Package 'SolarData'

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Title Work with freely available solar data

Version 0.1.0

Imports raster, httr, textreadr, tiff, fields, geosphere, lubridate

Description Download and manipulate some publicly available solar datasets.

Depends R (>= 3.4.4), ggplot2, insol, dplyr

Suggests

License MIT + file LICENSE

Encoding UTF-8

LazyData true

RoxygenNote 6.0.1

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R topics documented:

`LTF.get` *Read Linke turbidity factor from tiff maps*

Description

Read monthyl Linke turbidity factor from 12 tiff maps for any location(s) in the world.

Usage

```
LTF.get(lon, lat, directory)
```

Arguments

lon	a number or a numeric array, longitude of the location(s) for downloading
lat	a number or a numeric array, latitude of the location(s) for downloading
directory	the directory of the *downloaded* .tiff images

Details

Twelve monthly maps of Linke turbidity factor values were created given by latitude and longitude. Latitude is positive North, longitude is positive eastwards of longitude 0. The data are in gridded, raw format, no header (tiff images), 1 byte per value (unsigned int encoding), 2160 rows and 4320 columns. Cell size is 5' (approx. 10 km at mid-latitude). Upper left corner is 90 N, 180 W. Then, point 90 N, 179.5 W etc. Lower right is 90 S, 180 E.

Value

A $n \times 12$ matrix, where n is the number of lat-lon pairs.

Author(s)

D. Yang

PSM.get *Get NREL PSM version 3 data*

Description

Use API to download NREL Physical Solar Model (PSM) version 3 data in .csv format.

Usage

```
PSM.get(lon, lat, api_key, attributes, name, affiliation, year, leap_year,
interval, utc, reason_for_use, email, mailing_list, directory = "data-raw")
```

Arguments

lon	a number or a numeric array, longitude of the location(s) for downloading
lat	a number or a numeric array, latitude of the location(s) for downloading
api_key	the API key as a character string, can be obtained at https://developer.nrel.gov/signup/
attributes	the parameters to be downloaded, options are: "air_temperature", "clearsky_dhi", "clearsky_dni", "clearsky_ghi", "cloud_type", "dew_point", "dhi", "dni", "fill_flag", "ghi", "relative_humidity", "solar_zenith_angle", "surface_albedo", "surface_pressure", "total_precipitable_water", "wind_direction", "wind_speed". This argument should be passed in as a character string. If more than one, separate them using comma without spaces.
name	your name as a character string, e.g., "John+Smith". Spaces need to be replace with the + sign
affiliation	your affiliation as a character string, e.g., "National+Renewable+Energy+Lab". Spaces need to be replace with the + sign.

`year`	the year to be downloaded, options are: `"1998"`, `"1999"`, ..., `"2016"`, `"tmy"`. This argument should be passed in as a character string. The API only allows downloading one year at a time
`leap_year`	a character string (`"true"` or `"false"`) indicating whether you want the data on 29 Feb if it is a leap year
`interval`	a character string (`"30"` or `"60"`) indicating whether you want 30 min or 60 min data
`utc`	a character string (`"true"` or `"false"`) indicating whether you want the time to be UTC
`reason_for_use`	a character string indicating your purpose, e.g., `"research+development"`
`email`	your email as a character string, e.g., `"john.smith@gmail.com"`
`mailing_list`	a character string (`"true"` or `"false"`) indicating whether you want to be on the NREL mainling list
`directory`	the directory for the downloads, default to `"~/data-raw"`

Details

NREL PSM v3 contains half-hourly, regularly-gridded, satellite-derived irradiance and other meteorological parameters.

Value

A .csv file, or .csv files if `length(lat) > 1`, saved into your intended directory

Author(s)

D. Yang

References

Manajit Sengupta, Yu Xie, Anthony Lopez, Aron Habte, Galen Maclaurin, and James Shelby, The National Solar Radiation Data Base (NSRDB), *Renewable and Sustainable Energy Reviews*, Volume 89, 2018, Pages 51-60, https://doi.org/10.1016/j.rser.2018.03.003.

`SRTM.get` *Get NASA SRTM data*

Description

Download NASA Shuttle Radar Topography Mission (SRTM) digital elevation model (DEM) data in .hgt format.

