorian"), by = "days"), base.range = c(1990, 2002), n = 5, prefix = NULL)

Arguments

data  data.frame containing realizations of weather variables, e.g. the one retured as output by ComprehensiveTemperatureGenerator
station  names of weather stations where to apply climate indices
realization_TN  realizations of daily minimum temperature (observed and simulated) time series on which climate index are calculated
realization_TX  realizations of daily maximum temperature (observed and simulated) time series on which climate index are calculated
realization_PREC  realizations of daily precipitation (observed and simulated) time series on which climate index are calculated. It is NULL if missing.
start_date  start date yyyy-mm-dd of weather time series
end_date  start date yyyy-mm-dd of weather time series
climate_index  climate indices to be calculated. The names must correspond to the name of the respective function contained in the climdex.pcic R package
yearly  logical voalue. If TRUE (Default) the index is calculeted yearly per each year, otherwise the index is calculated monthly, i.e. per each month
base.range  see climdexInput.raw
n  see climdexInput.raw
prefix  name for time series on which climate indices are calculated.
date.series  see climdexInput.raw. If missing, it is automatically calculated from start_date and end_date
frequency  string value. Default is c("yearly","monthly","daily"). Set one of these, if the climate indices are referred to each year, month or day respectively.
climdex.data.frame

Value

A climdex.data.frame object (see the variable climdex in the examples.)

Author(s)

Emanuele Cordano, Annalisa Di Piazza

References

http://www.climdex.org

See Also

as.climdex.data.frame, climdexInput.raw

Examples

rm(list=ls())
library(RClimMAWGEN)
# generated and observed daily temperature data for the considering period (1981-2010) (RMAWGEN output data structure)
data(generation_p1)
# collected generated (realizations) and observed data (realizations$Tx_mes, realizations$Tn_mes)
realizations <- generation_p1$output
realizations$Tx_mes <- generation_p1$input$Tx_mes
realizations$Tn_mes <- generation_p1$input$Tn_mes
# realization scenarios used for 'climdex.data.frame'
realizations_TN <- c("Tn_mes", "Tn_gen00002", "Tn_gen00003", "Tn_gen00004")
realizations_TX <- c("Tx_mes", "Tx_gen00002", "Tx_gen00003", "Tx_gen00004")

stations <- names(realizations$Tn_mes)
start_date = "1981-01-01"
end_date = "2010-12-31"
climate_indices = c("climdex.tn90p","climdex.tx90p")
frequency = "monthly"
date.series = seq(as.POSIXct(start_date, cal = "gregorian"), as.POSIXct(end_date, cal = "gregorian"), by = "days")
base.range = c(1990, 2002)
n = 5
prefix = NULL

climdex <- climdex.data.frame(data=realizations, station=stations, realization_TN=realizations_TN, realization_TX=realizations_TX, climate_indices=climate_indices, frequency=frequency, date.series=date.series, base.range=base.range, n=n, prefix=prefix)
str(climdex)
# Wilcoxon Test between observed and generated climate indices

observed <- "T0129_Tn_meso__climdex.tx90p"
generated <- c("T0129_Tn_gen000001__climdex.tx90p","T0129_Tn_gen000002__climdex.tx90p")
wxt <- wilcox.test(x=climdex, observed=observed, generated=generated)
wxt
# Kolgomorov-Smirinov test between observed and generated climate indices

kst <- ks.test.climdex.data.frame(data=climdex, observed=observed, generated=generated)
kst

accepted(wxt)
accepted(kst)

generation_p1

RClimMAGEN Example Dataset

Description
This dataset contains `generation_p1`. It is a list object returned by `ComprehensiveTemperatureGenerator`. See `ComprehensiveTemperatureGenerator` for a detailed description. Some list elements, irrelevant for RClimMAGEN examples, were removed from the variable `generation_p1` to save disk memory. It contains the following variables:

Usage
data(generation_p1)

Format
list

Details
This data set can be regenerated using the R script 'generations.R' in the 'examples' package directory. See the Examples paragraph.

