

Package ‘ag5Tools’

March 24, 2022

Title Toolbox for Downloading and Extracting Copernicus AgERA5 Data

Version 0.0.1

Description

Tools for downloading and extracting data from the Copernicus ``Agrometeorological indicators from 1979 to present derived from reanalysis"

<https://cds.climate.copernicus.eu/cdsapp#!/dataset/sis-agrometeorological-indicators?tab=overview> (AgERA5).

Config/reticulate list(packages = list(list(package = ``cdsapi", pip = TRUE)))

Depends R (>= 3.5.0)

License MIT + file LICENSE

Encoding UTF-8

LazyData true

Imports terra, reticulate, fs

RoxygenNote 7.1.2

Suggests rmarkdown, knitr

VignetteBuilder knitr

URL <https://agrdatasci.github.io/ag5Tools/>

NeedsCompilation no

Author David Brown [aut, cre] (<<https://orcid.org/0000-0003-2859-1618>>),
Kaue de Sousa [aut] (<<https://orcid.org/0000-0002-7571-7845>>),
Jacob van Etten [ths] (<<https://orcid.org/0000-0001-7554-2558>>),
Sytze de Bruin [ths] (<<https://orcid.org/0000-0002-6884-2832>>)

Maintainer David Brown <d.brown@cgiar.org>

Repository CRAN

Date/Publication 2022-03-24 18:20:02 UTC

R topics documented:

| | |
|------------------------|---|
| ag5_download | 2 |
| ag5_extract | 4 |
| arusha_df | 7 |

| | |
|--------------|---|
| ag5_download | <i>Downloads AgERA5 data from the Copernicus Climate Change Service - Copernicus Climate Data Store</i> |
|--------------|---|

Description

The data is downloaded from Copernicus Climate Change Service (C3S) using the Copernicus Climate Data Store (CDSAPI) Python library <https://github.com/ecmwf/cdsapi>

This function provides programmatic access to the AgERA5 dataset. For more information about the data license, please visit: <https://cds.climate.copernicus.eu/api/v2/terms/static/licence-to-use-copernicus-products.pdf>

To download the data you should have a valid CDS account, an CDS API key. Please follow the instructions at: <https://cds.climate.copernicus.eu/api-how-to> to create a file to store your API key. You do not need to install Python or the cdsapi, Ag5Tools will do it if required.

Usage

```
ag5_download(variable, statistic = NULL, year, month, day, time = NULL, path)
```

Arguments

| | |
|-----------|--|
| variable | character The variable to be downloaded. See details |
| statistic | character Only required for some variables. See details for options. |
| year | numeric (Integer) Year to download. Should be between 1979 - 2022 |
| month | numeric Month to be requested. Use month = "all" download all the months for the requested year. |
| day | numeric Days of the month for the requested data. Use day = "all" to download all days from requested month |
| time | Character Only required for "2m_relative_humidity". See details for available options. |
| path | Character Target folder in an local harddrive e.g. "C:/agera5". The folder should exist and the user should have write permission. |

Value

No return value, called for side effects.

AgERA5 variables available for download:

- cloud_cover
- liquid_precipitation_duration_fraction
- snow_thickness_lwe
- solar_radiation_flux

- 2m_temperature
- 2m_dewpoint_temperature
- precipitation_flux
- solid_precipitation_duration_fraction
- snow_thickness
- vapour_pressure
- 10m_wind_speed
- 2m_relative_humidity

Statistics for variable "2m_temperature"

Variable "2m_temperature" requires to indicate at least one of the following options in statistic:

- 24_hour_maximum
- 24_hour_mean
- 24_hour_minimum
- day_time_maximum
- day_time_mean
- night_time_mean
- night_time_minimum

Parameter "time" for Variable "2m_relative_humidity"

Variable "2m_relative_humidity" requires to indicate one of the following options in time:

- 06_00
- 09_00
- 12_00
- 15_00
- 18_00

Variables that require statistic

For the following variables, only "24_hour_mean" statistic is available, but should be explicitly indicated.

