Package 'GHCNr'

December 13, 2024

Title Download Weather Station Data from GHCN

Version 0.8.0

Description The goal of 'GHCNr' is to provide a fast and friendly interface with the Global Historical Climatology Network daily (GHCNd) database, which contains daily summaries of weather station data worldwide (<https://www.ncei.noaa.gov/products/land-based-station/global-historical-climatology-network-daily>). GHCNd is accessed through the web API <https://www.ncei.noaa.gov/access/services/data/v1>. 'GHCNr' main functionalities consist of downloading data from GHCNd, filter it, and to aggregate it at monthly and annual scales.

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Imports tibble, dplyr, tidyr, readr, tidyselect, httr2, terra, utils, rlang

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

Config/testthat/edition 3

Encoding UTF-8

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Depends R (>= 2.10)

LazyData true

VignetteBuilder knitr

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Repository CRAN

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Contents

`.add_variables` *Add Columns to Handle Summarize*

Description

Add Columns to Handle Summarize

Usage

```
.add_variables(x)
```

Arguments

x	Object of class ghcn_daily. See daily() for details.

Value

Table with number of days in the months.

.check_flags *Check Flags Columns*

Description

Check Flags Columns

Usage

```
.check_flags(x)
```

Arguments

x	Object of class ghcn_daily. See daily() for details.

Value

NULL, called for side effects

.daily_request *Request Daily Summaries*

Description

Request Daily Summaries

Usage

```
.daily_request(url)
```

Arguments

url	Character, URL of the request.

Value

Body of the JSON request.

.daily_url *Create Request URL for Daily Summaries*

Description

Create Request URL for Daily Summaries

Usage

```
.daily_url(station_id, start_date, end_date, variables)
```

Arguments

station_id	Character, station id(s).
start_date	Character, start date.
end_date	Character, end date.
variables	Character, vector of the variables to include.

Details

station_id can be a vector with multiple stations. Dates should be given in YYYY-mm-dd format.

Value

Character string with the API URL.

.drop_flags *Drop Flags Columns*

Description

Drop Flags Columns

Usage

```
.drop_flags(x)
```

Arguments

x	Object of class ghcn_daily. See daily() for details.

Value

The original objects without flags column.

.extract_flag *Extract GHCNd Flags*

Description

Extract GHCNd Flags

Usage

```
.extract_flag(x)
```

Arguments

x	Character, vector of the flag as returned by the GHCNd API call.

Details

https://www.ncei.noaa.gov/products/land-based-station/global-historical-climatology-network-daily

Value

Character of the flag.

.flags *GHCNd Flags*

Description

GHCNd Flags

Usage

```
.flags(strict)
```

Arguments

strict	Logical, if to include all flags (TRUE) or not (FALSE).

Details

doi:10.1175/2010JAMC2375.1

Value

Table with flags.

.inventory_url *The GHCNd Inventory URL*

Description

The GHCNd Inventory URL

Usage

```
.inventory_url()
```

Value

The URL of the GHCNd inventory.

.max *Calculate Maximum*

Description

Calculate Maximum

Usage

```
.max(x)
```

Arguments

x	Numeric vector

Value

Numeric.

.mean *Calculate Mean*

Description

Calculate Mean

Usage

```
.mean(x)
```

Arguments

x	Numeric vector

Value

Numeric.

.min *Calculate Minimum*

Description

Calculate Minimum

Usage

```
.min(x)
```

Arguments

x	Numeric vector

Value

Numeric.

.missing_variables *Check Ahich Variables Are Absent*

Description

Check Ahich Variables Are Absent

Usage

```
.missing_variables(x)
```

Arguments

x	Object of class ghcn_daily.

Value

Character vector

.s3_annual *Annual Class Constructor*

Description

Annual Class Constructor

Usage

```
.s3_annual(data = tibble::tibble())
```

Arguments

data	A data frame or tibble to be used as the underlying data.

Details

Creates a new object of class ghcn_annual.

Value

An object of class ghcn_annual.

.s3_daily *Daily Class Constructor*

Description

Daily Class Constructor

Usage

```
.s3_daily(data = tibble::tibble())
```

Arguments

data	A data frame or tibble to be used as the underlying data.

Details

Creates a new object of class ghcn_daily.

Value

An object of class ghcn_daily.

.s3_monthly *Monthly Class Constructor*

Description

Monthly Class Constructor

Usage

```
.s3_monthly(data = tibble::tibble())
```

Arguments

data	A data frame or tibble to be used as the underlying data.

Details

Creates a new object of class ghcn_monthly.

Value

An object of class ghcn_monthly.

