Package 'nasapower'

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Title NASA POWER API Client

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Description Client for 'NASA' 'POWER' global meteorology, surface solar energy and climatology data 'API'. 'POWER' (Prediction Of Worldwide Energy Resource) data are freely available global meteorology and surface solar energy climatology data for download with a resolution of 1/2 by 1/2 arc degree longitude and latitude and are funded through the 'NASA' Earth Science Directorate Applied Science Program. For more on the data themselves, a web-based data viewer and web access, please see <https://power.larc.nasa.gov/>.

Depends R (>= 3.2.0)

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`create_icasa` *Create a DSSAT ICASA file from POWER data*

Description

Get POWER values for a single point or region and create an ICASA format text file suitable for use in DSSAT for crop modelling; saving it to local disk.

Usage

```
create_icasa(lonlat, dates, dsn, file_out)
```

Arguments

`lonlat`	A numeric vector of geographic coordinates for a cell or region entered as x, y coordinates. See argument details for more.
`dates`	A character vector of start and end dates in that order, *e.g.*, `dates = c("1983-01-01","2017-12-31")`. See argument details for more.
`dsn`	A file path where the resulting text file should be stored.
`file_out`	A file name for the resulting text file, *e.g.* "Kingsthorpe.txt". A ".txt" extension will be appended if not or otherwise specified by user.

Details

This function is essentially a wrapper for `get_power` that queries the POWER API and writes a DSSAT ICASA weather file to disk. All necessary `pars` are automatically included in the query.

Further details for each of the arguments are provided in their respective sections following below.

Value

A text file in ICASA format saved to local disk for use in DSSAT crop modelling.

Argument details for `lonlat`

For a single point To get a specific cell, 1/2 x 1/2 degree, supply a length-two numeric vector giving the decimal degree longitude and latitude in that order for data to download, *e.g.*, `lonlat = c(151.81,-27.48)`.

For regional coverage To get a region, supply a length-four numeric vector as lower left (lon, lat) and upper right (lon, lat) coordinates, *e.g.*, `lonlat = c(xmin,ymin,xmax,ymax)` in that order for a given region, *e.g.*, a bounding box for the southwestern corner of Australia: `lonlat = c(112.5,-55.5,115.5,-50.5)`. *Max bounding box is 10 x 10 degrees* of 1/2 x 1/2 degree data, *i.e.*, 100 points maximum in total.

Argument details for `dates`

If `dates` is unspecified, defaults to a start date of 1983-01-01 (the earliest available data) and an end date of current date according to the system. If one date only is provided, it will be treated as both the start date and the end date and only a single day's values will be returned.

Author(s)

Sparks, A. H. <adamhsparks@gmail.com>

See Also

`create_met` Create an APSIM met File from NASA POWER Data

Examples

```
# Create an ICASA file for Kingsthorpe,
# Qld from 1985-01-01 to 1985-06-30
# and save it in the current R session
# tempdir() as ICASA_example.txt


create_icasa(lonlat = c(151.81, -27.48),
            dates = c("1985-01-01", "1985-12-31"),
            dsn = tempdir(),
            file_out = "ICASA_example.txt"
            )
```

create_met *Create an APSIM met file from POWER data*

Description

Get POWER values for a single point or region and create an APSIM met file suitable for use in APSIM for crop modelling; saving it to local disk.

Usage

```
create_met(lonlat, dates, dsn, file_out)
```

Arguments

lonlat	A numeric vector of geographic coordinates for a cell or region entered as x, y coordinates. See argument details for more.
dates	A character vector of start and end dates in that order, *e.g.*, dates = c("1983-01-01","2017-12-31"). See argument details for more.
dsn	A file path where the resulting text file should be stored.
file_out	A file name for the resulting text file, *e.g.* "Kingsthorpe.met". A ".met" extension will be appended if given or otherwise specified by user.

Details

This function is essentially a wrapper for get_power prepareMet and writeMetFile that simplifies the querying of the POWER API and writes the met to local disk.

The weather values from POWER for temperature are 2 metre max and min temperatures, "T2M_MAX" and "T2M_MIN"; radiation, "ALLSKY_SFC_SW_DWN"; and rain, "PRECTOT" from the POWER AG community on a daily time-step.

