PRODUCT USER MANUAL

For the GLOBAL Ocean Sea Physical Analysis and Forecasting Products

GLOBAL_ANALYSIS_FORECAST_PHY_001_024

Issue: 1.8

Contributors: S. Law Chune , L.Nouel, E. Fernandez, Corinne Derval, M.Tressol, R. Dussurget

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CHANGE RECORD

Issue	Date	§	Description of Change	Author	Validated By
1.1	21/09/2016	All	initial version	L.NOUEL	Y Drillet
1.2	19/09/2017	All	Addition of static and monthly datasets – Reformatting to follow new template	E. Fernandez	L. Nouel
1.3	26/04/2018	II.3	Addition of Information on SSH	C. Derval	C. Derval
1.4	18/01/2019		Addition of a new dataset of 3 merged : general circulation, tides & waves	S. Law Chune	C. Derval
1.5	19/11/2019		Addition of new datasets for instantaneous data	M. Tressol	
1.6	01/07/2020	IV	Nomenclature description & FTP download behaviour.	M. Tressol	C. Derval
1.7	03/05/2021		10D forecast for SMOC	C. Derval	C. Derval
1.8	01/10/2021	IV	Correction of standard names for SMOC dataset	S. Law Chune	C. Derval

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GLOSSARY AND ABBREVIATIONS

CF	Climate Forecast (convention for NetCDF)
CMEMS	Copernicus Marine Environment Monitoring Service
DGF	Direct Get File (FTP like CMEMS service tool to download a NetCDF file)
ECMWF	European Centre for Medium Range Weather forecast
FTP	Protocol to download files
GLO	Global
NetCDF	Network Common Data Form
PUM	Product User Manual
QUID	Quality Information Document
Subsetter	CMEMS service tool to download a NetCDF file of a selected geographical box and time range

I INTRODUCTION

This document is the user manual for the CMEMS global analysis and forecast product **GLOBAL_ANALYSIS_FORECAST_PHY_001_024**: it provides with aggregated analyses updated weekly with 10-day forecast (updated daily). An archive of analysis since 26/12/2006 up to real-time is available on the CMEMS server.

It contains 3D potential temperature, salinity and currents information from top to bottom and 2D sea surface level, bottom potential temperature, mixed layer thickness, sea ice thickness, sea ice fraction and sea ice velocities information. This product is global. It is defined on a standard grid at 1/12 degree (approx. 8km) and on 50 standard levels. It is interpolated from the 1/12 degree and 50 vertical levels Arakawa C native grid. All variables are on the same grid points.

GLOBAL_ANALYSIS_FORECAST_PHY_001_024 product is organised in eight datasets:

- **global-analysis-forecast-phy-001-024** which contains the 3D daily mean fields: 3D potential temperature, salinity and currents information from top to bottom and 2D sea surface level, bottom potential temperature, mixed layer thickness, sea ice thickness, sea ice fraction and sea ice velocities information.
- **global-analysis-forecast-phy-001-024-hourly-t-u-v-ssh** which contains the hourly mean surface fields: potential temperature, currents and sea surface level information.
- **global-analysis-forecast-phy-001-024-monthly** which contains the monthly mean fields: 3D potential temperature, salinity and currents information from top to bottom and 2D sea surface level, bottom potential temperature, mixed layer thickness, sea ice thickness, sea ice fraction and sea ice velocities information.
- **global-analysis-forecast-phy-001-024--hourly-merged-uv (S**urface **and M**erged **O**cean **C**urrents **SMOC) which** contains one dataset**: dataset-**hourly-merged-uv, that distributes hourly zonal (u) and meridional (v) surface velocity fields (full temporal resolution) for three physical components, namely the general circulation (uo, vo), tides (utide, vtide) and waves (ustokes, vstokes) on a 1/12° regular grid. The linear addition of the three physical components is also distributed as (utotal, vtotal). This product is a combination between data-assimilated models that describe the ocean circulation, tides and waves, some of them been CMEMS systems like the global high resolution physical system (CMEMS GLOBAL_ANALYSIS_FORECAST_PHY_001_024) or the global high resolution wave model (CMEMS GLOBAL_ANALYSIS_FORECAST_WAV_001_027)
- **global-analysis-forecast-phy-001-024-3dinst-thetao** which contains the instantaneous 3D fields every 6 hour for potential temperature
- **global-analysis-forecast-phy-001-024-3dinst-so** which contains the instantaneous 3D fields every 6 hour for salinity
- **global-analysis-forecast-phy-001-024-3dinst-uovo** which contains the instantaneous 3D fields every 6 hour for currents
- **global-analysis-forecast-phy-001-024-statics** which contains the static fields for the system: coordinates, mean sea surface level, mask and bathymetry.