.sum *Calculate Sum*

Description

Calculate Sum

Usage

```
.sum(x)
```

Arguments

x	Numeric vector

Value

Numeric.

annual *Calculate Annual Summaries*

Description

Calculate Annual Summaries

Usage

```
annual(x)
```

Arguments

x	Object of class ghcn_daily. See daily() for details.

Value

A tibble with the annual timeseries at the stations.

Examples

```
annual(CA003076680)
```

annual_coverage *Calculate Annual Coverage*

Description

Calculate Annual Coverage

Usage

```
annual_coverage(x)
```

Arguments

x	Object of class ghcn_daily. See daily() for details.

Details

Calculates the annual coverage of one station.

Value

A table with annual coverage.

Examples

```
cleaned <- remove_flagged(CA003076680)
cover <- annual_coverage(cleaned)
cover
```

as_daily *Cast Table to Daily*

Description

Cast Table to Daily

Usage

```
as_daily(data)
```

Arguments

data	A data frame or tibble to be used as the underlying data.

Value

An object of class daily.

Examples

```
## Not run:
df <- read.csv(...)
df <- as_daily(df)

## End(Not run)
```

`CA003076680` *Maximum Temperature for Station CA003076680*

Description

Maximum Temperature for Station CA003076680

Usage

```
CA003076680
```

Format

`CA003076680`**:**
A 'ghcn-daily' object, i.e. table 7,574 x 8:

date Date of measurment
station Station name, i.e. 'CA003076680'
tmax Maximum temperature
tmin Minimum temperature
prcp Total precipitation
***_flag** Flags for the measurments

Source

https://www.countrycallingcodes.com/iso-country-codes/europe-codes.php

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`country_codes` *Countries ISO Codes*

Description

Countries ISO Codes

Usage

```
country_codes
```

Format

`europe_codes`**:**

A table 253 x 2:

name Country name

iso3 3 letter ISO country code

`coverage` *Calculate Coverage of Daily Summaries*

Description

Calculate Coverage of Daily Summaries

Usage

```
coverage(x, graph = FALSE)
```

Arguments

`x`	Object of class `ghcn_daily`. See `daily()` for details.
`graph`	Logical, if to show a graph of annual coverage.

Details

This function calculates the temporal coverage of stations. It returns a table with:

- mothly_coverage The proportion of the days with records in the month
- annual_coverage The proportion of the days with records in the year
- annual_coverage The proportion of the years with records in the reference period

Important: that 'annual_coverage = 1' does not mean that all years have 'annual_coverage = 1', but rather that all years have at least one record.

Value

A table with coverage.

Examples

```
cleaned <- remove_flagged(CA003076680)
cover <- coverage(cleaned)
cover[cover$month == 1, ]
```

daily *Download Daily Summaries*

Description

Download Daily Summaries

Usage

```
daily(station_id, start_date, end_date, variables = c("tmax", "tmin", "prcp"))
```

Arguments

station_id	Character, station id(s).
start_date	Character, start date.
end_date	Character, end date.
variables	Character, vector of the variables to include.

Details

station_id can be a vector with multiple stations. Dates should be given in YYYY-mm-dd format. Available *variables* can be found at https://www.ncei.noaa.gov/pub/data/ghcn/daily/readme.txt.

Value

A tibble with the daily timeseries at the stations.

Examples

```
## Not run:
CA003076680 <- daily("CA003076680", "1990-01-01", "2024-12-31")

## End(Not run)
```

download_inventory *Download GHCNd Inventory File*

Description

Download GHCNd Inventory File

Usage

```
download_inventory(filename)
```

Arguments

filename	Character of the filename of the inventory, if already downloaded.

Details

Download the inventory from <"https://www.ncei.noaa.gov/pub/data/ghcn/daily/ghcnd-inventory.txt">.

Value

Character, the location of the file where the inventory has been saved.

Examples

```
## Not run:
download_inventory(...)

## End(Not run)
```

---

filter_stations *Spatial Filtering of Stations*

Description

Spatial Filtering of Stations

Usage

```
filter_stations(stations, roi)
```

Arguments

stations	the table with station data. See stations().
roi	the geometry of the region of interest. See get_country().

Value

Table with filtered stations.

Examples

```
## Not run:
inventory <- stations()
roi <- get_country("ITA")
s <- filter_stations(inventory, roi)

## End(Not run)
```

get_countries *Download multiple countries' shapefiles from geoBoundaries*

Description

Download multiple countries' shapefiles from geoBoundaries

Usage

```
get_countries(countries_code, simplified = TRUE)
```

Arguments

countries_code	Vector of three letter ISO code.
simplified	Logical.

Details

https://github.com/wmgeolab/geoBoundaries.