Further details for each of the arguments are provided in their respective sections following below.

Value

A text file in met format saved to local disk for use in APSIM crop modelling.

Argument details for lonlat

For a single point To get a specific cell, 1/2 x 1/2 degree, supply a length-two numeric vector giving the decimal degree longitude and latitude in that order for data to download, *e.g.*, lonlat = c(151.81,-27.48).

For regional coverage To get a region, supply a length-four numeric vector as lower left (lon, lat) and upper right (lon, lat) coordinates, *e.g.*, lonlat = c(xmin,ymin,xmax,ymax) in that order for a given region, *e.g.*, a bounding box for the southwestern corner of Australia: lonlat = c(112.5,-55.5,115.5,-50.5). *Max bounding box is 10 x 10 degrees* of 1/2 x 1/2 degree data, *i.e.*, 100 points maximum in total.

Argument details for `dates`

If `dates` is unspecified, defaults to a start date of 1983-01-01 (the earliest available data) and an end date of current date according to the system.

If one date only is provided, it will be treated as both the start date and the end date and only a single day's values will be returned.

Author(s)

Sparks, A. H. <adamhsparks@gmail.com>

See Also

`create_icasa` Create a DSSAT ICASA File from NASA POWER Data

Examples

```
# Create a met file for Kingsthorpe, Qld
# from 1985-01-01 to 1985-06-30 and
# save it in the current R session
# tempdir() as `APSIM_example.met`


create_met(lonlat = c(151.81, -27.48),
           dates = c("1985-01-01", "1985-12-31"),
           dsn = tempdir(),
           file_out = "APSIM_example.met"
           )
```

`get_power` *Get NASA POWER data*

Description

Get POWER global meteorology and surface solar energy climatology data and return a tidy data frame `tibble`. All options offered by the official POWER API are supported.

Usage

```
get_power(community, pars, temporal_average, lonlat, dates = NULL)
```

Arguments

`community`	A character vector providing community name: "AG", "SB" or "SSE". See argument details for more.

`pars` A character vector of solar, meteorological or climatology parameters to download. See `parameters` for a full list of valid values and definitions. If downloading "CLIMATOLOGY" a maximum of three `pars` can be specified at one time, for "DAILY" and "INTERANNUAL" a maximum of 20 can be specified at one time.

`temporal_average`
Temporal average for data being queried, supported values are "DAILY", "INTERANNUAL" and "CLIMATOLOGY". See argument details for more.

`lonlat` A numeric vector of geographic coordinates for a cell or region entered as x, y coordinates or "GLOBAL" for global coverage (only used for "CLIMATOLOGY"). See argument details for more.

`dates` A character vector of start and end dates in that order,
e.g., `dates = c("1983-01-01","2017-12-31")`. Not used when
`temporal_average` is set to "CLIMATOLOGY". See argument details for more.

Value

A data frame of POWER data including location, dates (not including "CLIMATOLOGY") and requested parameters. A header of metadata is included.

Argument details for "community"

There are three valid values, one must be supplied. This will affect the units of the parameter and the temporal display of time series data.

AG Provides access to the Agroclimatology Archive, which contains industry-friendly parameters formatted for input to crop models.

SB Provides access to the Sustainable Buildings Archive, which contains industry-friendly parameters for the buildings community to include parameters in multi-year monthly averages.

SSE Provides access to the Renewable Energy Archive, which contains parameters specifically tailored to assist in the design of solar and wind powered renewable energy systems.

Argument details for `temporal_average`

There are three valid values.

DAILY The daily average of `pars` by day, month and year.

INTERANNUAL The monthly average of `pars` by year.

CLIMATOLOGY The monthly average of `pars` at the surface of the earth for a given month, averaged for that month over the 30-year period (Jan. 1984 - Dec. 2013).

Argument details for `lonlat`

For a single point To get a specific cell, 1/2 x 1/2 degree, supply a length-two numeric vector giving the decimal degree longitude and latitude in that order for data to download,
e.g., `lonlat = c(-89.5,-179.5)`.