The product is published on the CMEMS dissemination server after automatic and human quality controls. Product is available on-line and disseminated through the CMEMS Information System. Files downloaded are in NetCDF format and follow CF-1.4 convention.

The analysis and forecasting system is described in the Quality Information Document (QUID) CMEMS_GLO_QUID_001_024 (https://catalogue.marine.copernicus.eu/documents/QUID/CMEMS-GLO-QUID-001-024.pdf).

Information on operational issues on products and services can be found on our **User Notification Service**. If you have any questions, please **contact us**.

II DESCRIPTION OF THE PRODUCT SPECIFICATION

II.1 General Information about product

Product Specification	GLOBAL_ANALYSIS_FORECAST_PHY_001_024		
Geographical coverage	Global		
Delivery mechanisms	Subsetter	DGF	FTP
Horizontal resolution	1/12 ° (equirectangular grid)		
Datasets : global-analysis-forecast-phy-001-024-hourly-t-u-v-ssh global-analysis-forecast-phy-001-024 global-analysis-forecast-phy-001-024-monthly			
Variables	Temperature Salinity Sea surface height Horizontal velocity (eastward and northward components) Sea ice concentration Sea ice velocity (eastward and northward components) Sea ice thickness Sea floor potential temperature Density ocean mixed layer thickness		
	Analysis	**Forecast**	
Update frequency	Weekly	Daily	
Available time series	-2Y - up to real-time	10-days forecast -15D for monthly mean	
Target delivery time	On Thursdays at 12pm (noon) UTC	Daily at 12pm (noon) UTC	
Temporal resolution	- global-analysis-forecast-phy-001-024-hourly-t-u-v-ssh: hourly mean - global-analysis-forecast-phy-001-024: daily mean - global-analysis-forecast-phy-001-024-monthly: monthly mean		
Number of vertical levels	50		

Format	NetCDF CF1.4	
Dataset : cmems_mod_glo_phy_anfc_merged-uv_PT1H-i		
Variables	Zonal and Meridional Velocities for : - Oceanic general circulation : (uo,vo) - Tide currents (utide, vtide) - Current from waves (ustokes, vstokes) - Total current (utotal, vtotal)	
	Analysis	**Forecast**
Update frequency	Daily	Daily
Available time series	2Y - up to real-time	10-days forecast
Target delivery time	Daily at 12pm (noon) UTC	Daily at 12pm (noon) UTC
Temporal resolution	1-hourly instantaneous	1-hourly instantaneous
Number of vertical levels	1	
Dataset : global-analysis-forecast-phy-001-024-3dinst-thetao		
Variables	- Temperature	
	Analysis	**Forecast**
Update frequency	Daily	Daily
Available time series	-2Y - up to real-time	48 hours forecast
Target delivery time	Daily at 12pm (noon) UTC	Daily at 12pm (noon) UTC
Temporal resolution	6-hourly instantaneous	6-hourly instantaneous
Number of vertical levels	50	
Dataset : global-analysis-forecast-phy-001-024-3dinst-so		
Variables	- Salinity	
	Analysis	**Forecast**
Update frequency	Daily	Daily

Available time series	-2Y - up to real-time	48 hours forecast
Target delivery time	Daily at 12pm (noon) UTC	Daily at 12pm (noon) UTC
Temporal resolution	6-hourly instantaneous	6-hourly instantaneous
Number of vertical levels	50	
Dataset : global-analysis-forecast-phy-001-024-3dinst-uovo		
Variables	- Horizontal velocity (eastward and northward components)	
	Analysis	**Forecast**
Update frequency	Daily	Daily
Available time series	-2Y - up to real-time	48 hours forecast
Target delivery time	Daily at 12pm (noon) UTC	Daily at 12pm (noon) UTC
Temporal resolution	6-hourly instantaneous	6-hourly instantaneous
Number of vertical levels	50	