Source
This data set is obtained reducing the output of the function `ComprehensiveTemperatureGenerator` and can be reproduced through the R script ... This data set is intended for research purposes only, being distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY.
ks.test.climdex.data.frame

Kolgomorov-Smirnov Tests for a ClimDex Data Frame

Description

ks.test S3 method for 'climdex.data.frame'

Usage

ks.test.climdex.data.frame(data, observed, generated, ...)

Arguments

data a climdex.data.frame object
observed name (String) of the column of data containing the observed climate indices
generated names (String vector) of the columns of data containing the climate index realizations which will be tested.
...
... further arguments

Author(s)

Annalisa Di Piazza, Emanuele Cordano

See Also

climdex.data.frame,wilcox.test,ks.test

Examples

# See the example of 'climdex.data.frame' function
temperature_max_daily

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**temperature_max_daily**  *Daily Maximum Temperature*

**Description**

Extracts daily maximum temperature from an object of class `climdexInput-class`.

**Usage**

```r
temperature_max_daily(x)
```

**Arguments**

- `x`  
an object of class `climdexInput-class`

**Value**

Daily Maximum Temperature

**Author(s)**

Emanuele Cordano, Annalisa Di Piazza

**See Also**

`climdexInput-class`, `climdexInput.raw`

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temperature_min_daily

---

**temperature_min_daily**  *Daily Minimum Temperature*

**Description**

Extracts daily minimum temperature from an object of class `climdexInput-class`.

**Usage**

```r
temperature_min_daily(x)
```

**Arguments**

- `x`  
an object of class `climdexInput-class`

**Value**

Daily Minimum Temperature
Description

It contains the following variables:

**TEMPERATURE_MIN** Data frame containing year, month, day and daily minimum temperature in 59 stations in Trentino region

**TEMPERATURE_MAX** Data frame containing year, month, day and daily maximum temperature in 59 stations in Trentino region

**PRECIPITATION** Data frame containing year, month, day and daily precipitation in 59 stations in Trentino region

**STATION_NAMES** Vector containing the names of the meteorological stations

**ELEVATION** Vector containing the elevations of the meteorological stations respectively

**STATION_LATLON** Matrix containing the latitude and longitude coordinates, respectively, of the meteorological stations

**LOCATION** Vector containing the names of the location of each meteorological station

**TEMPERATURE_MEASUREMENT_START_DAY** Vector containing the first days (expressed as decimal julian day since 1970-1-1 00:00 UTC) of temperature measurement of each meteorological station

**TEMPERATURE_MEASUREMENT_END_DAY** Vector containing the last days (expressed as decimal julian day since 1-1-1970 00:00 UTC) of temperature measurement of each meteorological station

**PRECIPITATION_MEASUREMENT_START_DAY** Vector containing the first days (expressed as decimal julian day since 1-1-1970 00:00 UTC) of precipitation measurement of each meteorological station

**PRECIPITATION_MEASUREMENT_END_DAY** Vector containing the last days (expressed as decimal julian day since 1-1-1970) of precipitation measurement of each meteorological station
Usage

data(trentino_1958_2010)

Format

Data frames and vectors

Details

This dataset stores all information about meteorological stations and instrumental timeseries. The user can easily use the package with his/her own data after replacing the values of such variables.

Source

Original data are provided by Provincia Autonoma di Trento (http://www.meteotrentino.it/), Fondazione Edmund Mach (www.iasma.it), Provincia Autonoma di Bolzano/Autome Provinz Bozen (http://www.provincia.bz.it/meteo), ARPA Veneto (www.arpa.veneto.it/meteo.htm).

This dataset is intended for research purposes only, being distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY.

wilcox.test

Wilcoxon Rank Sum and Signed Rank Tests a ClimDex Data Frame

Description

wilcox.test S3 method for 'climdex.data.frame'

Usage

## S3 method for class 'climdex.data.frame'
wilcox.test(x, observed, generated, ...)

Arguments

x a climdex.data.frame object
observed name (String) of the column of data containing the observed climate indices
generated names (String vector) of the columns of data containing the climate index realizations which will be tested.
... further arguments

Author(s)

Emanuele Cordano, Annalisa Di Piazza
See Also

climdex.data.frame, ks.test, ks.test.climdex.data.frame

Examples

# See the example of 'climdex.data.frame' function
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