

Package ‘CopernicusMarine’

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Type Package

Title Search Download and Handle Data from Copernicus Marine Service Information

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Description Subset and download data from EU Copernicus Marine Service Information: <<https://data.marine.copernicus.eu>>. Import data on the oceans physical and biogeochemical state from Copernicus into R without the need of external software.

Depends R (>= 3.5.0)

Imports crayon, dplyr, httr, jsonlite, leaflet, purrr, readr, rvest, sf, stringr, xml2

Suggests lifecycle, stars, testthat (>= 3.0.0)

URL <<https://github.com/pepijn-devries/CopernicusMarine>>

BugReports <https://github.com/pepijn-devries/CopernicusMarine/issues>

License GPL (>= 3)

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addCopernicusWMSTiles *Add Copernicus Marine WMS Tiles to a leaflet map*

Description

[Experimental] Create an interactive map with `leaflet::leaflet()` and add layers of Copernicus marine WMS data to it.

Usage

```
addCopernicusWMSTiles(
  map,
  product,
  layer,
  variable,
  options = leaflet::WMSTileOptions(format = "image/png", transparent = TRUE),
  ...
)
```

Arguments

map	A map widget object created from <code>leaflet::leaflet()</code>
product	An identifier (type character) of the desired Copernicus marine product. Can be obtained with <code>copernicus_products_list</code> .
layer	The name of a desired layer within a product (type character). Can be obtained with <code>copernicus_product_details</code> .
variable	The name of a desired variable in a specific layer of a product (type character). Can be obtained with <code>copernicus_product_details</code> .
options	Passed on to <code>leaflet::addWMSTiles()</code> .
...	Passed on to <code>leaflet::addWMSTiles()</code> .

Value

Returns an updated map

Note

WMS functions don't work on systems that don't support GDAL utils

Author(s)

Pepijn de Vries

See Also

Other wms-functions: [copernicus_wms2geotiff\(\)](#), [copernicus_wms_details\(\)](#)

Examples

```
if (interactive()) {  
  leaflet::leaflet() %>%  
    leaflet::setView(lng = 3, lat = 54, zoom = 4) %>%  
    leaflet::addProviderTiles("Esri.WorldImagery") %>%  
    addCopernicusWMSTiles(  
      product = "GLOBAL_ANALYSISFORECAST_PHY_001_024",  
      layer = "cmems_mod_glo_phy-thetao_anfc_0.083deg_P1D-m",  
      variable = "thetao")  
}
```

CopernicusMarine

Package description

Description

The CopernicusMarine package service as an interface between R and the EU [Copernicus Marine Service Information](#). With this package you can access data on the oceans physical and biogeochemical state. For some practical guidance on getting started: please visit <https://github.com/pepijn-devries/CopernicusMarine>

Author(s)

Pepijn de Vries

copernicus_cite_product

How to cite a Copernicus marine product

Description

[Stable] Get details for properly citing a Copernicus product.

Usage

```
copernicus_cite_product(product)
```

Arguments

product An identifier (type character) of the desired Copernicus marine product. Can be obtained with [copernicus_products_list](#).

Value

Returns a vector of character strings. The first element is always the product title, id and doi. Remaining elements are other associated references. Note that the remaining references are returned as listed at Copernicus. Note that the citing formatting does not appear to be standardised.

Author(s)

Pepijn de Vries

See Also

Other product-functions: [copernicus_product_details\(\)](#), [copernicus_product_metadata\(\)](#), [copernicus_products_list\(\)](#)

Examples

```
copernicus_cite_product("SST_MED_PHY_SUBSKIN_L4_NRT_010_036")
```

 copernicus_download_motu

Subset and download a specific marine product from Copernicus

Description

[Stable] Subset and download a specific marine product from Copernicus. This particular function uses the MOTU server for this purpose. You need to register an account at <https://data.marine.copernicus.eu> before you can use this function.

Usage

```
copernicus_download_motu(
  username = getOption("CopernicusMarine_uid", ""),
  password = getOption("CopernicusMarine_pwd", ""),
  destination,
  product,
  layer,
  variable,
  output,
  region,
  timerange,
  verticalrange,
  sub_variables,
  overwrite = FALSE
)
```

Arguments

username	Your Copernicus marine user name. Can be provided as option(CopernicusMarine_uid = "my_user_name"), or as argument here.
password	Your Copernicus marine password. Can be provided as option(CopernicusMarine_pwd = "my_password"), or as argument here.
destination	File or path where the requested file will be downloaded to.
product	An identifier (type character) of the desired Copernicus marine product. Can be obtained with copernicus_products_list .
layer	The name of a desired layer within a product (type character). Can be obtained with copernicus_product_details .
variable	The name of a desired variable in a specific layer of a product (type character). Can be obtained with copernicus_product_details .
output	File type for the output. "netcdf" will work in most cases.
region	Specification of the bounding box as a vector of numeric WGS84 lat and lon coordinates. Should be in the order of: xmin, ymin, xmax, ymax.
timerange	[Experimental] A vector with two elements (lower and upper value) for a requested time range. The vector should be coercible to POSIXct.