- cloud_cover
- snow_thickness_lwe
- 2m_dewpoint_temperature
- snow_thickness
- vapour_pressure
- 10m_wind_speed

Examples

```
## Not run:
ag5_download(variable = "2m_temperature",
             statistic = "night_time_minimum",
             day = "all",
             month = "all",
             year = 2015,
             path = "C:/custom_target_folder"
            )

## End(Not run)
```

ag5_extract

Extract AgERA5 data stored in a local hardrive

Description

Extract data from AgERA5 data files previously downloaded from the Copernicus Climate Data Store. These functions use package 'terra' to read *.nc files and extract the requested data for a given location and dates. If dates is one value it extracts a single observation for the specified variable and location. If dates is a character vector of length == 2, it will extract a time series of the specified variable and location, where the first dates value is the start date and the second the end date.

Usage

```
ag5_extract(coords, ..., path)

## S3 method for class 'numeric'
ag5_extract(
  coords,
  dates,
  variable,
  statistic = NULL,
  time = NULL,
  celsius = FALSE,
  ...,
  path
)

## S3 method for class 'data.frame'
ag5_extract(
  coords,
  lon = "lon",
  lat = "lat",
  start_date = "start_date",
```

```

    end_date = "end_date",
    variable,
    statistic = NULL,
    time = NULL,
    celsius = FALSE,
    ...,
    path
)

```

Arguments

| | |
|------------|---|
| coords | numeric vector of length = 2 of the form (lon, lat), or a <code>data.frame</code> with required columns |
| ... | Other parameters |
| path | character The path for the folder containing the AgERA5 files |
| dates | character The dates for extracting the specified variable, a vector of length 1 extracts a single date, while a vector of length 2 indicates the start and end dates. or the column name in the case of <code>data.frame</code> |
| variable | character The AgERA5 variable to extract, see details for available options |
| statistic | character Only for some variables, see details for valid options |
| time | Only for variable Relative-Humidity-2m, see details for valid options |
| celsius | logical Only for variables "Temperature-Air-2m" and "2m_dewpoint_temperature". If TRUE the values are converted from Kelvin to Celsius. Default is FALSE |
| lon | character Column name of longitude values in the case of <code>data.frame</code> |
| lat | character Column name of latitude values in the case of <code>data.frame</code> |
| start_date | character Column name of start_date values in the case that coords is a <code>data.frame</code> |
| end_date | character Column name of end_date values in the case that coords is a <code>data.frame</code> |

Value

numeric vector with length equal to the number of dates between first and second date. The returned vector is a named vector, with requested dates as names. If only one date is provided the function returns a numeric vector with length = 1. If coords is a `data.frame`, the function returns a list of numeric vectors, each one corresponding to the rows in the input `data.frame`

Valid variable values

- "cloud_cover"
- "liquid_precipitation_duration_fraction"
- "snow_thickness_lwe"
- "Solar-Radiation-Flux"
- "Temperature-Air-2m"
- "2m_dewpoint_temperature"
- "Precipitation-Flux"

- "solid_precipitation_duration_fraction"
- "snow_thickness"
- "vapour_pressure"
- "10m_wind_speed"
- "Relative-Humidity-2m"

Valid statistics for variable "Temperature-Air-2m"

- Max-24h
- Mean-24h
- 24_hour_minimum
- Max-Day-Time
- Mean-Day-Time
- Mean-Night-Time
- Min-Night-Time

Variables that require statistic

For the following variables, only "24_hour_mean" statistic is available, but should be explicitly indicated.

- cloud_cover
- snow_thickness_lwe
- 2m_dewpoint_temperature
- snow_thickness
- vapour_pressure
- 10m_wind_speed

Valid time values for variable "Relative-Humidity-2m"

- 06h
- 09h
- 12h
- 15h
- 18h

References

Temperature conversion is made accordingly to: Preston-Thomas, H. (1990). The International Temperature Scale of 1990 (ITS-90). *Metrologia*, 27(1), 3-10. doi:10.1088/0026-1394/27/1/002

Examples

```
## Not run:
temp <- ag5_extract(coords = c(lon = 35.72636, lat = -2.197162),
                    dates = "1991-04-22",
                    variable = "Temperature-Air-2m",
                    statistic = "Max-Day-Time",
                    path = "C:/temperature_data/")

## End(Not run)
```

arusha_df

Example dataset for the agera5 package

Description

100 points in Arusha, Tanzania The geographic coordinates were generated with the function `st_sample` from package `sf`

Usage

```
arusha_df
```

Format

An object of class `data.frame` with 100 rows and 4 columns.

Index

* datasets

arusha_df, [7](#)

ag5_download, [2](#)

ag5_extract, [4](#)

arusha_df, [7](#)