

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 (>= 4.1.0)

Imports aws.s3, cli, dplyr, httr2, leaflet, purrr, rlang, sf, stringr, tibble, tidyr, xml2

Suggests lifecycle, ncmeta, stars, testthat (>= 3.0.0)

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

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

License GPL (>= 3)

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Collate 'CopernicusMarine-package.r' 'cms_catalogue_entry.R'
'cms_cite_product.r' 'cms_download_native.R'
'cms_download_stac.r' 'cms_login.r' 'cms_download_subset.r'
'cms_list_stac_files.r' 'cms_product_details.r'
'cms_product_metadata.r' 'cms_product_services.r'
'cms_products_list.r' 'cms_stac_properties.r' 'generics.r'
'cms_wmts.r' 'import.r'

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cms_cite_product	<i>How to cite a Copernicus marine product</i>
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Description

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

Usage

cms_cite_product(product)

Arguments

product	An identifier (type character) of the desired Copernicus marine product. Can be obtained with cms_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: [cms_product_details\(\)](#), [cms_product_services\(\)](#), [cms_products_list\(\)](#)

Examples

```
cms_cite_product("SST_MED_PHY_SUBSKIN_L4_NRT_010_036")
```

cms_download_native	<i>Download raw files as provided to Copernicus Marine</i>
---------------------	--

Description

[Experimental] Full marine data sets can be downloaded using the functions documented here. Use `cms_list_native_files()` to list available files, and `cms_download_native()` to download specific files. Files are usually organised per product, layer, year, month and day.

Usage

```
cms_download_native(destination, product, layer, pattern, progress = TRUE, ...)
```

```
cms_list_native_files(product, layer, pattern, ...)
```

Arguments

destination	Path where to store the downloaded file(s).
product	An identifier (type character) of the desired Copernicus marine product. Can be obtained with cms_products_list .
layer	The name of a desired layer within a product (type character). Can be obtained with cms_product_details .
pattern	A regular expression (regex) pattern. Only paths that match the pattern will be returned. It can be used to select specific files. For instance if pattern = "2022/06/", only files for the year 2022 and the month June will be listed (assuming that the file path is structured as such, see examples)
progress	A logical value. When TRUE a progress bar is shown.
...	Ignored

Value

Returns NULL invisibly.

Author(s)

Pepijn de Vries

Examples

```

if (interactive()) {
  cms_list_native_files(
    product      = "GLOBAL_ANALYSISFORECAST_PHY_001_024",
    layer        = "cmems_mod_glo_phy_anfc_0.083deg_PT1H-m",
    pattern      = "2022/06/"
  )

  ## Use 'pattern' to download a file for a specific day:
  cms_download_native(
    destination  = tempdir(),
    product      = "GLOBAL_ANALYSISFORECAST_PHY_001_024",
    layer        = "cmems_mod_glo_phy_anfc_0.083deg_PT1H-m",
    pattern      = "m_20220630"
  )
}

```

cms_download_stac	<i>Deprecated</i>
-------------------	-------------------

Description

[Deprecated] Full marine data sets can be downloaded using the SpatioTemporal Asset Catalogs (STAC). The API for interacting with these files is no longer operational. Please use `cms_download_native()` instead.

Usage

```

cms_download_stac(
  file_tibble,
  destination,
  show_progress = TRUE,
  overwrite = FALSE
)

cms_list_stac_files(product, layer)

cms_stac_properties(product, layer)

```

Arguments

file_tibble	Ignored
destination	Ignored
show_progress	Ignored
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.

product	An identifier (type character) of the desired Copernicus marine product. Can be obtained with cms_products_list .
layer	The name of a desired layer within a product (type character). Can be obtained with cms_product_details .

Value

returns NULL, as the API is no longer available

Author(s)

Pepijn de Vries

cms_download_subset	<i>Subset and download a specific marine product from Copernicus</i>
---------------------	--

Description

[Questioning] Subset and download a specific marine product from Copernicus. You need to register an account at <https://data.marine.copernicus.eu> before you can use this function.

