Package 'MODISTools'

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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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`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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