II.2 Details of the datasets

Dataset : global-analysis-forecast-phy-001-024 contains the 3D daily mean fields: 3D potential temperature, salinity and currents information from top to bottom and 2D sea surface level, bottom potential temperature, mixed layer thickness, sea ice thickness, sea ice fraction and sea ice velocities information.
thetao [°C] Potential temperature sea_water_potential_temperature
so [psu] Salinity sea_water_salinity
uo [m/s] Eastward ocean current velocity eastward_sea_water_velocity
vo [m/s] Northward ocean current velocity northward_sea_water_velocity
zos [m] Sea surface height sea_surface_height_above_geoid
mlotst [m] Mixed layer thickness ocean_mixed_layer_thickness_defined_by_sigma_theta
bottomT [°C] Sea floor potential temperature sea_water_potential_temperature_at_sea_floor
siconc [1] Sea ice concentration sea_ice_area_fraction
sithick [m] Sea ice thickness sea_ice_thickness
usi [m/s] Eastward sea ice velocity eastward_sea_ice_velocity
vsi [m/s] Northward sea ice velocity northward_sea_ice_velocity

Dataset global-analysis-forecast-phy-001-024-hourly-t-u-v-ssh contains the hourly mean surface fields: potential temperature, currents and surface sea surface level information.
thetao [°C] Potential temperature sea_water_potential_temperature
uo [m/s] Eastward ocean current velocity eastward_sea_water_velocity
vo [m/s] Northward ocean current velocity northward_sea_water_velocity
zos [m] Sea surface height sea_surface_height_above_geoid
Dataset global-analysis-forecast- phy-001-024-monthly contains the 3D monthly mean fields: 3D potential temperature, salinity and currents information from top to bottom and 2D sea surface level, bottom potential temperature, mixed layer thickness, sea ice thickness, sea ice fraction and sea ice velocities information.
thetao [°C] Potential temperature sea_water_potential_temperature
so [psu] Salinity sea_water_salinity
uo [m/s] Eastward ocean current velocity eastward_sea_water_velocity
vo [m/s] Northward ocean current velocity northward_sea_water_velocity
zos [m] Sea surface height sea_surface_height_above_geoid
mlotst [m] Mixed layer thickness ocean_mixed_layer_thickness_defined_by_sigma_theta
bottomT [°C] Sea floor potential temperature sea_water_potential_temperature_at_sea_floor
siconc [1] Sea ice concentration sea_ice_area_fraction
sithick [m] Sea ice thickness sea_ice_thickness

usi [m/s] Eastward sea ice velocity eastward_sea_ice_velocity
vsi [m/s] Northward sea ice velocity northward_sea_ice_velocity
Dataset : cmems_mod_glo_phy_anfc_merged-uv_PT1H-i (SMOC) contains all the variables.
uo [meter per second] zonal velocity eastward_sea_water_velocity
vo [meter per second] meridional velocity northward_sea_water_velocity;
ustokes [meter per second] zonal velocity eastward_sea_water_velocity
vstokes [meter per second] meridional velocity northward_sea_water_velocity;
utide [meter per second] zonal velocity surface_sea_water_x_velocity_due_to_tide
vtide [meter per second] meridional velocity surface_sea_water_y_velocity_due_to_tide;
utotal [meter per second] zonal velocity surface_sea_water_x_velocity;
vtotal [meter per second] meridional velocity surface_sea_water_y_velocity;
Dataset: global-analysis-forecast-phy-001-024-3dinst-thetao contains the 6h instantaneous fields: potential temperature information.
thetao [°C] Potential temperature sea_water_potential_temperature
Dataset: global-analysis-forecast-phy-001-024-3dinst-thetao contains the 6h instantaneous fields: salinity information.
so [psu] Salinity sea_water_salinity
Dataset: global-analysis-forecast-phy-001-024-3dinst-uovo contains the 6h instantaneous fields: currents information.
uo [m/s] zonal velocity

eastward_sea_water_velocity
vo [m/s] Northward ocean current velocity northward_sea_water_velocity
Dataset: global-analysis-forecast-phy-001-024-statics contains the static fields for the system: coordinates, mean sea surface level, mask and bathymetry.
e1t [m] Cell dimension along X axis
e2t [m] Cell dimension along Y axis
e3t [m/s] Cell dimension along Z axis cell_thickness
mask [1] Land-sea mask: 1 = sea ; 0 = land sea_binary_mask
deptho [m] Bathymetry sea_floor_depth_below_geoid
deptho_lev [1] Model level number at sea floor model_level_number_at_sea_floor
mdt [m] Mean dynamic topography sea_surface_height_above_geoid

