

Package ‘weaana’

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Title Analysis the Weather Data

Type Package

Description Functions are collected to analyse weather data for agriculture purposes including to read weather records in multiple formats, calculate extreme climate index.

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URL <https://weaana.bangyou.me/>, <https://github.com/byzheng/weaana>

BugReports <https://github.com/byzheng/weaana/issues>

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changeWeatherRecords	<i>Change weather records</i>
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Description

Change weather records
Change weather records

Usage

changeWeatherRecords(object, ...)

S4 method for signature 'WeaAna'
changeWeatherRecords(object, ...)

Arguments

object	A WeaAna object.
...	New weather records

Value

A new WeaAna object with updated records

convert2Records	<i>Convert a data frame to weaana class</i>
-----------------	---

Description

Convert a data frame to weaana class

Usage

```
convert2Records(infor, records)
```

Arguments

infor	A list or data frame of site information
records	A data frame will convert to records

Value

A new WeaAna object

createWeaAna	<i>create WeaAna class</i>
--------------	----------------------------

Description

create WeaAna class

Usage

```
createWeaAna(mets)
```

Arguments

mets	A list contained information of weather records.
------	--

Value

A new WeaAna class

dayLength	<i>The time elapsed in hours between the specified sun angle from 90 degree in am and pm. +ve above the horizon, -ve below the horizon.</i>
-----------	---

Description

The time elapsed in hours between the specified sun angle from 90 degree in am and pm. +ve above the horizon, -ve below the horizon.

Usage

```
dayLength(doy, lat, angle = -6)
```

Arguments

doy	day of year number
lat	latitude of site (deg)
angle	angle to measure time between, such as twilight (deg). angular distance between 90 deg and end of twilight - altitude of sun. +ve up, -ve down.

Value

day length in hours

diurnalT	<i>Calculate the diurnal variation in air temperature with Parton and Logan, 1981</i>
----------	---

Description

Calculate the diurnal variation in air temperature. Parton WJ, Logan JA (1981) A model for diurnal variation in soil and air temperature. Agricultural Meteorology, 23, 205-216. Codes copied from APSIM Utilities.cpp

Usage

```
diurnalT(maxt, mint, doy, hour, latitude, A = 1.5, B = 4, C = 1)
```

Arguments

maxt	maximum daily temperature
mint	minimum daily temperature
doy	day of year
hour	hour from 1 to 24
latitude	latitude in radials
A	is the time lag in temperature after noon
B	is coef that controls temperature decrease at night
C	is the time lag for min temperature after sunrise

Value

A vector with diurnal air temperature

Examples

```
diurnalT(maxt = 20, mint = 10, doyear = 1,
  hour = seq(from = 1, to = 23.99, by = 0.1),
  latitude = -10, A = 1.5, B = 4, C = 1)
```

getWeatherRecords	<i>Get all weather records by year range</i>
-------------------	--

Description

Get all weather records by year range

Get all weather records by year range

Usage

```
getWeatherRecords(object, ...)
```

```
## S4 method for signature 'WeaAna'
```

```
getWeatherRecords(object, yrange = NULL, vars = "all", ...)
```

Arguments

object	A WeaAna object.
...	Other arguments
yrange	Year range.
vars	Variable

Value

A data frame with all weather records

Examples

```
library(weaana)
data( "WeatherRecordsDemo" )
getWeatherRecords( records, yrange = c( 2008, 2009 ) )
getWeatherRecords( records, yrange = c( 2008, 2009 ), length = 10 )
```

interpolationFunction *Return a y value from a linear interpolation function*

Description

Return a y value from a linear interpolation function

Usage

```
interpolationFunction(x, y, values, split = "\\s+")
```

Arguments

x	x
y	y
values	values
split	split

Value

The interpolated values

readWeatherRecords *Read weather records from a file list and/or a folder list*

Description

Read weather records from a file list and/or a folder list

Usage

```
readWeatherRecords(
  dataFiles = NULL,
  dataFolders = NULL,
  dataFormat = "APSIM",
  dataWeather = NULL,
  load.later = FALSE,
  ...
)
```

Arguments

- dataFiles A character vector to specify the path of weather data files.
- dataFolders A character vector to specify the path of weather data folders.
- dataFormat The format of weather data file.
- dataWeather A data.frame for existing data.
- load.later Whether load weather records now or later. "dataFroamt" should be One of "APSIM" and "RDATA".
- ... Other arguments

Value

A WeaAna class which contains all weather data.

records	<i>Demo weather records</i>
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Description

Demo weather records

Usage

records

Format

An object of class WeaAna of length 1.

result-class	<i>Define the class for statistics results</i>
--------------	--

Description

Define the class for statistics results

Slots

- name Name of result
- type Type of result

show,WeaAna-method	Show basic information of class WeaAna
--------------------	--

Description

Show the name, number, latitude, longitude of all weather stations.

