Package 'Interpol.T'

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Type Package

Title Hourly interpolation of multiple temperature daily series

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Description Hourly interpolation of daily minimum and maximum temperature series. Carries out interpolation on multiple series ad once. Requires some hourly series for calibration (alternatively can use default calibration table).

Depends R (>= 2.10), date, chron

License GPL (>= 2)

Collate 'F_bias.R' 'F_daily_mean.R' 'F_date_time.R' 'F_Mo.Th.Ra.R' 'F_par_calibration.R' 'F_plot_meas_sim.R' 'F_shape_calibration.R' 'F_Th_int_series.R' 'F_Th_interp.R' 'InterpolT-package.R'

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`Interpol.T-package` *Hourly interpolation of multiple temperature daily series*

Description

Hourly interpolation of multiple temperature daily series

Details

Package:	Interpol.T
Type:	Package
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LazyLoad:	yes
Depends:	R(>=2.12)

Author(s)

Emanuele Eccel & Emanuele Cordano <emanuele.eccel@fmach.it>

`bias` *Calculates mean bias (difference between (max+min)/2 and 24-hour averages) in mean daily temperature series*

Description

Calculates the average difference between the series of mean daily temperatures calculated by (Tmax + Tmin) / 2 and the average calculated by 24 hourly values a day, as resulting from the interpolation (or from measurements). The function works on data tables with series on columns.

Usage

```
bias(TMIN, TMAX, TMEAN, min_valid = 21)
```

Arguments

TMIN	data frame with daily minimum temperatures in columns. The first 3 columns are skipped (dates as year, month and day are supposed to be stored in these columns)
TMAX	same for TMAX
TMEAN	same for TMEAN. Should come from 24-hour daily means.
min_valid	min nr. of valid days in a month for retaining its average value (if valid days are fewer, monthly value is NA). Default is 21.

Value

A vector of means of daily biases, where the TMEAN is considered the "true" (reference) value

Note

Biases are calculated only on columns that are present in both TMIN/TMAX and TMEAN

Author(s)

Emanuele Eccel, Emanuele Cordano <emanuele.eccel@iasma.it>

References

Eccel, E., 2010: What we can ask to hourly temperature recording. Part II: hourly interpolation of temperatures for climatology and modelling. Italian Journal of Agrometeorology XV(2):45-50 http://www.agrometeorologia.it/documenti/Rivista2010_2/AIAM%202-2010_pag45.pdf,www.agrometeorologia.it

See also: Eccel, E., 2010: What we can ask to hourly temperature recording. Part I: statistical vs. meteorological meaning of minimum temperature. Italian Journal of Agrometeorology XV(2):41-43. http://www.agrometeorologia.it/documenti/Rivista2010_2/AIAM%202-2010_pag41.pdf,www.agrometeorologia.it

See Also

daily_mean

Examples

```
data(Trentino_hourly_T)
mo_bias <- bias(TMIN = Tn, TMAX = Tx, TMEAN = Tm_list, min_valid = 20)
```

daily_mean *Production of daily means from hourly temperature series*

Description

The function works on a list of hourly temperature series. The hourly list is the output of the interpolation function `Th_int`, called iteratively to produce a list where each component represents one interpolated series.

Usage

```
daily_mean(hourly_list, series_names = NULL)
```

Arguments

`hourly_list`	the list of hourly temperatures
`series_names`	names of the serie to be averaged (if `NULL` (default): all series)

Value

A list of daily averaged series

Note

The first element of `hourly_list` must be a data frame named "Date" and its columns "year", "month", "day" (a fourth column ("hours") is not used in this function)

Author(s)

Emanuele Eccel, Emanuele Cordano <emanuele.eccel@iasma.it>

References

Eccel, E., 2010: What we can ask to hourly temperature recording. Part II: hourly interpolation of temperatures for climatology and modelling. Italian Journal of Agrometeorology XV(2):45-50

Eccel, E., 2010: What we can ask to hourly temperature recording. Part I: statistical vs. meteorological meaning of minimum temperature. Italian Journal of Agrometeorology XV(2):41-43.