II.3 Details on some parameters

mlotst [m]	ocean_mixed_layer_thickness_defined_by_sigma_theta. It is the depth where the density increase compared to density at 10 m depth corresponds to a temperature decrease of 0.2°C in local surface conditions (θ10m, S10m, P0= 0 db, surface pressure)
zos [m]	sea_surface_height_above_geoid. The geoid is a surface of constant geopotential with which mean sea level would coincide if the ocean were at rest. The parameter “zos” is the difference between the actual sea surface height at any given time and place, and that which it would have if the ocean were at rest.

- The altimeter measures **the SSH referenced to the ellipsoid of reference** (Earth + Ocean contributions) = Geoid + ADT
- The NEMO Ocean General Circulation Model represents **the SSH referenced to the geoid** (Ocean only contribution) = ADT

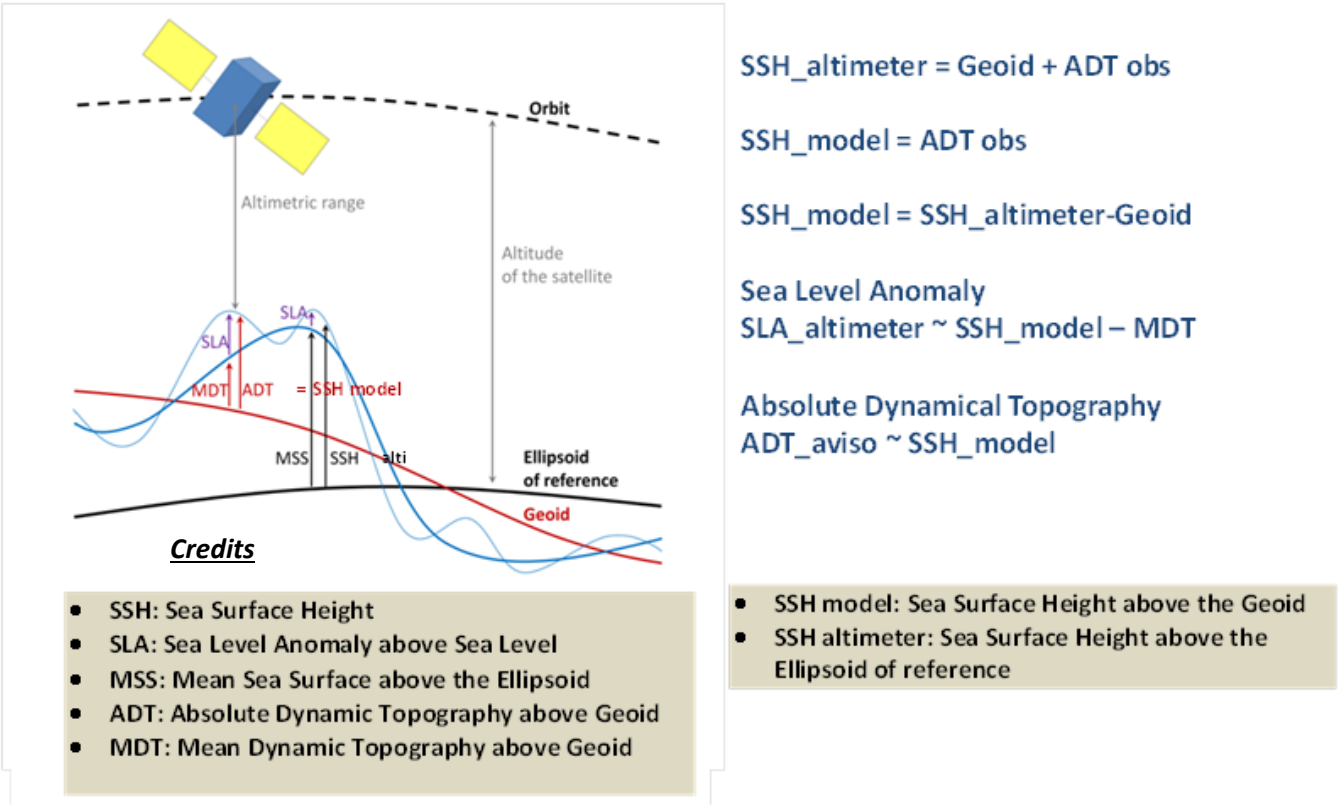
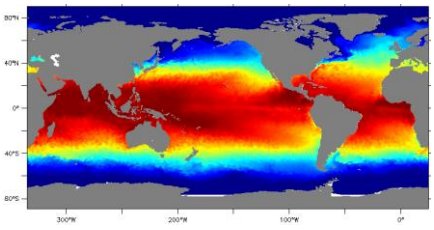