Value

A shapefile.

Examples

```
## Not run:
eu <- get_countries(country_code$iso3, simplified = TRUE)

## End(Not run)
```

get_country *Download country shapefile from geoBoundaries*

Description

Download country shapefile from geoBoundaries

Usage

```
get_country(country_code, simplified = TRUE)
```

Arguments

country_code	Three letter ISO code.
simplified	Logical.

Details

https://github.com/wmgeolab/geoBoundaries.

Value

A shapefile.

Examples

```
## Not run:
italy <- get_country("ITA")

## End(Not run)
```

---

monthly *Calculate Monthly Summaries*

Description

Calculate Monthly Summaries

Usage

```
monthly(x)
```

Arguments

x	Object of class ghcn_daily. See daily() for details.

Details

x is the table returned from daily() or remove_flagged() or any subset of them.

Value

A tibble with the monthly timeseries at the stations.

Examples

```
monthly(CA003076680)
```

monthly_coverage *Calculate Monthly Coverage*

Description

Calculate Monthly Coverage

Usage

```
monthly_coverage(x)
```

Arguments

x	Object of class ghcn_daily. See daily() for details.

Details

Calculates the monthly coverage of one station.

Value

A table with mothly coverages.

Examples

```
cleaned <- remove_flagged(CA003076680)
cover <- monthly_coverage(cleaned)
cover[cover$year == 2020, ]
```

period_coverage *Calculate Period Coverage*

Description

Calculate Period Coverage

Usage

```
period_coverage(x)
```

Arguments

x	Object of class ghcn_daily. See daily() for details.

Details

Calculates the period coverage of one station.

Value

A table with coverage across the period.

Examples

```
cleaned <- remove_flagged(CA003076680)
cover <- period_coverage(cleaned)
cover
```

`plot.ghcn_annual` *Plot GHCN Timeseries*

Description

Plot GHCN Timeseries

Usage

```
## S3 method for class 'ghcn_annual'
plot(x, variable, ...)
```

Arguments

`x`	Object of class `ghcn_daily`. See `daily()` for details.
`variable`	Name of the variable to plot.
`...`	additional arguments to be passed to `plot()`.

Value

NULL, called for side effects.

Examples

```
plot(annual(CA003076680), "tmax")
```

plot.ghcn_daily *Plot GHCN Timeseries*

Description

Plot GHCN Timeseries

Usage

```
## S3 method for class 'ghcn_daily'
plot(x, variable, ...)
```

Arguments

x	Object of class ghcn_daily. See daily() for details.
variable	Name of the variable to plot.
...	additional arguments to be passed to plot().

Value

NULL, called for side effects.

Examples

```
plot(CA003076680, "tmax")
```

plot.ghcn_monthly *Plot GHCN Timeseries*

Description

Plot GHCN Timeseries

Usage

```
## S3 method for class 'ghcn_monthly'
plot(x, variable, ...)
```

Arguments

x	Object of class ghcn_daily. See daily() for details.
variable	Name of the variable to plot.
...	additional arguments to be passed to plot().

Value

NULL, called for side effects.

Examples

```
plot(monthly(CA003076680), "tmax")
```

`remove_flagged` *Remove Flagged Recrods*

Description

Remove Flagged Recrods

Usage

```
remove_flagged(x, strict = FALSE)
```

Arguments

`x`	Object of class `ghcn_daily`. See `daily()` for details.
`strict`	Logical, if to remove also `looser` flags.

Details

dates should be given in `YYYY-mm-dd` format.

Value

`x` without flagged records.

Examples

```
remove_flagged(CA003076680)
```

stations *Get GHCNd Inventory*

Description

Get GHCNd Inventory

Usage

```
stations(filename, variables = c("tmin", "tmax", "prcp"))
```

Arguments

filename	Character of the filename of the inventory, if already downloaded.
variables	Character, vector of the variables to include.

Details

If *filename* is not provided, this will download the inventory from <"https://www.ncei.noaa.gov/pub/data/ghcn/daily/ghcnd-inventory.txt">. In alternative, you can download the invetory yourself and load it (see examples).

Value

The table with the GHCNd stations.

Examples

```
## Not run:
dest <- tempfile()
download_inventory(dest)
s <- stations(dest)

## End(Not run)
```

stations_elevation *Elevation of the GHCNd Stations*

Description

Elevation of the GHCNd Stations

Usage

```
stations_elevation
```

Format

`europe_codes`**:**
A table 128,024 x 2:

station Station name

elevation Elevation in meters

Source

https://www.ncei.noaa.gov/pub/data/ghcn/daily/ghcnd-stations.csv

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