For regional coverage To get a region, supply a length-four numeric vector as lower left (lon, lat) and upper right (lon, lat) coordinates, *e.g.*, `lonlat = c(xmin,ymin,xmax,ymax)` in that order for a given region, *e.g.*, a bounding box for the southwestern corner of Australia: `lonlat = c(112.5,-55.5,115.5,-50.5)`. *Maximum area processed is 4.5 x 4.5 degrees (100 points).

For global coverage To get global coverage for CLIMATOLOGY, supply "GLOBAL" while also specifying "CLIMATOLOGY" for the `temporal_average`.

Argument details for `dates`

If one date only is provided, it will be treated as both the start date and the end date and only a single day's values will be returned, *e.g.*, `dates = "1983-01-01"`. When `temporal_average` is set to "INTERANNUAL", use only two year values (YYYY), *e.g.* `dates = c(1983,2010)`. This argument should not be used when `temporal_average` is set to "CLIMATOLOGY".

Note

The associated metadata are not saved if the data are exported to a file format other than a native R data format, *e.g.*, .Rdata, .rda or .rds.

Author(s)

Sparks, A. H. <adamhsparks@gmail.com>

References

https://power.larc.nasa.gov/documents/POWER_Data_v9_methodology.pdf https://power.larc.nasa.gov

Examples

```
# Fetch daily "AG" community temperature, relative
# humidity and precipitation for January 1 1985
# for Kingsthorpe, Queensland, Australia
ag_d <- get_power(
  community = "AG",
  lonlat = c(151.81, -27.48),
  pars = c("RH2M", "T2M", "PRECTOT"),
  dates = "1985-01-01",
  temporal_average = "DAILY"
)

# Fetch single point climatology for air temperature
ag_c_point <- get_power(
  community = "AG",
  pars = "T2M",
  c(151.81, -27.48),
  temporal_average = "CLIMATOLOGY"
)

ag_c_point
```

```
# Fetch global AG climatology for air temperature
ag_c_global <- get_power(
  community = "AG",
  pars = "T2M",
  lonlat = "GLOBAL",
  temporal_average = "CLIMATOLOGY"
)

ag_c_global

# Fetch interannual solar cooking parameters
# for a given region
sse_i <- get_power(
  community = "SSE",
  lonlat = c(112.5, -55.5, 115.5, -50.5),
  dates = c("1984", "1985"),
  temporal_average = "INTERANNUAL",
  pars = c("CLRSKY_SFC_SW_DWN", "ALLSKY_SFC_SW_DWN")
)

sse_i
```

`nasapower` *NASA POWER API client*

Description

Client for NASA POWER global meteorology, surface solar energy and climatology data API. POWER (Prediction Of Worldwide Energy Resource) data are freely available global meteorology and surface solar energy climatology data for download with a resolution of 1/2 by 1/2 arc degree longitude and latitude and are funded through the NASA Earth Science Directorate Applied Science Program. For more on the data themselves and a web-based data viewer and access, please see <https://power.larc.nasa.gov/>.

Note

While **nasapower** does not redistribute the data in any way, we encourage users to follow the requests of the POWER Project Team.

```
When POWER data products are used in a publication, we request the
following acknowledgment be included:

"These data were obtained from the NASA Langley Research Center POWER Project
funded through the NASA Earth Science Directorate Applied Science Program."
```

Author(s)

Sparks, A. H. <adamhsparks@gmail.com>

References

https://power.larc.nasa.gov/documents/POWER_Data_v9_methodology.pdf https://power.larc.nasa.gov

See Also

- `get_power` Download POWER Data and Return a Tidy Data Frame
- `create_icasa` Create a DSSAT ICASA File from POWER Data
- `create_met` Create an APSIM met File from POWER Data
- `citation("nasapower")` For proper citation of **nasaspower**

`parameters` *NASA POWER parameters available for download*

Description

An R `list` object of POWER parameters and metadata available for querying from the POWER database.

Usage

```
parameters
```

Format

A list with 146 weather and climate parameters contained within the POWER database.