Figure 1 Altimetry principle https://resources.marine.copernicus.eu/documents/PUM/CMEMS-SL-PUM-008-063.pdf

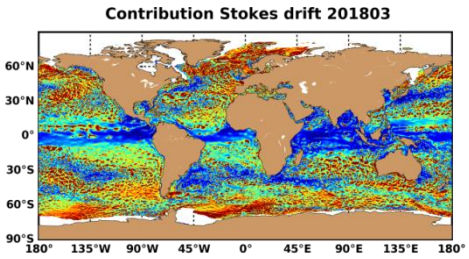
II.4 Product System Description

The Operational Mercator global ocean analysis and forecast system at 1/12 degree is providing 10 days of 3D global ocean forecasts updated daily. The time series starts on December 26, 2006 until real time. This product includes daily and monthly mean files of temperature, salinity, currents, sea level, mixed layer depth and ice parameters from the top to the bottom over the global ocean. It also includes hourly mean surface fields for sea level height, temperature and currents.

Domain Resolution and grid Geographic coverage	GLOBAL (180°W-180°E ; 89°S – 90°N) 1/12º ; regular grid ; 4320 x 2041 This product is global with dedicated projection and spatial resolution. It is defined on a standard collocated grid at 1/12 degree (approx. 8 km). The parameters are interpolated from the native grid model, the 1/12 degree and 50 vertical levels Arakawa C native grid. 
Model Version	NEMO 3.1
Atmospheric forcings	3-hourly from ECMWF
Assimilation scheme	SAM2 (SEEK Kernel)
Assimilated observations	CMEMS OSTIA SST + CMEMS Sea Ice Concentration + CMEMS SLA + in situ profile from CMEMS database + MDT adjusted based on CNES-CLS13, Rio et al., 2014 + WOA 2013 climatology (temperature and salinity) below 2000 m (assimilation using a non-Gaussian error at depth)
Initial conditions	Levitus (2009 T and S) for the ocean Ifremer/Cersat data for ice concentration and GLORYS2V1 for ice thickness
Bathymetry	ETOPO1 for the deep ocean and GEBCO8 close to the cost and slope

SMOC (**S**urface and **M**erged **O**cean **C**urrents) is a composite surface current product that combines information from the CMEMS modeling systems to approach a practical velocity at sea surface. In SMOC, the total current is obtained from the simple addition of contributions from the oceanic general circulation, tides and waves. Indeed, published studies have demonstrated the importance of wave-induced (e.g. Stokes drift) currents contribution for particle advection (Monismith and Fong 2004; Constantin 2006), as well as the role of the tide in the exchange between the coast and the open sea in addition to the local oceanic circulation (Rynne et al. 2016). SMOC product covers the global domain, with