Usage

```
cms_download_subset(
  username = cms_get_username(),
  password = cms_get_password(),
  destination,
  product,
  layer,
  variable,
  region,
  timerange,
  verticalrange,
  overwrite = FALSE
)
```

Arguments

username	Your Copernicus marine user name. Can be provided with cms_get_username() (default), or as argument here.
password	Your Copernicus marine password. Can be provided as cms_get_password() (default), 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 cms_products_list .

layer	The name of a desired layer within a product (type character). Can be obtained with cms_product_details .
variable	The name of a desired variable in a specific layer of a product (type character). Can be obtained with cms_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.
timerange	A vector with two elements (lower and upper value) for a requested time range. The vector should be coercible to POSIXct.
verticalrange	A vector with two elements (minimum and maximum) numerical values for the depth of the vertical layers (if any). Note that values below the sea surface needs to be specified as negative values.
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`
cms_download_subset(
  destination = destination,
  product     = "GLOBAL_ANALYSISFORECAST_PHY_001_024",
  layer       = "cmems_mod_glo_phy-cur_anfc_0.083deg_P1D-m",
  variable    = "sea_water_velocity",
  region      = c(-1, 50, 10, 55),
  timerange   = c("2021-01-01 UTC", "2021-01-02 UTC"),
  verticalrange = c(0, -2)
)

mydata <- stars::read_stars(destination)

plot(mydata["vo"])

## End(Not run)
```

cms_get_client_info	<i>Get information about Copernicus Marine clients</i>
---------------------	--

Description

This function retrieves the client information from the Copernicus Marine Service. Among others, it lists where to find the catalogues required by this package

Usage

```
cms_get_client_info(...)
```

Arguments

...	Ignored
-----	---------

Value

In case of success it returns a named list with information about the available Copernicus Marine clients.

Author(s)

Pepijn de Vries

Examples

```
if (interactive()) {  
  cms_get_client_info()  
}
```

cms_get_username	<i>Set or get Copernicus account details</i>
------------------	--

Description

Set or get username and password throughout an R session. This can be used to obscure your account details in an R script and store them as either an R option or system environment variable.

Usage

```
cms_get_username()
```

```
cms_get_password()
```

```
cms_set_username(username, method = c("option", "sysenv"))
```

```
cms_set_password(password, method = c("option", "sysenv"))
```

Arguments

username	Your Copernicus Marine username
method	Either "option" to use R options to store account details. Use "sysenv" to store account details as system environment variable.
password	Your Copernicus Marine password

Value

Returns your account details for the get variant or nothing in case of the set variant.

Author(s)

Pepijn de Vries

Examples

```
if (interactive()) {
  ## Returns your account details only if they have been set for your session
  cms_get_username()
  cms_get_password()
}
```

cms_login

Contact Copernicus Marine login page

Description

[Stable] Contact Copernicus Marine login page and check if login is successful.

Usage

```
cms_login(username = cms_get_username(), password = cms_get_password())
```

Arguments

username	Your Copernicus marine user name. Can be provided with cms_get_username() (default), or as argument here.
password	Your Copernicus marine password. Can be provided as cms_get_password() (default), or as argument here.

Details

This function will return your account details if successful.

Value

Returns a named list with your account details if successful, returns NULL otherwise.

Author(s)

Pepijn de Vries

Examples

```
if (interactive()) {
  cms_login()
}
```

cms_products_list	<i>List products available from data.marine.copernicus.eu</i>
-------------------	---

Description

[Stable] Collect a list of products and some brief descriptions for marine products available from Copernicus. cms_products_list() does not use a formal API, but provides a more detailed list. cms_products_list2() Does use the formal API, but provides less details

Usage

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

cms_products_list2(...)
```

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: [cms_cite_product\(\)](#), [cms_product_details\(\)](#), [cms_product_services\(\)](#)

Examples

```
cms_products_list()

## Query a specific product:
cms_products_list(freeText = "GLOBAL_ANALYSISFORECAST_PHY_001_024")
```

cms_product_details	<i>Obtain details for a specific Copernicus marine product</i>
---------------------	--

Description

[Experimental] Obtain details for a specific Copernicus marine product.

Usage

```
cms_product_details(product, layer, variant, ...)
```

Arguments

product	An identifier (type character) of the desired Copernicus marine product. Can be obtained with cms_products_list .
layer	[Deprecated] Ignored and deprecated
variant	[Deprecated] Ignored and deprecated
...	Ignored

Value

Returns a named list with product details.