See Also

`Th_int_list`

Examples

```
data(Trentino_hourly_T)
# generates daily means for series T0001 and T0129:
Tm_list <- daily_mean(hourly_list = Th_int_list, series_names = c("T0001", "T0129"))
```

`date.time` *Generation of dates and hours between start and end terms*

Description

Generates dates and hours between start and end terms. The result is a data frame with years, months, days and hours. Called in function `Th_int_series`

Usage

```
date.time(day.begin, day.end, h.begin = 0, h.end = 23,
  date.format = "y/m/d")
```

Arguments

`day.begin`	begin date (day) - format specified in `date.format`
`day.end`	end date (day) - format specified in `date.format`
`h.begin`	begin time (hour - integer)
`h.end`	end time (hour - integer)
`date.format`	input date format (formats for function `chron`)

Value

A 4-column table having the folloging fields (integer): "year", "month", "day", "hour"

Note

Input start and end dates as `character` (default format "yyyy/mm/dd"), hours as `integers` (0 to 23).

Date format can be changed according to package `chron`'s standard, e.g. "y/m/d" (default) or "m/d/y"

Author(s)

Emanuele Eccel, Emanuele Cordano <emanuele.eccel@iasma.it>

See Also

`Th_int_series`

Examples

```
data(Trentino_hourly_T)
date<-date.time(day.begin="01/01/2004", day.end="31/12/2005", date.format= "d/m/y")
```

Mo.Th.Ra. *Creates a table of mean monthly "daily thermal range" (dtr)*

Description

Creates a table of mean monthly DTR (difference between maximum and minimum temperature) over the series' period, to use a reference for establishing the exponent "z" of the night stretch of the interpolation curve.

Usage

```
Mo.Th.Ra.(Tmin, Tmax, name, min_mo.length = 21,
  silent = FALSE)
```

Arguments

Tmin	a table of 4 named columns, the first are year, month, day, the 4th is minimum temperature. The column names "month" and "T" are mandatory
Tmax	same for Tmax
name	name of the series dtr is calculated for
min_mo.length	minimum number of days necessary to calculate monthly dtr values
silent	logical. If TRUE no warning is issued

Value

A vector of 12 dtr values (1 for January, ... 12 for December)

Author(s)

Emanuele Eccel, Emanuele Cordano <emanuele.eccel@iasma.it>

See Also

shape_calibration, Th_int_series

Examples

```
data(Trentino_hourly_T)
id<-"T0001"
Tmin<-data.frame(Tn[,1:3], T=Tn[,id])
Tmax<-data.frame(Tx[,1:3], T=Tx[,id])
dtr <- Mo.Th.Ra.(Tmin = Tmin, Tmax = Tmax, name = id)
```

`par_calibration` *Calibration of "hour" parameters for temperature interpolation*

Description

Calibrates the monthly parameters for the definition of the interpolation algorithm values of: time of minimum temperature; time of maximum temperature; time of sunset; parameter 'c' (see references for details). It works on more than one series at once. It also calculates an average calibration table, for simulations of series with no calibration.

Usage

```
par_calibration(meas, date.format = "ymd",
  cal_period = NULL, missing_value_code = NA,
  min_valid_yrs = 1, band_min = 4:9, band_max = 12:16,
  band_suns = 14:20, silent = FALSE, aver_series = NULL)
```

Arguments

`meas`	measured hourly values file (table), where the first column is the series' ID
`date.format`	date format in `meas`. Default is `"ymd"` (year month day)
`cal_period`	calibration period for the series. Default is `NULL` (use whole period)
`missing_value_code`	allows to deal missing data if a code (either numeric or character) is passed. Default is `NA`
`min_valid_yrs`	minimum fraction of year(s) on any series ID necessary for carrying out calibration
`band_min`	(continuous) band of hours to seek day minimum
`band_max`	same for maximum time
`band_suns`	same for sunset time
`silent`	if set to `TRUE` removes notice of insufficient length for the calibration of single short series
`aver_series`	set of series IDs (chr) used to calculate the average calibration (if `NULL`: all stations with valid data are included)

Value

a list of calibration tables, one for each series, plus one average table at the bottom (named "Average")

Note

meas must be organized as 4-field records, all series in the same file, no headers. Column order: station ID, date, time (hour), T, [others fields, if any...] separated by spaces. This field order is mandatory.

Default date format is "ymd" (yyyy/mm/dd). Different combinations can be passed to function with date.format, but separator must be "/"

See also: Eccel, E., 2010: What we can ask to hourly temperature recording. Part I: statistical vs. meteorological meaning of minimum temperature. Italian Journal of Agrometeorology XV(2):41-43.