ALLSKY_SFC_LW_DWN Downward Thermal Infrared (Longwave) Radiative Flux

ALLSKY_SFC_SW_DWN All Sky Insolation Incident on a Horizontal Surface

ALLSKY_SFC_SW_DWN_00_GMT All Sky Insolation Incident On A Horizontal Surface at 00 GMT

ALLSKY_SFC_SW_DWN_03_GMT All Sky Insolation Incident On A Horizontal Surface at 03 GMT

ALLSKY_SFC_SW_DWN_06_GMT All Sky Insolation Incident On A Horizontal Surface at 06 GMT

ALLSKY_SFC_SW_DWN_09_GMT All Sky Insolation Incident On A Horizontal Surface at 09 GMT

ALLSKY_SFC_SW_DWN_12_GMT All Sky Insolation Incident On A Horizontal Surface at 12 GMT

ALLSKY_SFC_SW_DWN_15_GMT All Sky Insolation Incident On A Horizontal Surface at 15 GMT

ALLSKY_SFC_SW_DWN_18_GMT All Sky Insolation Incident On A Horizontal Surface at 18 GMT

ALLSKY_SFC_SW_DWN_21_GMT All Sky Insolation Incident On A Horizontal Surface at 21 GMT

ALLSKY_SFC_SW_DWN_MAX_DIFF Maximum Monthly Difference From Monthly Averaged All Sky Insolation

ALLSKY_SFC_SW_DWN_MIN_DIFF Minimum Monthly Difference From Monthly Averaged All Sky Insolation

ALLSKY_TOA_SW_DWN Top-of-atmosphere Insolation

CDD0 Cooling Degree Days Above 0 C

CDD10 Cooling Degree Days Above 10 C

CDD18_3 Cooling Degree Days Above 18.3 C

CLD_AMT Daylight Cloud Amount

CLD_AMT_00_GMT Cloud Amount at 00 GMT

CLD_AMT_03_GMT Cloud Amount at 03 GMT

CLD_AMT_06_GMT Cloud Amount at 06 GMT

CLD_AMT_09_GMT Cloud Amount at 09 GMT

CLD_AMT_12_GMT Cloud Amount at 12 GMT

CLD_AMT_15_GMT Cloud Amount at 15 GMT

CLD_AMT_18_GMT Cloud Amount at 18 GMT

CLD_AMT_21_GMT Cloud Amount at 21 GMT

CLRSKY_DIFF Clear Sky Diffuse Radiation On A Horizontal Surface

CLRSKY_NKT Normalized Clear Sky Insolation Clearness Index

CLRSKY_SFC_SW_DWN Clear Sky Insolation Incident on a Horizontal Surface

DIFF Diffuse Radiation On A Horizontal Surface

DIFF_MAX Maximum Diffuse Radiation On A Horizontal Surface

DIFF_MIN Minimum Diffuse Radiation On A Horizontal Surface

DNR Direct Normal Radiation

DNR_MAX Maximum Direct Normal Radiation

DNR_MAX_DIFF Maximum Difference From Monthly Averaged Direct Normal Radiation

DNR_MIN Minimum Direct Normal Radiation

DNR_MIN_DIFF Minimum Difference From Monthly Averaged Direct Normal Radiation

EQVLNT_NO_SUN_BLACKDAYS_1 Equivalent Number Of NO-SUN Or BLACK Days Over A Consecutive 1-day Period

EQVLNT_NO_SUN_BLACKDAYS_14 Equivalent Number Of NO-SUN Or BLACK Days Over A Consecutive 14-day Period

EQVLNT_NO_SUN_BLACKDAYS_21 Equivalent Number Of NO-SUN Or BLACK Days Over A Consecutive 21-day Period

EQVLNT_NO_SUN_BLACKDAYS_3 Equivalent Number Of NO-SUN Or BLACK Days Over A Consecutive 3-day Period

EQVLNT_NO_SUN_BLACKDAYS_7 Equivalent Number Of NO-SUN Or BLACK Days Over A Consecutive 7-day Period

EQVLNT_NO_SUN_BLACKDAYS_MONTH Equivalent Number Of NO-SUN Or BLACK Days Over A Consecutive Month Period

FROST_DAYS Frost Days

FRQ_BRKNCLD_10_70_00_GMT Frequency Of Broken-cloud Skies 10 - 70 percent At 00 GMT

FRQ_BRKNCLD_10_70_03_GMT Frequency Of Broken-cloud Skies 10 - 70 percent At 03 GMT

