Package 'MODISTools'

September 17, 2023

Title Interface to the 'MODIS Land Products Subsets' Web Services

Version 1.1.5

Description Programmatic interface to the Oak Ridge National Laboratories 'MODIS Land Products Subsets' web services (<https://modis.ornl.gov/data/modis_webservice.html>). Allows for easy downloads of 'MODIS' time series directly to your R workspace or your computer.

URL https://github.com/bluegreen-labs/MODISTools

BugReports https://github.com/bluegreen-labs/MODISTools/issues

Depends R (>= 3.4)

Imports httr, utils, sf, sp, terra, stats, memoise, jsonlite

License AGPL-3

LazyData true

ByteCompile true

RoxygenNote 7.2.3

Suggests knitr, markdown, covr, testthat, ggplot2, dplyr

VignetteBuilder knitr

NeedsCompilation no

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Repository CRAN

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R topics documented:

`arcachon_lai` *arcachon_lai*

Description

MODIS leaf area index (LAI) around the French town of Arcachon derived from the MODIS MOD15A2H product (band Lai_500m).

Usage

```
arcachon_lai
```

Format

A MODISTools tidy data frame

`arcachon_lc` *arcachon_lc*

Description

MODIS land cover (IGBP) around the French town of Arcachon derived from the MODIS MCD12Q2 product (band LC_Type1).

Usage

```
arcachon_lc
```

Format

A MODISTools tidy data frame

mt_bands *Download all available bands*

Description

Lists all available bands for a MODIS Land Products Subset product.

Usage

```
mt_bands(product)
```

Arguments

product	a valid MODIS product name

Value

A data frame of all available bands for a MODIS Land Products Subsets products

See Also

mt_products mt_sites mt_dates

Examples

```
# list all available MODIS Land Products Subsets products
bands <- mt_bands(product = "MCD12Q2")
head(bands)
```

mt_batch_subset *Batch download MODIS Land Products subsets*

Description

Lists all available dates for a MODIS Land Products Subset product at a particular location.

Usage

```
mt_batch_subset(
  df,
  product,
  band,
  start = "2000-01-01",
  end = format(Sys.time(), "%Y-%m-%d"),
  km_lr = 0,
  km_ab = 0,
  out_dir = tempdir(),
  internal = TRUE
)
```

Arguments

df	a CSV file or data frame holding locations and their sitenames to batch process with column names site_name, lat, lon holding the respective sitenames, latitude and longitude. When providing a CSV make sure that the data are comma separated.
product	a valid MODIS product name
band	band to download
start	start date
end	end date
km_lr	km left-right to sample
km_ab	km above-below to sample
out_dir	location where to store all data
internal	should the data be returned as an internal data structure TRUE or FALSE (default = TRUE)

Value

A data frame combining meta-data and actual data values, data from different sites is concatenated into one large dataframe. Subsets can be created by searching on sitename.

See Also

mt_sites mt_dates mt_bands mt_products mt_subset

Examples

```
## Not run:
# create data frame with a site_name, lat and lon column
# holding the respective names of sites and their location
df <- data.frame("site_name" = paste("test",1:2))
df$lat <- 40
df$lon <- -110
```

```
print(df)

# test batch download
subsets <- mt_batch_subset(df = df,
                        product = "MOD11A2",
                        band = "LST_Day_1km",
                        internal = TRUE,
                        start = "2004-01-01",
                        end = "2004-03-31")

# the same can be done using a CSV file with
# a data structure similar to the dataframe above

write.table(df, file.path(tempdir(),"my_sites.csv"),
 quote = FALSE,
 row.names = FALSE,
 col.names = TRUE,
 sep = ",")

# test batch download form CSV
subsets <- mt_batch_subset(df = file.path(tempdir(),"my_sites.csv"),
                        product = "MOD11A2",
                        band = "LST_Day_1km",
                        internal = TRUE,
                        start = "2004-01-01",
                        end = "2004-03-31"
                        )

head(subsets)

## End(Not run)
```

`mt_bbox` *Converts lower-left sinusoidal coordinates to lat-lon sf bounding box*

Description

Converts lower-left sinusoidal coordinates to lat-lon sf bounding box

Usage

```
mt_bbox(xllcorner, yllcorner, cellsize, nrows, ncols, transform = TRUE)
```

Arguments

`xllcorner`	lower left x coordinate as provided by `mt_subset`
`yllcorner`	lower left y coordinate as provided by `mt_subset`
`cellsize`	cell size provided by `mt_subset`

nrows	cell size provided by mt_subset
ncols	cell size provided by mt_subset
transform	transform the bounding box from sin to lat long coordinates, TRUE or FALSE (default = TRUE)

See Also

sin_to_ll, mt_subset

Examples

```
# Download some test data
subset <- mt_subset(product = "MOD11A2",
                        lat = 40,
                        lon = -110,
                        band = "LST_Day_1km",
                        start = "2004-01-01",
                        end = "2004-03-31",
                        progress = FALSE)

# convert sinusoidal to lat / lon
lat_lon <- sin_to_ll(subset$xllcorner, subset$yllcorner)

# bind with the original dataframe
subset <- cbind(subset, lat_lon)

# convert to bounding box
bb <- apply(subset, 1, function(x){
  mt_bbox(xllcorner = x['xllcorner'],
          yllcorner = x['yllcorner'],
          cellsize = x['cellsize'],
          nrows = x['nrows'],
          ncols = x['ncols'])
})

head(bb)
```

---

mt_dates *Download all available dates*

Description

Lists all available dates for a MODIS Land Products Subset product at a particular location.

