Package 'CopernicusMarine'

April 5, 2025

Type Package

Title Search Download and Handle Data from Copernicus Marine Service Information

Version 0.2.5

Author Pepijn de Vries [aut, cre, dtc] (<https://orcid.org/0000-0002-7961-6646>)

Maintainer Pepijn de Vries <pepijn.devries@outlook.com>

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 crayon, dplyr, httr2, leaflet, purrr, rlang, sf, stringr, tidyr, utils, 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)

Encoding UTF-8

RoxygenNote 7.2.3

Config/testthat/edition 3

Collate 'CopernicusMarine-package.r' 'cms_cite_product.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' 'cms_wmts.r' 'generics.r' 'import.r'

NeedsCompilation no

Repository CRAN

Date/Publication 2025-04-05 15:10:09 UTC

Contents

`cms_cite_product` *How to cite a Copernicus marine product*

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_metadata()`, `cms_product_services()`, `cms_products_list()`

Examples

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

cms_download_stac *List and get STAC files for a Copernicus marine product*

Description

[Stable] Full marine data sets can be downloaded using the SpatioTemporal Asset Catalogs (STAC). Use these functions to list download locations and get the files.

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	A dplyr::tibble() with in each row the files to be downloaded. Should be created with cms_list_stac_files().
destination	A character string representing the path location where the downloaded files should be stored.
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 the 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

In case of cms_stac_properties a dplyr::tibble() is returned with some product properties, It is used as precursor for cms_list_stac_files. In case of cms_list_stac_files a dplyr::tibble() is returned containing available URLs (for the specified product and layer) and some meta information is returned. In case of cms_download_stac an invisible logical value is returned, indicating whether all requested files are successfully stored at the destination path. A list of responses (of class httr2::response()) for all requested download links is included as attribute to the result.

Author(s)

Pepijn de Vries

Examples

```
## Not run:
## List some STAC properties for a specific product and layer
cms_stac_properties(
  product       = "GLOBAL_ANALYSISFORECAST_PHY_001_024",
  layer         = "cmems_mod_glo_phy-cur_anfc_0.083deg_P1D-m"
)

## Get the available files for a specific product and layer:
file_tibble <-
  cms_list_stac_files("GLOBAL_ANALYSISFORECAST_PHY_001_024",
                      "cmems_mod_glo_phy-cur_anfc_0.083deg_P1D-m")

dest <- tempdir()

## download the first file from the file_tibble to 'dest'
cms_download_stac(file_tibble[1,, drop = FALSE], dest)

## End(Not run)
```

---

cms_download_subset *Subset and download a specific marine product from Copernicus*

Description

[Stable] 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 = getOption("CopernicusMarine_uid", ""),
  password = getOption("CopernicusMarine_pwd", ""),
  destination,
  product,
  layer,
  variable,
  region,
  timerange,
  verticalrange,
  overwrite = FALSE
)
```

Arguments

username	Your Copernicus marine user name. Can be provided as `options(CopernicusMarine_uid = "my_user_name")`, or as argument here.
password	Your Copernicus marine password. Can be provided as `options(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 `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 the 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_login` *Contact Copernicus Marine login page*

Description

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

Usage

```
cms_login(
  username = getOption("CopernicusMarine_uid", ""),
  password = getOption("CopernicusMarine_pwd", "")
)
```

Arguments

`username`	Your Copernicus marine user name. Can be provided as `options(CopernicusMarine_uid = "my_user_name")`, or as argument here.
`password`	Your Copernicus marine password. Can be provided as `options(CopernicusMarine_pwd = "my_password")`, or as argument here.

Details

This function will return a logical value indicating if the login is successful. It can be used to test your account details.

Value

Returns a `logical` value indicating if the login is successful. The response from the login page is returned as an attribute named `response`.

Author(s)

Pepijn de Vries

Examples

```
## Not run:
## This will return FALSE if you have not set your account details with 'options'.
## If you have specified your account details and there are no other problems,
## it will return TRUE.
cms_login()

## End(Not run)
```

`cms_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

```
cms_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: `cms_cite_product()`, `cms_product_details()`, `cms_product_metadata()`, `cms_product_services()`

Examples

```
cms_products_list()

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

`cms_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

```
cms_product_details(
  product,
  layer,
  variable,
  variant = c("", "detailed-v2", "detailed-v3")
)
```

Arguments

`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`.
`variant`	A `character` string indicating the type of details that should be returned. Should be one of `""` (default), `"detailed-v2"`, or `"detailed-v3"`.

Value

Returns a named `list` with properties of the requested product.

Author(s)

Pepijn de Vries

See Also

Other product-functions: `cms_cite_product()`, `cms_product_metadata()`, `cms_product_services()`, `cms_products_list()`

Examples

```
cms_product_details("GLOBAL_ANALYSISFORECAST_PHY_001_024")

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

`cms_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

```
cms_product_metadata(product, type = c("list", "xml"))
```

Arguments

`product`	An identifier (type `character`) of the desired Copernicus marine product. Can be obtained with `cms_products_list`.
`type`	A `character` string indicating how the data should be returned. Should be one of `"list"` or `"xml"`.

Value

Returns a named `list` (when `type = "list"`) with info about the requested `product`. Returns the same info as `xml_document` (see `xml2::xml_new_document()`) when `type = "xml"`. Returns `NULL` when contacting Copernicus fails.

Author(s)

Pepijn de Vries

See Also

Other product-functions: `cms_cite_product()`, `cms_product_details()`, `cms_product_services()`, `cms_products_list()`

Examples

```
cms_product_metadata("GLOBAL_ANALYSISFORECAST_PHY_001_024")
```

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

Description

[Deprecated] 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.

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_product_metadata(), cms_products_list()

Examples

```
cms_product_services("GLOBAL_ANALYSISFORECAST_PHY_001_024")
```

cms_wmts_details *Obtain a WMTS entry for specific Copernicus marine products and add to a leaflet map*

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 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.
map	A map widget object created from leaflet::leaflet()
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 cms_wmts_details.
options	Passed on to leaflet::addWMSTiles().
...	Passed on to leaflet::addWMSTiles().
type	A character string indicating whether the capabilities should be returned as "list" (default) or "xml" (xml2::xml_new_document()).

Value

cms_wmts_details returns a tibble with detains 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")
}
```

Index