Author(s)

Emanuele Eccel, Emanuele Cordano <emanuele.eccel@iasma.it>

References

Eccel, E., 2010: What we can ask to hourly temperature recording. Part II: hourly interpolation of temperatures for climatology and modelling. Italian Journal of Agrometeorology XV(2):45-50 http://www.agrometeorologia.it/documenti/Rivista2010_2/AIAM%202-2010_pag45.pdf,www.agrometeorologia.it

Original algorithm from: Cesaraccio, C., Spano, D., Duce, P., Snyder, R.L., 2001. An improved model for determining degree-day values from daily temperature data. Int. J. Biometeorol. 45: 161-169. http://www.springerlink.com/content/qwctkmlq3tebthek/

See Also

shape_calibration

Examples

```
data(Trentino_hourly_T)
stations <- c("T0001","T0010","T0129")

calibration_l <- par_calibration(meas = h_d_t[h_d_t$V1 %in% stations,],
                 missing_value_code = -999.9,
band_min = 4:8, band_max = 13:16,
band_suns = 16:20, cal_period = NULL)
```

---

plot_meas_sim *Plots hourly curves*

Description

Plots curves for comparison between measures and simulations (hourly interpolations)

Usage

```
plot_meas_sim(meas, sim, series = NULL, chart.start,
  chart.end, date.format = "ymd", missing_code = NA,
  wait = 1, plot.leg = TRUE, leg.pos = "bottomright")
```

Arguments

meas	measured hourly values file (table), where the first column is the series' ID
sim	simulated hourly list (output of Th_int_series)
series	names of the seris to plot. If NULL, plots all the series
chart.start	start date for the plotting. Format example: "1Jan2000"
chart.end	end date for the plotting. Format example: "1Jan2000"
date.format	input date format for measurements (formats for function chron). Default is "ymd"
missing_code	code (either real or character) for missing values in measurements. Default is NA
wait	lag time (seconds) between plot appearance on the screen (default is 1 second)
plot.leg	logical: if TRUE (default) legends are plotted
leg.pos	position of legends (only if plot.leg = TRUE). Default is "bottomright". Values for par can be passed to function

Value

A plot with two curves: measured values and hourly interpolations

Note

If daily minimum and maximum values are the absolute ones for each day, the interpolated curve will be generally either higher (maximum) or lower (minimum) than hourly measurements, which are mean hourly values (hence, slightly lower and higher than the absolute daily ones, respectively). This may explain an apparent mismatch between the two curves.

Author(s)

Emanuele Eccel, Emanuele Cordano <emanuele.eccel@iasma.it>

References

Eccel, E., 2010: What we can ask to hourly temperature recording. Part II: hourly interpolation of temperatures for climatology and modelling. Italian Journal of Agrometeorology XV(2):45-50 http://www.agrometeorologia.it/documenti/Rivista2010_2/AIAM%202-2010_pag45.pdf,www.agrometeorologia.it

See also: Eccel, E., 2010: What we can ask to hourly temperature recording. Part I: statistical vs. meteorological meaning of minimum temperature. Italian Journal of Agrometeorology XV(2):41-43. http://www.agrometeorologia.it/documenti/Rivista2010_2/AIAM%202-2010_pag41.pdf

Examples

```
data(Trentino_hourly_T)
stations <- c("T0001","T0010","T0129")
plot_meas_sim(meas = h_d_t, sim = Th_int_list, series=stations,
              missing_code = -999.9, chart.start = "1Feb2004",
             chart.end = "29Feb2004", leg.pos = "top")
```

`shape_calibration` *Calibrates the shape of the night interpolating curve*

Description

Calibrates the shape of the night interpolating curve, either horizontal-axe parabola or line, by changing the exponent z (see reference). It functions according to the comparison of the daily thermal range and the climate (reference) monthly one.

Usage

```
shape_calibration(meas, date.format = "ymd",
  cal_times_list, band_min = 0:23, band_max = 0:23,
  ratio_dtr_range = c(0, 6), nr_cycles = 10,
  min_mo.length = 21, full.24.hrs.span_min = TRUE,
  silent = FALSE)
```

Arguments

`meas`	measured hourly values file (table), where the first column is the series' ID
`date.format`	input date format (formats for function `chron`)
`cal_times_list`	calibration list of "time" parameters (output of `par_calibration`)
`band_min`	band of hours of occurrence of day minimum in the daily series (continuous). See `Note`
`band_max`	same for maximum time
`ratio_dtr_range`	range for seeking the optimal value of `ratio_dtr`
`nr_cycles`	number of calibration trials within the calibration ranges (all)
`min_mo.length`	minimum number of days to calculate any monthly values of dtr (is passed to function `Mo.Th.Ra.`)
`full.24.hrs.span_min`	logical, if set to `FALSE` does not allow to shift minimum time to the late hours of the day
`silent`	logical, if set to `TRUE` suppresses any warning issue

Value

A list containing the optimum values of `ratio_dtr`

Note

meas must be organized as 4-field records, all series in the same file, no headers. Column order: station ID, date, time (hour), T, [others fields, if any...] separated by spaces. This field order is mandatory.