Usage

```
mt_dates(product, lat, lon, site_id, network)
```

Arguments

product	a valid MODIS product name
lat	latitude in decimal degrees
lon	longitude in decimal degrees
site_id	site id (overides lat / lon)
network	the network for which to generate the site list, when not provided the complete list is provided

Value

A data frame of all available dates for a MODIS Land Products Subsets products at the given location.

See Also

mt_products mt_sites mt_bands

Examples

```
# list all available MODIS Land Products Subsets products
bands <- mt_dates(product = "MOD11A2", lat = 40, lon = -110)
head(bands)
```

---

mt_products *Download all available products*

Description

Lists all available MODIS Land Products Subset products.

Usage

```
mt_products()
```

Value

A data frame of all available MODIS Land Products Subsets products

See Also

mt_bands mt_sites mt_dates

Examples

```
# list all available MODIS Land Products Subsets products
products <- mt_products()
head(products)
```

`mt_sites` *Download all available fixed sites*

Description

Lists all available MODIS Land Products Subset pre-processed sites

Usage

```
mt_sites(network)
```

Arguments

`network`	the network for which to generate the site list, when not provided the complete list is provided

Value

A data frame of all available MODIS Land Products Subsets pre-processed sites

See Also

`mt_products` `mt_bands` `mt_dates`

Examples

```
# list all available MODIS Land Products Subsets products
sites <- mt_sites()
print(head(sites))
```

`mt_subset` *Download MODIS Land Products subsets*

Description

Download a MODIS Land Products Subset product for a given point location buffered with a given amount of kilometers left-right, top-bottom for a given location (provided as latitude and longitude values).

Usage

```
mt_subset(
  product,
  band,
  lat,
  lon,
  start = "2000-01-01",
  end = format(Sys.time(), "%Y-%m-%d"),
  km_lr = 0,
  km_ab = 0,
  site_id,
  network,
  site_name = "sitename",
  out_dir = tempdir(),
  internal = TRUE,
  progress = TRUE
)
```

Arguments

`product`	a valid MODIS product name
`band`	band or bands (as a character vector) to download
`lat`	latitude in decimal degrees
`lon`	longitude in decimal degrees
`start`	start date
`end`	end date
`km_lr`	km left-right to sample (rounded to the nearest integer)
`km_ab`	km above-below to sample (rounded to the nearest integer)
`site_id`	site id (overides lat / lon)
`network`	the network for which to generate the site list, when not provided the complete list is provided
`site_name`	arbitrary site name used in writing data to file (default = sitename)
`out_dir`	path where to store the data if writing to disk (default = tempdir())

internal	should the data be returned as an internal data structure TRUE or FALSE (default = TRUE)
progress	show download progress

Value

A data frame combining meta-data and actual data values.

See Also

mt_sites mt_dates mt_bands mt_products mt_batch_subset

Examples

```
# list all available MODIS Land Products Subsets products
# download data
subset <- mt_subset(product = "MOD11A2",
                        lat = 40,
                        lon = -110,
                        band = "LST_Day_1km",
                        start = "2004-01-01",
                        end = "2004-03-31",
                        progress = FALSE)
 head(subset)
```

---

mt_to_terra *Convert tidy MODISTools data to terra SpatRaster*

Description

Convert tidy MODISTools data to a terra SpatRaster for easy spatial processing and plotting.

Usage

```
mt_to_terra(df, reproject = FALSE, method = "bilinear")
```

Arguments

df	a valid MODISTools data frame with a single band (filter for a particular band using the dplyr filter() function or base subset()
reproject	reproject output to lat / long (default = FALSE)
method	character. Method used for estimating the new cell values of a SpatRaster. One of: near: nearest neighbor. This method is fast, and it can be the preferred method if the cell values represent classes. It is not a good choice for continuous values. This is used by default if the first layer of x is categorical. bilinear: bilinear interpolation. This is the default if the first layer of x is numeric (not categorical). cubic: cubic interpolation. cubicspline: cubic spline interpolation.

Value

A terra SpatRaster populated with the tidy dataframe values

See Also

mt_subset mt_batch_subset

Examples

```
# list all available MODIS Land Products Subsets products
# download data
LC <- mt_subset(product = "MCD12Q1",
 lat = 48.383662,
 lon = 2.610250,
 band = "LC_Type1",
 start = "2005-01-01",
 end = "2005-12-30",
 km_lr = 2,
 km_ab = 2,
 site_name = "testsite",
 internal = TRUE,
 progress = FALSE)

head(LC)

# convert to raster
LC_r <- mt_to_terra(df = LC)
```

---

sin_to_ll *Convert sinusoidal coordinates to lat / lon*

Description

A full description of the sinusoidal projection is provided on the lpdaac page: https://lpdaac.usgs.gov/dataset_discovery/modis
and wikipedia: https://en.wikipedia.org/wiki/Sinusoidal_projection

Usage

```
sin_to_ll(x, y)
```

Arguments

x	sinusoidal x coordinate (vector)
y	sinusoidal y coordinate (vector)

See Also

mt_bbox

Examples

```
# Download some test data
subset <- mt_subset(product = "MOD11A2",
                        lat = 40,
                        lon = -110,
                        band = "LST_Day_1km",
                        start = "2004-01-01",
                        end = "2004-03-31",
                        progress = FALSE)

# convert sinusoidal to lat / lon
lat_lon <- sin_to_ll(subset$xllcorner, subset$yllcorner)

# bind with the original dataframe
subset <- cbind(subset, lat_lon)
head(subset)
```

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