FRQ_BRKNCLD_10_70_06_GMT Frequency Of Broken-cloud Skies 10 - 70 percent At 06 GMT

FRQ_BRKNCLD_10_70_09_GMT Frequency Of Broken-cloud Skies 10 - 70 percent At 09 GMT

FRQ_BRKNCLD_10_70_12_GMT Frequency Of Broken-cloud Skies 10 - 70 percent At 12 GMT

FRQ_BRKNCLD_10_70_15_GMT Frequency Of Broken-cloud Skies 10 - 70 percent At 15 GMT

FRQ_BRKNCLD_10_70_18_GMT Frequency Of Broken-cloud Skies 10 - 70 percent At 18 GMT

FRQ_BRKNCLD_10_70_21_GMT Frequency Of Broken-cloud Skies 10 - 70 percent At 21 GMT

FRQ_CLRSKY_0_10_00_GMT Frequency Of Clear Skies < 10 percent At 00 GMT

FRQ_CLRSKY_0_10_03_GMT Frequency Of Clear Skies < 10 percent At 03 GMT

FRQ_CLRSKY_0_10_06_GMT Frequency Of Clear Skies < 10 percent At 06 GMT

FRQ_CLRSKY_0_10_09_GMT Frequency Of Clear Skies < 10 percent At 09 GMT

FRQ_CLRSKY_0_10_12_GMT Frequency Of Clear Skies < 10 percent At 12 GMT

FRQ_CLRSKY_0_10_15_GMT Frequency Of Clear Skies < 10 percent At 15 GMT

FRQ_CLRSKY_0_10_18_GMT Frequency Of Clear Skies < 10 percent At 18 GMT

FRQ_CLRSKY_0_10_21_GMT Frequency Of Clear Skies < 10 percent At 21 GMT

FRQ_NROVRCST_70_00_GMT Frequency Of Near-overcast Skies >= 70 percent At 00 GMT

FRQ_NROVRCST_70_03_GMT Frequency Of Near-overcast Skies >= 70 percent At 03 GMT

FRQ_NROVRCST_70_06_GMT Frequency Of Near-overcast Skies >= 70 percent At 06 GMT

FRQ_NROVRCST_70_09_GMT Frequency Of Near-overcast Skies >= 70 percent At 09 GMT

FRQ_NROVRCST_70_12_GMT Frequency Of Near-overcast Skies >= 70 percent At 12 GMT

FRQ_NROVRCST_70_15_GMT Frequency Of Near-overcast Skies >= 70 percent At 15 GMT

FRQ_NROVRCST_70_18_GMT Frequency Of Near-overcast Skies >= 70 percent At 18 GMT

FRQ_NROVRCST_70_21_GMT Frequency Of Near-overcast Skies >= 70 percent At 21 GMT

HDD0 Heating Degree Days Below 0 C

HDD10 Heating Degree Days Below 10 C

HDD18_3 Heating Degree Days Below 18.3 C

INSOL_MIN_CONSEC_1 Minimum Available Insolation Over A Consecutive 1-day Period

INSOL_MIN_CONSEC_14 Minimum Available Insolation Over A Consecutive 14-day Period

INSOL_MIN_CONSEC_21 Minimum Available Insolation Over A Consecutive 21-day Period

INSOL_MIN_CONSEC_3 Minimum Available Insolation Over A Consecutive 3-day Period

INSOL_MIN_CONSEC_7 Minimum Available Insolation Over A Consecutive 7-day Period

INSOL_MIN_CONSEC_MONTH Minimum Available Insolation Over A Consecutive Month Period

KT Insolation Clearness Index

KT_CLEAR Clear Sky Insolation Clearness Index

MIDDAY_INSOL Midday Insolation Incident On A Horizontal Surface

NKT Normalized Insolation Clearness Index

NO_SUN_BLACKDAYS_MAX Maximum NO-SUN Or BLACK Days

PHIS Surface Geopotential

PRECTOT Precipitation

PS Surface Pressure

PSC Corrected Atmospheric Pressure (Adjusted For Site Elevation)