Default date format is "ymd" (yyyy/mm/dd). Different combinations can be passed to function with date.format, but separator must be "/"

band_min and band_max are the time bands according to which the minimum and maximum temperature were calculated in the daily series to be interpolated. In general, they range from 0 to 23, unless the series has had some restriction in the calculation of minimum and maximum values. Hence, these bands can be different from those used to calibrate the most frequent occurrence of min and max.

The optimal value of ratio_dtr (k, eq. 7, in the quoted reference Eccel (2010a)) is chosen as the one with the (absolute) minimum value of the bias (irrespective of its sign). ratio_dtr is the ratio between the daily thermal range of the day to be interpolated and the mean monthly value for that series. The corresponding values of mean absolute error and RMSE can be checked in the resulting list.

min_mo.length (passed to function Mo.Th.Ra.) refers to the sum of days along all the series for each specific month, not for any single month in one year.

full.24.hrs.span_min is TRUE as default. If must be set to FALSE only if minimum values of the daily series have been calculated on a restricted time band, which is included in band_min (see function par_calibration). If this is the case, the minimum of the interpolated curve will always fall within band_min (early hours of the day). If this option is erroneously chosen, errors as large as 0.6 deg C can arise in the average of mean daily T.

Author(s)

Emanuele Eccel, Emanuele Cordano <emanuele.eccel@iasma.it>

References

Eccel, E., 2010: What we can ask to hourly temperature recording. Part II: hourly interpolation of temperatures for climatology and modelling. Italian Journal of Agrometeorology XV(2):45-50 http://www.agrometeorologia.it/documenti/Rivista2010_2/AIAM%202-2010_pag45.pdf,www.agrometeorologia.it

Original algorithm from: Cesaraccio, C., Spano, D., Duce, P., Snyder, R.L., 2001. An improved model for determining degree-day values from daily temperature data. Int. J. Biometeorol. 45: 161-169. http://www.springerlink.com/content/qwctkmlq3tebthek/

See also: Eccel, E., 2010: What we can ask to hourly temperature recording. Part I: statistical vs. meteorological meaning of minimum temperature. Italian Journal of Agrometeorology XV(2):41-43. http://www.agrometeorologia.it/documenti/Rivista2010_2/AIAM%202-2010_pag41.pdf,www.agrometeorologia.it

See Also

par_calibration, Th_interp

Examples

```
library(Interpol.T)
data(Trentino_hourly_T)

stations <- c("T0001","T0010","T0129")

calibration_shape <- shape_calibration(meas = h_d_t[h_d_t$V1 %in% stations,],
cal_times_list = calibration_l[stations],
                    band_min = 0:23, band_max = 0:23, ratio_dtr_range = c(0,4),
min_mo.length=21)
```

`Th_interp` *24-hourly interpolation of temperature*

Description

The function creates 24 values of hourly temperature from minimum and maximum daily values. This function applies to single series and to single day couples of minimum and maximum temperature. It is called by functions `Th_int_series` and `shape_calibration`. The function uses four different curves: from time 00 to the minimum time: a horizontal-axis parabola (a line, if this choice is enabled and according to the daily thermal range of the day); from minimum to maximum time: an increasing sinusoidal curve; from maximum time to sunset: a decreasing sinusoidal curve; from sunset to time = 23: a horizontal-axis parabola (a line, if this choice is enabled and according to the daily thermal range of the day). Calibration parameters are series- and monthly-specific. This function is operationally called by `Th_int_series`, which requires the daily series and the calibration table as input (plus other parameters). A general user will conveniently use the latter function.

