

# 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, utils, 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)

**Encoding** UTF-8

**RoxygenNote** 7.2.3

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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") %>%
    addCopernicusWMTiles(
      product = "GLOBAL_ANALYSISFORECAST_PHY_001_024",
      layer   = "cmems_mod_glo_phy-thetao_anfc_0.083deg_P1D-m",
      variable = "thetao")
}
```

---

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 <a href="#">copernicus_products_list</a> .
layer	The name of a desired layer within a product (type character). Can be obtained with <a href="#">copernicus_product_details</a> .
variable	The name of a desired variable in a specific layer of a product (type character). Can be obtained with <a href="#">copernicus_product_details</a> .
output	File type for the output. "netcdf" will work in most cases.
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	<b>[Experimental]</b> A vector with two elements (lower and upper value) for a requested time range. The vector should be coercible to POSIXct.
verticalrange	<b>[Experimental]</b> 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 `option`
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", ""),
  recursive = TRUE,
  subdir = NULL
)

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 <a href="#">copernicus_products_list</a> .
layer	The name of a desired layer within a product (type character). Can be obtained with <a href="#">copernicus_product_details</a> .
username	Your Copernicus marine user name. Can be provided as <code>option(CopernicusMarine_uid = "my_user_name")</code> , or as argument here.

password	Your Copernicus marine password. Can be provided as option(CopernicusMarine_pwd = "my_password"), or as argument here.
recursive	A logical value. When TRUE all nested files will be listed.
subdir	A character string of a subdir which will be appended to the obtained ftp address.
url	The URL of the file to be downloaded. Obtain this URL with <a href="#">copernicus_ftp_list</a> .
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_heattrp")

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\\_meta](#)

**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 <a href="#">copernicus_products_list</a> .
layer	The name of a desired layer within a product (type character). Can be obtained with <a href="#">copernicus_product_details</a> .
variable	The name of a desired variable in a specific layer of a product (type character). Can be obtained with <a href="#">copernicus_product_details</a> .

**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**

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

**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 <a href="#">copernicus_products_list</a> .
layer	The name of a desired layer within a product (type character). Can be obtained with <a href="#">copernicus_product_details</a> .
variable	The name of a desired variable in a specific layer of a product (type character). Can be obtained with <a href="#">copernicus_product_details</a> .
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_P1D-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 <a href="#">copernicus_products_list</a> .
layer	The name of a desired layer within a product (type character). Can be obtained with <a href="#">copernicus_product_details</a> .
variable	The name of a desired variable in a specific layer of a product (type character). Can be obtained with <a href="#">copernicus_product_details</a> .

**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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