`verticalrange` **[Experimental]** A vector with two elements (minimum and maximum) numerical values for the depth of the vertical layers (if any).

`sub_variables` A vector of names of requested sub variables.

`overwrite` A logical value. When FALSE (default), files at the destination won't be overwritten when they exist. Instead an error will be thrown if this is the case. When set to TRUE, existing files will be overwritten.

Value

Returns a logical value invisibly indicating whether the requested file was successfully stored at the destination.

Author(s)

Pepijn de Vries

Examples

```
## Not run:
destination <- tempfile("copernicus", fileext = ".nc")

## Assuming that Copernicus account details are provided as `options`
copernicus_download_motu(
  destination = destination,
  product     = "GLOBAL_ANALYSISFORECAST_PHY_001_024",
  layer       = "cmems_mod_glo_phy-cur_anfc_0.083deg_P1D-m",
  variable    = "sea_water_velocity",
  output      = "netcdf",
  region      = c(-1, 50, 10, 55),
  timerange   = c("2021-01-01", "2021-01-02"),
  verticalrange = c(0, 2),
  sub_variables = c("uo", "vo")
)

mydata <- stars::read_stars(destination)

plot(mydata["vo"])

## End(Not run)
```

`copernicus_ftp_list` *List and get FTP files for a Copernicus marine product*

Description

[Stable] Full marine data sets can be downloaded using the File Transfer Protocol (FTP). Use these functions to list download locations and get the files.

Usage

```

copernicus_ftp_list(
  product,
  layer,
  username = getOption("CopernicusMarine_uid", ""),
  password = getOption("CopernicusMarine_pwd", "")
)

copernicus_ftp_get(
  url,
  destination,
  show_progress = TRUE,
  overwrite = FALSE,
  username = getOption("CopernicusMarine_uid", ""),
  password = getOption("CopernicusMarine_pwd", "")
)

```

Arguments

product	An identifier (type character) of the desired Copernicus marine product. Can be obtained with copernicus_products_list .
layer	The name of a desired layer within a product (type character). Can be obtained with copernicus_product_details .
username	Your Copernicus marine user name. Can be provided as option(CopernicusMarine_uid = "my_user_name"), or as argument here.
password	Your Copernicus marine password. Can be provided as option(CopernicusMarine_pwd = "my_password"), or as argument here.
url	The URL of the file to be downloaded. Obtain this URL with copernicus_ftp_list .
destination	File or path where the requested file will be downloaded to.
show_progress	A logical value. When TRUE (default) the download progress will be shown. This can be useful for large files.
overwrite	A logical value. When FALSE (default), files at the destination won't be overwritten when they exist. Instead an error will be thrown if this is the case. When set to TRUE, existing files will be overwritten.

Value

In case of `copernicus_ftp_list` a tibble is returned containing available URLs (for the specified product and layer) and some meta information is returned. In case of `copernicus_ftp_get` an invisible logical value is returned, indicating whether the requested file is successfully stored at the destination path.

Author(s)

Pepijn de Vries

Examples

```
## Not run:
## Assuming that Copernicus account details are provided as `options`
cop_ftp_files <- copernicus_ftp_list("GLOBAL_OMI_WMHE_heatrp")

destination <- tempdir()

copernicus_ftp_get(cop_ftp_files$url[[1]], destination)

## End(Not run)
```

copernicus_products_list

List products available from data.marine.copernicus.eu

Description

[Stable] Collect a list of products and some brief descriptions for marine products available from Copernicus

Usage

```
copernicus_products_list(..., info_type = c("list", "meta"))
```

Arguments

...	Allows you to pass (search) query parameters to apply to the list. When omitted, the full list of products is returned.
info_type	One of "list" (default) or "meta". "list" returns the actual list whereas "meta" returns meta information for the executed query (e.g. number of hits).

Value

Returns a tibble of products available from <https://data.marine.copernicus.eu> or a named list when info_type = "meta". Returns NULL in case on-line services are unavailable.

Author(s)

Pepijn de Vries

See Also

Other product-functions: [copernicus_cite_product\(\)](#), [copernicus_product_details\(\)](#), [copernicus_product_metadata\(\)](#)

Examples

```
copernicus_products_list()

## Query a specific product:
copernicus_products_list(freeText = "GLOBAL_ANALYSIS_FORECAST_BIO_001_028")
```

copernicus_product_details

Obtain details for a specific Copernicus marine product

Description

[Stable] Obtain details for a specific Copernicus marine product. This can be narrowed down to specific layers and/or variables within the product.

Usage

```
copernicus_product_details(product, layer, variable)
```

Arguments

product	An identifier (type character) of the desired Copernicus marine product. Can be obtained with copernicus_products_list .
layer	The name of a desired layer within a product (type character). Can be obtained with copernicus_product_details .
variable	The name of a desired variable in a specific layer of a product (type character). Can be obtained with copernicus_product_details .

Value

Returns a named list with properties of the requested product.