Usage

```
Th_interp(Tmin, Tmax, Tsuns = NULL, Th_24_before = NULL,
  day, tab_calibr, dtr_month = NULL, ratio_dtr = NULL,
  late_min = TRUE)
```

Arguments

`Tmin`	a daily table of 4 named columns, the first 3 being year, month, day, the 4th minimum temperature. The column names "month" and "T" are mandatory
`Tmax`	same for Tmax
`Tsuns`	temperature at sunset time
`Th_24_before`	temperature at time 24 of the previous day (time 00 of the present day)
`day`	progressive number of the day (row of both `Tmin` and `Tmax`), corresponding to a day
`tab_calibr`	"hour" parameter calibration table for the specific series. See `par_calibration`
`dtr_month`	monthly daily thermal range table (see function `Mo.Th.Ra.`)
`ratio_dtr`	parameter for the choice of the night curve shape; it is `NULL` if no calibration_shape is passed to the function by `Th_int_series`

late_min — logical; allows to shift the time of occurrence of minima to the late hours of the day (assumes the value of full.24.hrs.span_min, passed by functions Th_int_series) and shape_calibration)

Value

A vector containing the values from hour = 0 (element 1) to hour = 23 (element 24)

Note

The function is called by Th_int_series.

If the series ID coincides with one with non-null results of the par_calibration function (enough data for calibration) its table is passed to the interpolation function, otherwise the average (cal_table) is used.

A non-NULL value for ratio_dtr enables the function to interpolate night values with a line, if the conditions on Daily Thermal Range occur. This may give rise to a sharp change for the hours following the min.

Tmin of the day before the first is set = to Tmin of the first day and Tmin of the day after the last = Tmin of the last day.

If T from sunset falls below the minimum of the day (temptatively attributed to time_min), an adjustement is done: the early hours assume a constant T = T[00] and the minimum is shifted so that T[23] = Tmin for that day

Since the very first value of T series at sunset (of the day before) is NULL, the first hourly values produced till time_min are = Tmin of the day.

Author(s)

Emanuele Eccel, Emanuele Cordano <emanuele.eccel@iasma.it>

References

Eccel, E., 2010: What we can ask to hourly temperature recording. Part II: hourly interpolation of temperatures for climatology and modelling. Italian Journal of Agrometeorology XV(2):45-50 http://www.agrometeorologia.it/documenti/Rivista2010_2/AIAM%202-2010_pag45.pdf,www.agrometeorologia.it

Original algorithm from: Cesaraccio, C., Spano, D., Duce, P., Snyder, R.L., 2001. An improved model for determining degree-day values from daily temperature data. Int. J. Biometeorol. 45: 161-169. http://www.springerlink.com/content/qwctkmlq3tebthek/

See also: Eccel, E., 2010: What we can ask to hourly temperature recording. Part I: statistical vs. meteorological meaning of minimum temperature. Italian Journal of Agrometeorology XV(2):41-43. http://www.agrometeorologia.it/documenti/Rivista2010_2/AIAM%202-2010_pag41.pdf,www.agrometeorologia.it

See Also

Th_int_list

Th_int_series *Hourly interpolation of multiple daily temperature series*

Description

The function creates sets of hourly temperature series, in a specified period, from minimum and maximum daily series. The calibration files, created by the functions par_calibration and shape_calibration, are loaded and passed to function Th_interp.

Usage

```
Th_int_series(cal_times, TMIN, TMAX, start_year,
  end_year, cal_shape = NULL, active_IDs = NULL,
  min_mo.length = 21, full.24.hrs.span_min = TRUE,
  silent = FALSE)
```

Arguments

cal_times	calibration table of "time" parameters for the specific series
cal_shape	calibration table for "shape" parameter for the specific series; default is NULL(don't use)
TMIN	minimum temperature daily table
TMAX	maximum temperature daily table
start_year	year of simulation start
end_year	year of simulation end
active_IDs	a set of series IDs to be interpolated. If NULL (default), all series are interpolated
min_mo.length	minimum number of days necessary to calculate monthly dtr values
full.24.hrs.span_min	logical, if set to FALSE does not allow to shift minimum time to the late hours of the day
silent	logical: if set to TRUE suppresses any warning issue

Value

A list of interpolated hourly temperatures for the active_IDs series

Note

TMIN and TMAX are data frames with the first three columns devoted to the date. The names of these columns must be "year", "month", and "day", irrespective of their order. Data series range from column 4 to the last.

If the series ID coincides with one with non-null results of the par_calibration function (enough data for calibration) its table is passed to the interpolation function, otherwise the average (cal_table) is used.

full.24.hrs.span_min is TRUE as default. If must be set to FALSE only if minimum values of the daily series have been calculated on a restricted time band, which is included in band_min (see function par_calibration). If this is the case, the minimum of the interpolated curve will always fall within band_min (early hours of the day). If this option is erroneously chosen, errors as large as 0.6 deg C can arise in the average of mean daily T.