QV2M Specific Humidity at 2 Meters

RH2M Relative Humidity at 2 Meters

SG_DAY_COZ_ZEN_AVG Daylight Average Of Hourly Cosine Solar Zenith Angles

SG_DAY_HOUR_AVG Daylight Hours

SG_DEC_AVG Declination

SG_HR_AZM_ANG_AVG Hourly Solar Azimuth Angles

SG_HR_HRZ_ANG_AVG Hourly Solar Angles Relative To The Horizon

SG_HR_SET_ANG Sunset Hour Angle

SG_MAX_HRZ_ANG Maximum Solar Angle Relative To The Horizon

SG_MID_COZ_ZEN_ANG Cosine Solar Zenith Angle At Mid-Time Between Sunrise And Solar Noon

SG_NOON Solar Noon

SI_EF_MAX_OPTIMAL Maximum Solar Irradiance Optimal

SI_EF_MAX_OPTIMAL_ANG Maximum Solar Irradiance Optimal Angle

SI_EF_MAX_TILTED_ANG_ORT Maximum Solar Irradiance Tilted Surface Orientation

SI_EF_MAX_TILTED_SURFACE Maximum Solar Irradiance for Equator Facing Tilted Surfaces (Set of Surfaces)

SI_EF_MIN_OPTIMAL Minimum Solar Irradiance Optimal

SI_EF_MIN_OPTIMAL_ANG Minimum Solar Irradiance Optimal Angle

SI_EF_MIN_TILTED_ANG_ORT MinimumSolar Irradiance Tilted Surface Orientation

SI_EF_MIN_TILTED_SURFACE Minimum Solar Irradiance for Equator Facing Tilted Surfaces (Set of Surfaces)

SI_EF_OPTIMAL Solar Irradiance Optimal

SI_EF_OPTIMAL_ANG Solar Irradiance Optimal Angle

SI_EF_TILTED_ANG_ORT Solar Irradiance Tilted Surface Orientation

SI_EF_TILTED_SURFACE Solar Irradiance for Equator Facing Tilted Surfaces (Set of Surfaces)

SR Surface Roughness

SRF_ALB Surface Albedo

T10M Temperature at 10 Meters

T10M_MAX Maximum Temperature at 10 Meters

T10M_MIN Minimum Temperature at 10 Meters

T10M_RANGE Temperature Range at 10 Meters

T2M Temperature at 2 Meters

T2MDEW Dew/Frost Point at 2 Meters

T2MWET Wet Bulb Temperature at 2 Meters

T2M_MAX Maximum Temperature at 2 Meters

T2M_MIN Minimum Temperature at 2 Meters

T2M_RANGE Temperature Range at 2 Meters

TM_ZONES Climate Thermal and Moisture Zones

TQV Total Column Precipitable Water

TS Earth Skin Temperature

TS_AMP Earth Skin Temperature Amplitude

TS_MAX Maximum Earth Skin Temperature

TS_MIN Minimum Earth Skin Temperature

TS_RANGE Earth Skin Temperature Range

T_ZONES Climate Thermal Zones

U10M Eastward Wind at 10 Meters

V10M Northward Wind at 10 Meters

WD10M Wind Direction at 10 Meters (Meteorological Convention)

WD2M Wind Direction at 2 Meters (Meteorological Convention)

WD50M Wind Direction at 50 Meters (Meteorological Convention)

WS10M Wind Speed at 10 Meters

WS10M_MAX Maximum Wind Speed at 10 Meters

WS10M_MIN Minimum Wind Speed at 10 Meters

WS10M_RANGE Wind Speed Range at 10 Meters

WS2M Wind Speed at 2 Meters

WS2M_MAX Maximum Wind Speed at 2 Meters

WS2M_MIN Minimum Wind Speed at 2 Meters

WS2M_RANGE Wind Speed Range at 2 Meters

WS50M Wind Speed at 50 Meters

WS50M_MAX Maximum Wind Speed at 50 Meters

WS50M_MIN Minimum Wind Speed at 50 Meters

WS50M_RANGE Wind Speed Range at 50 Meters

WSC Corrected Wind Speed (Adjusted For Elevation)

Author(s)

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Source

https://power.larc.nasa.gov/RADAPP/GEODATA/powerWeb/POWER_Parameters_v109.json

References

https://power.larc.nasa.gov/docs/v1/

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