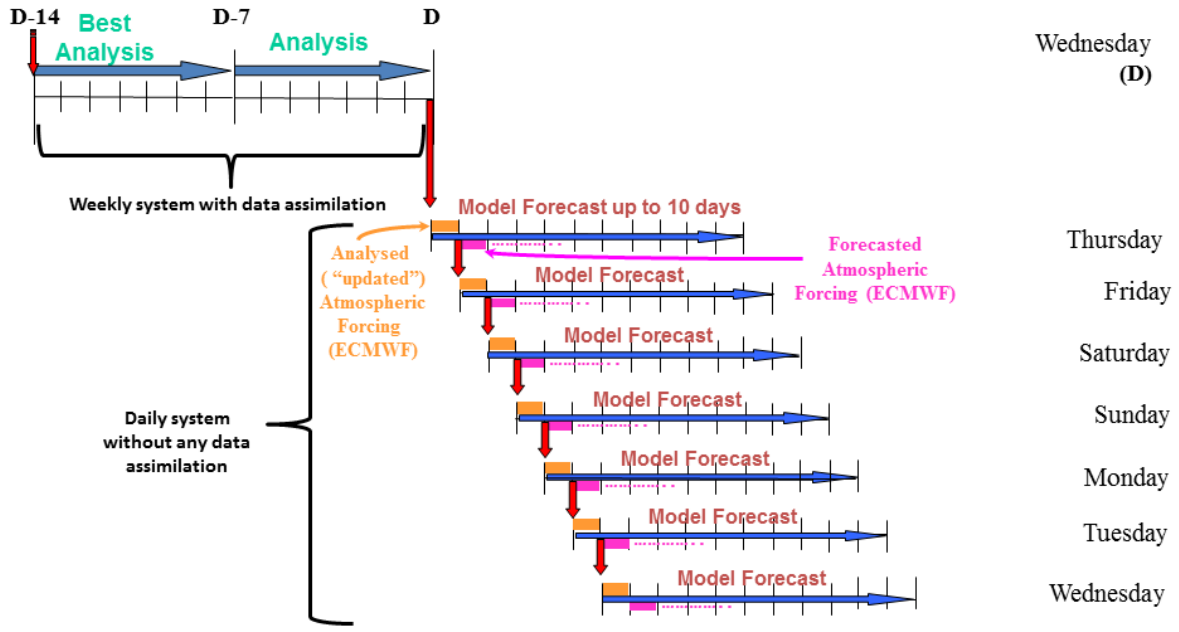
a horizontal resolution of 1/12° and an hourly frequency output. Three independent systems are used to compute SMOC products which are the CMEMS global high resolution (1/12°) real time forecasting system (Lellouche et al. 2018), the CMEMS global waves (1/10°) forecasting system (Lefèvre et al. 2009) and the FES tidal model (Carrere et al. 2015). SMOC data are computed daily, with one day of hindcast for the previous day, and five days of forecast ahead from the date of production. All horizontal components and their sum are delivered, so that the user can select and focus on each component individually.

Domain	GLOBAL (180°W-180°E ; 90°S – 90°N)
Resolution and grid	1/12º ; regular grid ; 4320 x 2041
Geographic coverage	This product is dedicated global with and spatial projection It is defined resolution. standard on a grid at 1/12 collocated (approx. 8 degree wave km). The parameters are interpolated from the native grid model, which is irregular with increasing distance in the latitudinal direction close to the poles. 
General circulation surface current	CMEMS GLOBAL_ANALYSIS_FORECAST_PHY_001_024
Wave-related surface current	CMEMS GLOBAL_ANALYSIS_FORECAST_WAV_001_027
Tide current	FES2014 tide model

II.5 Processing information

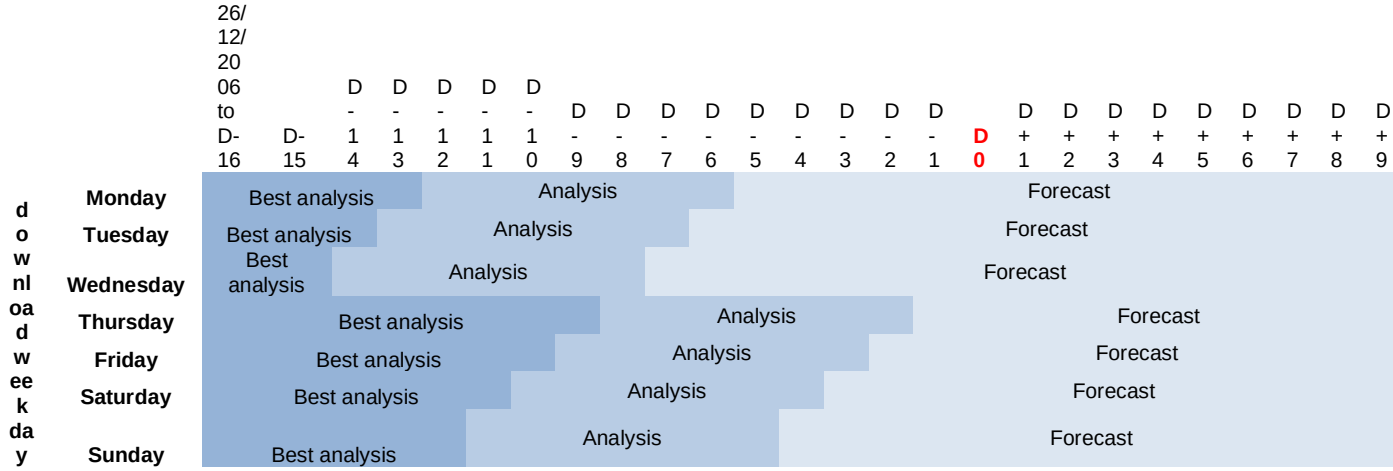
II.5.1 Update Time

The product is updated as follows:



Everyday, the daily configuration is run with updated atmospheric forcings, without assimilation, for days D-1 to D+9. The daily runs are initialized with the previous day's run, except on Thursdays, when they start from the weekly analysis run. Every week, on Wednesdays, the weekly configuration is run with assimilation for days D-14 to D-1. This run is separated in two parts: a best analysis for days D-14 to D-8 and an analysis for days D-7 to D-1

Every day, the time series is updated with new forecasts for days D-1 to D+9, erasing the previously available data for D-1 to D+8. In addition, on Thursdays, the analysis is also provided, replacing previously available files for days D-14 to D-1. So depending on the download weekday, one will have a time series from different runs with or without assimilation. The following table explains what time series to expect depending on when one downloads data.



For example, on Friday 15th September 2017, if one downloads data for a month, from 20th August to 20th September, the time series obtained will be as follows:

- 20th August to 5th September (D-10) will be from the best analysis

- 6th September (D-9) to 12th September (D-3) will be from the analysis

- 13th September (D-2) will be from the forecast run on Thursday 14th September

- 14th September (D-1) to 20th September (D+5) will be from the latest forecast, run on Friday 15th September

The product is updated daily at 1200 UTC for the daily and hourly datasets.

The monthly dataset is updated monthly on the 20th (addition of the monthly mean of the previous month).

The operational production of the SMOC dataset is closely linked to the availability of the CMEMS product GLOBAL_ANALYSIS_FORECAST_WAV_001_027.

SMOC is updated daily with:

- analysis from the production day for D-24h to D
- forecast for D to D+10

The product is updated daily before 1200 UTC.

The **instantaneous production** is updated daily with date D-18h to D+48h before 1200UTC

II.5.2 Time coverage

An archive of analysis since 26/12/2006 up to real-time is available.

An archive of analysis (SMOC) since 1st April 2016 up to real-time is available

II.5.3 Time averaging

For the **monthly dataset**, the fields are monthly means over the calendar month (first to last day of the month). For the **daily dataset**, the fields are daily means over a day (midnight to midnight, centered at noon). For the **hourly dataset**, the fields are hourly means (centered every half-hour). For **SMOC dataset**, the fields are 1-hourly instantaneous.

For **instantaneous dataset**, fields give information every 6-hour.

III DOWNLOAD A PRODUCT

After registration, you will be able to download our data. To assist you, our HelpCenter is available, and more specifically its section about download.

Information on operational issues on products and services can be found on our User Notification Service. If you have any questions, please contact us.

IV FILES NOMENCLATURE AND FORMAT

IV.1 Nomenclature of files when downloaded through the Subsetter Service

Product files nomenclature when downloaded through the CMEMS Web Portal Subsetter is based on product dataset name and a numerical reference related to the request date on the portal.

The scheme is: datasetname_nnnnnnnnnnnn.nc

where:

- datasetname: as described previously
- nnnnnnnnnnnn: 13-digit integer corresponding to the current time (download time) in milliseconds since January 1, 1970 midnight UTC.
- .nc: standard NetCDF filename extension.

Example: global-analysis-forecast-phy-001-024_1303461772348.nc

For SMOC cmems_mod_glo_phy_anfc_merged-uv_PT1H-i _1303461772348.nc

For instantaneous global-analysis-forecast-phy-001-024-3Dinst-uovo_1303461772348.nc

IV.2 Nomenclature of files when downloaded through the FTP Service

Product files nomenclature when downloaded through the CMEMS Web Portal File Transfer Protocol (FTP) is based on product dataset name. See table and follows naming conventions defined in section IV.4 for nomenclature of files downloaded through this interface.

FTP subdirectory organization is YYYY/MM for daily datasets. The reference date for sorting files is the field date for daily dataset.

Example : mercatorpsy4v3r1_gl12_mean_20200630_20200701.nc will be in FTP subdirectory “/2020/06”.