Tmin of the day before the first is set = to Tmin of the first day and Tmin of the day after the last = Tmin of the last day.

Since the first value of T at sunset (of the day before) is NULL, the first hourly values produced till time_min are = Tmin.

Author(s)

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References

Eccel, E., 2010: What we can ask to hourly temperature recording. Part II: hourly interpolation of temperatures for climatology and modelling. Italian Journal of Agrometeorology XV(2):45-50 http://www.agrometeorologia.it/documenti/Rivista2010_2/AIAM%202-2010_pag45.pdf

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See also: Eccel, E., 2010: What we can ask to hourly temperature recording. Part I: statistical vs. meteorological meaning of minimum temperature. Italian Journal of Agrometeorology XV(2):41-43. http://www.agrometeorologia.it/documenti/Rivista2010_2/AIAM%202-2010_pag41.pdf

See Also

Th_interp, Mo.Th.Ra., date.time

Examples

```
library(Interpol.T)
data(Trentino_hourly_T)
stations <- c("T0001","T0010","T0129")
# interpolation of temperature for series T0001 and T0129, from 2004 to 2005
Th_int_list <- Th_int_series(cal_times = calibration_l,
cal_shape = calibration_shape,
    TMIN=Tn, TMAX=Tx,
                    start_year = 2004, end_year = 2005,
active_IDs = stations)
```

Trentino_hourly_T *Dataset of hourly temperature for Trentino, Italy*

Description

Contains the following objects:

`Tn` Data frame with `year`,`month`, `day` and daily minimum temperature in 39 stations in Trentino, Italy. This series has been directly calculated from the hourly one (`h_d_t`), so it contains the daily minima and maxima of hourly measurements, not daily absolute minima and maxima.

`Tx` Data frame containing `year`,`month` , `day` and daily maximum temperature in 39 stations in Trentino, Italy. This series has been directly calculated from the hourly one (`h_d_t`), so it contains the daily minima of hourly measurements.

`h_d_t` Data frame containing station id, date (yyyy/mm/dd), hour (integer 0,...23), hourly temperature, and a quality flag (not used) in 39 stations in Trentino.

`mo_bias` Data frame containing the monthly (lines 1-12) and annual (line 13) average bias between mean daily temperatures calculated as (Tmin + Tmax)/2 and the corresponding 24-value mean, for 39 stations in Trentino.

`Th_int_list` List containing the simulated (interpolated) hourly values. The first element (`Date`) is a data frame of `year`, `month`, `day`, and `hour`. All other elements, each having the name of one station id, are numeric vectors of temperature.

`Tm_list` List containing the daily means, calculated from the hourly interpolations. The first element (`Date`) is a data frame of `year`, `month`, and `day`. All other elements, each having the name of one station id, are numeric data frames of daily temperature.

`calibration_l` List containing the "hour" calibration parameters. Each element (name: station id) reports the following parameters, for each month: `time_min`: mode value of the time of occurrence of minimum temperature; `time_max`: mode value of the time of occurrence of maximum temperature; `time_suns`: mode value of the time of occurrence of sunset; `C_m`: value of "c" (see `par_calibration` and the quoted reference). An unreported station id means insufficient data for calibration.

`calibration_shape` List containing the "shape" calibration parameters for the night portion of the curve. The list has one data frame (name: `ratio`). It has in every line (one line per station id) the following: 1. the value of `ratio_dtr` that minimizes the mean error. 2., 3., 4. the mean error, mean absolute error, root mean square error, respectively, corresponding to this value (all in "deg C"). For details see `shape_calibration`.

Usage

```
data(Trentino_hourly_T)
```

Format

Data frames and lists.

Details

Dataset from Trentino, Italy, with examples of hourly temperature series, the daily series (min and max) obtained from these, and the results of the calibration and application of the interpolation algorithm: the calibration lists (parameters), the interpolated list of series, and the bias between interpolated 24-hour daily means and the means obtained by (Tmin + Tmax)/2. 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, Italy (http://www.meteotrentino.it/).

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

References

Eccel, E., 2010: What we can ask to hourly temperature recording. Part II: hourly interpolation of temperatures for climatology and modelling. Italian Journal of Agrometeorology XV(2):45-50 http://www.agrometeorologia.it/documenti/Rivista2010_2/AIAM%202-2010_pag45.pdf,www.agrometeorologia.it

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