Usage

```
## S4 method for signature 'WeaAna'
show(object)
```

Arguments

object WeaAna objects

Examples

```
library(weaana)
data( "WeatherRecordsDemo" )
show( records )
records
```

siteInfor	Get site information
-----------	----------------------

Description

Get site information
Get site information
Get site information

Usage

```
siteInfor(object, ...)
```



```
## S4 method for signature 'WeaAna'
siteInfor(object, load.now = FALSE)
```



```
## S4 method for signature 'WeaAnaSite'
siteInfor(object, load.now = FALSE)
```

Arguments

object	A WeaAnaSite object.
...	Not used
load.now	Whether load site information

Value

Site information in the WeaAna object

Site information in the WeaAnaSite object

Examples

```
library(weaana)
data( "WeatherRecordsDemo" )
siteInfor( records )
siteInfor( records, load.now = TRUE )
```

sphericalDistance	<i>Calculate the sphere distance</i>
-------------------	--------------------------------------

Description

Calculate the sphere distance

Usage

```
sphericalDistance(lat1, lon1, lat2, lon2)
```

Arguments

lat1	Latitude
lon1	Longitude
lat2	Latitude
lon2	Longitude

Value

Distance in km

thermalTime	<i>Calculate thermal time using cardinal temperatures</i>
-------------	---

Description

Calculate thermal time using cardinal temperatures

Usage

```
thermalTime(weather, x_temp, y_temp, method = NULL)
```

Arguments

weather	WeaAna object
x_temp	The cardinal temperatures
y_temp	The effective thermal time
method	The method to calculate thermal time. The default method is $(\text{maxt} + \text{mint}) / 2$ - base. The three hour temperature methods will be used if method = '3hr'

Value

A data.frame with three columns: year, day and thermalTime.

Examples

```
met_file <- system.file("extdata/WeatherRecordsDemo1.met", package = "weaana")
records <- readWeatherRecords(met_file)
x_temp <- c(0, 26, 34)
y_temp <- c(0, 26, 0)
res <- thermalTime(records, x_temp, y_temp)
head(res)
res <- thermalTime(records, x_temp, y_temp, method = "3hr")
head(res)
```

thermalTimeDaily	<i>Calculate thermal time using cardinal temperatures</i>
------------------	---

Description

Calculate thermal time using cardinal temperatures

Usage

```
thermalTimeDaily(mint, maxt, x_temp, y_temp, method = NULL)
```

Arguments

mint	The minimum temperature
maxt	The maximum temperature
x_temp	The cardinal temperatures
y_temp	The effective thermal time
method	The method to calculate thermal time. The default method is $(\text{maxt} + \text{mint}) / 2$ - base. The three hour temperature methods will be used if method = '3hr'

Value

The thermal time.

Examples

```
mint <- c(0, 10)
maxt <- c(30, 40)
x_temp <- c(0, 20, 35)
y_temp <- c(0, 20, 0)
thermalTimeDaily(mint, maxt, x_temp, y_temp)
thermalTimeDaily(mint, maxt, x_temp, y_temp, method = '3hr')
```

thermalTimeHourly	<i>Calculate thermal time using the hourly temperature (non daily temperature)</i>
-------------------	--

Description

Calculate thermal time using the hourly temperature (non daily temperature)

Usage

```
thermalTimeHourly(timestamp, temperature, x_temp, y_temp)
```

Arguments

timestamp	The timestamp of weather records
temperature	The temperature
x_temp	The cardinal temperatures
y_temp	The effective thermal time

Value

A data frame with daily thermal time

Examples

```
met_file <- system.file("extdata/WeatherHourly.csv", package = "weaana")
hourly <- read.csv(met_file, as.is = TRUE)

hourly$timestamp <- as.POSIXct(hourly$timestamp, format = "%Y-%m-%dT%H:%M:%SZ")
x_temp <- c(0, 20, 35)
y_temp <- c(0, 20, 0)
thermalTimeHourly(hourly$timestamp, hourly$temperature, x_temp, y_temp)
```

ttest_ts	<i>Significantly t-test with auto-correlation for time serial data</i>
----------	--

Description

Method is presented by Santer et al. 2000

Usage

```
ttest_ts(y, slope = NULL)
```

Arguments

- y A vector of time serial data
- slope Whether export slope

Value

p values of t-test

WeaAna-class	<i>Define the class for multiple sites</i>
--------------	--

Description

Define the class for multiple sites

Slots

- num total number of weather station
- records A pointer vector to weather records of each site
- result A pointer for all results name and type.

WeaAnaSite-class	<i>Define the class of WeaAna</i>
------------------	-----------------------------------

Description

Define the class of WeaAna

Slots

name Name of weather station
 number Station number of weather station
 latitude Latitude of weather station
 longitude Latitude of weather station
 tav Annual average ambient temperature
 amp Annual amplitude in mean monthly temperature
 marker The extra marker for this site
 year A vector of year of weather station
 day A vector of day of weather station
 radn A vector of radiation of weather station
 maxt A vector of maximum temperature of weather station
 mint A vector of minimum temperature of weather station
 evap A vector of evaporation of weather station
 rain A vector of rainfall of weather station
 vp A vector of pressure atmosphere of weather station
 code The 6 digit code indicates the source of the 6 data columns
 extra A list of variables need to store
 res All statistics results store in this slot
 figures A list to store all plotted figures.
 file.path The file path for this site.
 data.format The data format for this site.
 load.later Whether are records loaded laterly.

writeWeatherRecords	<i>Write weather records into file</i>
---------------------	--

Description

Write weather records into file

Write weather records into file

Usage

```
writeWeatherRecords(object, ...)
```

```
## S4 method for signature 'WeaAna'
```

```
writeWeatherRecords(object, file, cols = NULL)
```

Arguments

object	A WeaAna object.
...	Not used
file	Path of output file.
cols	Columns to export. All columns exported if NULL

Value

No return values

[,WeaAna-method	<i>Getter to access the weather data at a specific position.</i>
-----------------	--

Description

Getter to access the weather data at a specific position.

Usage

```
## S4 method for signature 'WeaAna'
```

```
x[i, j, drop]
```

Arguments

x	A WeaAna object.
i	the specific position which will access.
j	None use parameter.
drop	None use parameter.

Value

A WeaAnaSite object at the position i.

Examples

```
library(weaana)
data( "WeatherRecordsDemo" )
records[1]
records[1:2]
records[2:2]
```

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