Author(s)

Pepijn de Vries

See Also

Other product-functions: [cms_cite_product\(\)](#), [cms_product_services\(\)](#), [cms_products_list\(\)](#)

Examples

```
if (interactive()) {
  cms_product_details("GLOBAL_ANALYSISFORECAST_PHY_001_024")
}
```

`cms_product_metadata` *Obtain product meta data*

Description

[Experimental] Obtain product meta data such as spatio-temporal bounds of the data.

Usage

```
cms_product_metadata(product, type, ...)
```

Arguments

<code>product</code>	An identifier (type character) of the desired Copernicus marine product. Can be obtained with cms_products_list .
<code>type</code>	[Deprecated] Deprecated and ignored.
<code>...</code>	Ignored

Value

Returns a `data.frame`/tibble with the metadata. Each row in the `data.frame` represents a layer available for the product.

Author(s)

Pepijn de Vries

Examples

```
if (interactive()) {  
  cms_product_metadata("GLOBAL_ANALYSISFORECAST_PHY_001_024")  
}
```

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

Description

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

Usage

```
cms_product_services(product, ...)
```

Arguments

product	An identifier (type character) of the desired Copernicus marine product. Can be obtained with cms_products_list .
...	Ignored.

Value

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

Author(s)

Pepijn de Vries

See Also

Other product-functions: [cms_cite_product\(\)](#), [cms_product_details\(\)](#), [cms_products_list\(\)](#)

Examples

```
if (interactive()) {
  cms_product_services("GLOBAL_ANALYSISFORECAST_PHY_001_024")
}
```

cms_wmts_details	<i>Obtain a WMTS entry for specific Copernicus marine products and add to a leaflet map</i>
------------------	---

Description

[Stable] Functions for retrieving Web Map Tile Services information for specific products, layers and variables and add them to a leaflet map.

Usage

```
cms_wmts_details(product, layer, variable)

addCmsWMTSTiles(
  map,
  product,
  layer,
  variable,
  tilematrixset = "EPSG:3857",
  options = leaflet::WMSTileOptions(format = "image/png", transparent = TRUE),
  ...
)

cms_wmts_get_capabilities(product, layer, variable, type = c("list", "xml"))
```

Arguments

product	An identifier (type character) of the desired Copernicus marine product. Can be obtained with <code>cms_products_list</code> .
layer	The name of a desired layer within a product (type character). Can be obtained with <code>cms_product_details</code> .
variable	The name of a desired variable in a specific layer of a product (type character). Can be obtained with <code>cms_product_details</code> .
map	A map widget object created from <code>leaflet::leaflet()</code>
tilematrixset	A character string representing the tilematrixset to be used. In many cases "EPSG:3857" (Pseudo-Mercator) or "EPSG:4326" (World Geodetic System 1984) are available, but should be checked with <code>cms_wmts_details</code> .
options	Passed on to <code>leaflet::addWMSTiles()</code> .
...	Passed on to <code>leaflet::addWMSTiles()</code> .
type	A character string indicating whether the capabilities should be returned as "list" (default) or "xml" (<code>xml2::xml_new_document()</code>).

Value

`cms_wmts_details` returns a tibble with details on the WMTS service. `cms_wmts_getcapabilities` returns either a list or xml_document depending on the value of type. `AddCmsWMTSTiles` returns a leaflet map updated with the requested tiles.

Author(s)

Pepijn de Vries

Examples

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

cms_wmts_get_capabilities("GLOBAL_ANALYSISFORECAST_PHY_001_024")

if (interactive() && nrow(wmts_details) > 0) {
  leaflet::leaflet() |>
    leaflet::setView(lng = 3, lat = 54, zoom = 4) |>
    leaflet::addProviderTiles("Esri.WorldImagery") |>
    addCmsWMTSTiles(
      product = "GLOBAL_ANALYSISFORECAST_PHY_001_024",
      layer   = "cmems_mod_glo_phy-thetao_anfc_0.083deg_P1D-m",
      variable = "thetao"
    )
}
```

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