Author(s)

Pepijn de Vries

See Also

Other product-functions: [copernicus_cite_product\(\)](#), [copernicus_product_metadata\(\)](#), [copernicus_products_list\(\)](#)

Examples

```
copernicus_product_details("GLOBAL_ANALYSISFORECAST_PHY_001_024")

copernicus_product_details(
  product = "GLOBAL_ANALYSISFORECAST_PHY_001_024",
  layer   = "cmems_mod_glo_phy-thetao_anfc_0.083deg_P1D-m",
  variable = "thetao"
)
```

copernicus_product_metadata

Obtain meta data for a specific Copernicus marine product

Description

[Stable] Collect meta information, such as vocabularies used, for specific Copernicus marine products

Usage

```
copernicus_product_metadata(product)
```

Arguments

product An identifier (type character) of the desired Copernicus marine product. Can be obtained with [copernicus_products_list](#).

Value

Returns a named list with info about the requested product. Returns NULL when contacting Copernicus fails.

Author(s)

Pepijn de Vries

See Also

Other product-functions: [copernicus_cite_product\(\)](#), [copernicus_product_details\(\)](#), [copernicus_products_list](#)

Examples

```
copernicus_product_metadata("GLOBAL_ANALYSISFORECAST_PHY_001_024")
```

`copernicus_product_services`*Obtain available services for a specific Copernicus marine product*

Description

[Stable] Obtain an overview of services provided by Copernicus for a specific marine product.

Usage

```
copernicus_product_services(product)
```

Arguments

<code>product</code>	An identifier (type character) of the desired Copernicus marine product. Can be obtained with copernicus_products_list .
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Value

Returns a tibble with a list of available services for a Copernicus marine product

Author(s)

Pepijn de Vries

Examples

```
copernicus_product_services("GLOBAL_ANALYSISFORECAST_PHY_001_024")
```

`copernicus_wms2geotiff`*Extract and store WMS as a geo-referenced TIFF*

Description

[Experimental] Extract and store imagery from a Copernicus WMS as a geo-referenced TIFF.

Usage

```
copernicus_wms2geotiff(  
  product,  
  layer,  
  variable,  
  region,  
  destination,  
  width,  
  height  
)
```

Arguments

product	An identifier (type character) of the desired Copernicus marine product. Can be obtained with copernicus_products_list .
layer	The name of a desired layer within a product (type character). Can be obtained with copernicus_product_details .
variable	The name of a desired variable in a specific layer of a product (type character). Can be obtained with copernicus_product_details .
region	Specification of the bounding box as a vector of numerics WGS84 lat and lon coordinates. Should be in the order of: xmin, ymin, xmax, ymax.
destination	File name for the geo-referenced TIFF.
width	Width in pixels of the TIFF image.
height	Height in pixels of the TIFF image.

Details

A Web Map Service (WMS) cannot be plotted directly (base, ggplot2 and/or lattice). For that purpose you need to extract and download a specific region in a format that can be handled by plots. You can use this function to store a subset of a WMS map as a geo-referenced TIFF file.

Value

Stores the file as `destination` and returns invisible NULL

Note

WMS functions don't work on systems that don't support GDAL utils

Author(s)

Pepijn de Vries

See Also

Other wms-functions: [addCopernicusWMSTiles\(\)](#), [copernicus_wms_details\(\)](#)

Examples

```
destination <- tempfile("wms", fileext = ".tiff")
copernicus_wms2geotiff(
  product      = "GLOBAL_ANALYSISFORECAST_PHY_001_024",
  layer        = "cmems_mod_glo_phy-thetao_anfc_0.083deg_PID-m",
  variable     = "thetao",
  region       = c(-1, 50, 7, 60),
  destination  = destination,
  width        = 1920,
  height       = 1080
)
```

copernicus_wms_details

Obtain a WMS entry for specific Copernicus marine products

Description

[Experimental] Web Map Services are not available for all products and layers. Use this function to obtain URLs of WMS services if any.

Usage

```
copernicus_wms_details(product, layer, variable)
```

Arguments

product	An identifier (type character) of the desired Copernicus marine product. Can be obtained with copernicus_products_list .
layer	The name of a desired layer within a product (type character). Can be obtained with copernicus_product_details .
variable	The name of a desired variable in a specific layer of a product (type character). Can be obtained with copernicus_product_details .

Value

Returns a tibble with WMS URLs and descriptors for the specified product.

Note

WMS functions don't work on systems that don't support GDAL utils

Author(s)

Pepijn de Vries

See Also

Other wms-functions: [addCopernicusWMSTiles\(\)](#), [copernicus_wms2geotiff\(\)](#)

Examples

```
copernicus_wms_details(  
  product = "GLOBAL_ANALYSISFORECAST_PHY_001_024",  
  layer   = "cmems_mod_glo_phy-thetao_anfc_0.083deg_P1D-m",  
  variable = "thetao"  
)
```

%>%

Objects exported from other packages

Description

Objects imported and exported from other packages. See original documentation for more details.

Details

dplyr pipe operator [%>%](#)

Value

Returns the result of the function call on the right-hand side of the pipe operator. The left-hand side is used as first argument to the call to the right-hand side. For more details see [dplyr::reexports](#).

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