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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R topics documented:

changeWeatherRecords 2
convert2Records 3
createWeaAna 3
dayLength 4

diurnalT 4
getWeatherRecords 5
interpolationFunction 6
readWeatherRecords 6
records 7
result-class 7
show,WeaAna-method 8
siteInfor 8
sphericalDistance 9
thermalTime 10
thermalTimeDaily 10
thermalTimeHourly 11
ttest_ts 12
WeaAna-class 12
WeaAnaSite-class 13
writeWeatherRecords 14
[,WeaAna-method 14

Index **16**

`changeWeatherRecords` *Change weather records*

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 *Convert a data frame to weaana class*

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 *create WeaAna class*

Description

create WeaAna class

Usage

```
createWeaAna(mets)
```

Arguments

mets	A list contained information of weather records.

Value

A new WeaAna class

dayLength *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.*

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 *Calculate the diurnal variation in air temperature with Parton and Logan, 1981*

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, doy  = 1,
   hour = seq(from = 1, to = 23.99, by = 0.1),
   latitude = -10, A = 1.5, B = 4, C = 1)
```

---

getWeatherRecords *Get all weather records by year range*

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 *Demo weather records*

Description

Demo weather records

Usage

```
records
```

Format

An object of class `WeaAna` of length 1.

---

result-class *Define the class for statistics results*

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 *Calculate the sphere distance*

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 *Calculate thermal time using cardinal temperatures*

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 (maxt + 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 *Calculate thermal time using cardinal temperatures*

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 (maxt + mint) / 2 - base. The three hour temperature methods will be usesd 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 *Calculate thermal time using the hourly temperature (non daily temperature)*

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` *Significantly t-test with auto-correlation for time serial data*

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` *Define the class for multiple sites*

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` *Define the class of WeaAna*

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 *Write weather records into file*

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 *Getter to access the weather data at a specific position.*

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]
```

Index

∗ **datasets**
    records, 7
[,WeaAna-method, 14

changeWeatherRecords, 2
changeWeatherRecords,WeaAna,WeaAna-method
        *(*changeWeatherRecords*)*, 2
changeWeatherRecords,WeaAna-method
        *(*changeWeatherRecords*)*, 2
convert2Records, 3
createWeaAna, 3

dayLength, 4
diurnalT, 4

getWeatherRecords, 5
getWeatherRecords,WeaAna,WeaAna-method
        *(*getWeatherRecords*)*, 5
getWeatherRecords,WeaAna-method
        *(*getWeatherRecords*)*, 5

interpolationFunction, 6

readWeatherRecords, 6
records, 7
result-class, 7

show,WeaAna-method, 8
siteInfor, 8
siteInfor,WeaAna,WeaAna-method
        *(*siteInfor*)*, 8
siteInfor,WeaAna-method *(*siteInfor*)*, 8
siteInfor,WeaAnaSite,WeaAnaSite-method
        *(*siteInfor*)*, 8
siteInfor,WeaAnaSite-method
        *(*siteInfor*)*, 8
sphericalDistance, 9

thermalTime, 10
thermalTimeDaily, 10
thermalTimeHourly, 11
ttest_ts, 12

WeaAna-class, 12
WeaAnaSite-class, 13
writeWeatherRecords, 14
writeWeatherRecords,WeaAna,WeaAna-method
        *(*writeWeatherRecords*)*, 14
writeWeatherRecords,WeaAna-method
        *(*writeWeatherRecords*)*, 14