Usage

```
SRTM.get(resolution, files, directory = "data-raw")
```

Arguments

resolution	a number indicating the resolution of the DEM, two options are available: 1 or 3, see SRTM.list
files	character strings indicating the file names for downloading, see SRTM.list for available files
directory	the directory for the downloads, default to "~/data-raw"

Details

place holder for now

Value

A .dat file, or .dat files if length(day_of_year) > 1, saved into your intended directory

Author(s)

D. Yang

References

Bernhard Rabus, Michael Eineder, Achim Roth, Richard Bamler, The shuttle radar topography mission—a new class of digital elevation models acquired by spaceborne radar, *ISPRS Journal of Photogrammetry and Remote Sensing*, Volume 57, Issue 4, 2003, Pages 241-262, https://doi.org/10.1016/S0924-2716(02)00124-7.

See Also

SRTM.list, SRTM.read

SRTM.list *List the available SRTM files*

Description

This function retrieves the directory listing, i.e., available files from https://dds.cr.usgs.gov/.

Usage

```
SRTM.list(resolution, want.plot = TRUE)
```

Arguments

resolution	a number indicating the resolution of the DEM, two options are available: 1 or 3, see details
want.plot	boolean, if TRUE return plot

Details

Souce: https://dds.cr.usgs.gov/srtm/version2_1/Documentation/Quickstart.pdf

SRTM data are distributed in two levels: SRTM1 (for the United States and its territories and possessions) with data sampled at 1 arc-second intervals in latitude and longitude (or 30 meters or 98 feet), and SRTM3 (for the world) sampled at 3 arc-seconds (or 90 meters or 295 feet). Three arc-second data are generated by three by three averaging of the one arc-second samples.

File names refer to the latitude and longitude of the lower left corner of the tile - e.g. N37W105 has its lower left corner at 37 degrees north latitude and 105 degrees west longitude. To be more exact, these coordinates refer to the geometric center of the lower left pixel. In addition, the files are separated by geographical zones, i.e., parent directory. For example, SRTM1 contains 7 zones, whereas SRTM3 divides the zones by continent.

SRTM3 files contain 1201 lines and 1201 samples. The rows at the north and south edges as well as the columns at the east and west edges of each cell overlap and are identical to the edge rows and columns in the adjacent cell. SRTM1 files contain 3601 lines and 3601 samples, with similar overlap.

Value

A vector of character strings, indicating the available file names.

Author(s)

D. Yang

See Also

SRTM.get, SRTM.read

SRTM.read *Read SRTM .hgt files*

Description

This function reads SRTM .hgt files and outputs a RasterLayer obejct or a data.frame (not recommended).

Usage

```
SRTM.read(files, as.data.frame = FALSE)
```

Arguments

files	a vector of character strings indicating the file names to be read
as.data.frame	boolean, if TRUE output a data.frame

Details

The SRTM1 has 3601×3601 cells, and SRTM3 has 1201×1201 cells. It is thus not recommened to convert the output into a data.frame. Moreover, the RasterLayer object is easier to work with using the raster package.

Value

A RasterLayer object or a data.frame

Author(s)

D. Yang

See Also

SRTM.list, SRTM.get

SURFRAD.get *Get NOAA SURFRAD data*

Description

Download NOAA Surface Radiation (SURFRAD) data in .dat format.

Usage

```
SURFRAD.get(station, year, day_of_year, directory = "data-raw")
```

Arguments

station	a character string indicating the station name, options are "Bondville_IL", "Boulder_CO", "Desert_Rock_NV", "Fort_Peck_MT", "Goodwin_Creek_MS", "Penn_State_PA", "Sioux_Falls_SD". Alternatively, abbreviations of the stations can be used, i.e., "bon", "tbl", "dra", "fpk", "gwn", "psu", "sxf", respectively
year	a character string indicating the four-digit year
day_of_year	days of year to be downloaded, as a numeric array
directory	the directory for the downloads, default to "~/data-raw"

Details

NOAA high-resolution, long-term, ground-based irradiance measurements at 7 locations.

Value

A .dat file, or .dat files if length(day_of_year) > 1, saved into your intended directory

Author(s)

D. Yang

References

J.A. Augustine, J.J. DeLuisi, and C.N. Long, SURFRAD–A National Surface Radiation Budget Network for Atmospheric Research. *Bull. Amer. Meteor. Soc.*, Volume 81, Pages 2341–2358, https://doi.org/10.1175/1520-0477(2000)081<2341:SANSRB>2.3.CO;2

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