For monthly dataset, there is only one date in nomenclature which is field date. We use it to sort the date in corresponding year directory.

Example : mercatorpsy4v3r1_gl12_mean_202006.nc will be in FTP subdirectory ”/ 2020”.

IV.3 File Format: format name

The products are stored using the NetCDF format.

NetCDF (network Common Data Form) is an interface for array-oriented data access and a library that provides an implementation of the interface. The NetCDF library also defines a machine-independent format for representing scientific data. Together, the interface, library, and format support the creation, access, and sharing of scientific data. The NetCDF software was developed at the Unidata Program Center

in Boulder, Colorado. The NetCDF libraries define a machine-independent format for representing scientific data.

Please see Unidata NetCDF pages for more information, and to retrieve NetCDF software package.

NetCDF data is:

* Self-Describing. A netCDF file includes information about the data it contains.

* Architecture-independent. A NetCDF file is represented in a form that can be accessed by computers with different ways of storing integers, characters, and floating-point numbers.

* Direct-access. A small subset of a large dataset may be accessed efficiently, without first reading through all the preceding data.

* Appendable. Data can be appended to a NetCDF dataset along one dimension without copying the dataset or redefining its structure. The structure of a NetCDF dataset can be changed, though this sometimes causes the dataset to be copied.

* Sharable. One writer and multiple readers may simultaneously access the same NetCDF file.

IV.4 File size

DATASET NAME	NAME OF FILE	DIMENSION [GB]
global-analysis-forecast-phy-001-024	mercatorpsy4v3r1_gl12_mean_${date1}_R${date2}.nc	3.4
global-analysis-forecast-phy-001-024-hourly-t-u-v-ssh	mercatorpsy4v3r1_gl12_hrly_${date1}_R${date2}.nc	1.6
global-analysis-forecast-phy-001-024-monthly	mercatorpsy4v3r1_gl12_mean_${YYYYMM}.nc	3.4
cmems_mod_glo_phy_anfc_merged-uv_PT1H-i	SMOC_${date1}_R${date2}.nc	0.826
global-analysis-forecast-phy-001-024-3dinst-thetao	mercatorpsy4v3r1_gl12_thetao_${date1}_${HH}h_R${date2}.nc	0.303
global-analysis-forecast-phy-001-024-3dinst-so	mercatorpsy4v3r1_gl12_so_${date1}_${HH}h_R${date2}.nc	0.210
global-analysis-	mercatorpsy4v3r1_gl12_uovo_${date1}_${HH}h_	0.539

forecast-phy-001-024-3dinst-uovo	R${date2}.nc	
global-analysis-forecast-phy-001-024-statics	GLO-MFC_001_024_${field}.nc	2.3

Where :

- ${date1} is the date : format YYYYMMDD,
- ${date2} is the run (bulletin) date : format (YYYYMMDD),
- ${YYYYMM} is the date field for monthly mean file,
- ${HH} is the hour field for instantaneous file,

- ${field} : coordinates (longitude, latitude, depth), mdt (mean dynamical topography) or mask_bathy (ocean/land mask).

IV.5 Remember: scale_factor & add_offset / missing_value / land mask

Real_Value = (Display_Value X scale_factor) + add_offset

The missing value for this product is: -32767s

Land mask are equal to "_FillValue" (see variable attribute on NetCDF file).

IV.6 Reading Software

NetCDF data can be browsed and used through a number of software, like:

- ✔ ncBrowse: http://www.epic.noaa.gov/java/ncBrowse/,
- ✔ NetCDF Operator (NCO): http://nco.sourceforge.net/
- ✔ IDL, Matlab, GMT…

Useful information on UNIDATA: http://www.unidata.ucar.edu/software/netcdf/

IV.7 Structure and semantic of netCDF maps files

netcdf global-analysis-forecast-phy-001-024_1553161585093 {

dimensions:

time = 1 ;

latitude = 2041 ;

longitude = 4320 ;

depth = 1 ;

variables:

short mlotst(time, latitude, longitude) ;

mlotst:long_name = "Density ocean mixed layer thickness" ;

mlotst:standard_name = "ocean_mixed_layer_thickness_defined_by_sigma_theta" ;

mlotst:units = "m" ;

mlotst:unit_long = "Meters" ;

mlotst:add_offset = -0.152592554688454 ;

mlotst:scale_factor = 0.152592554688454 ;

mlotst:_FillValue = -32767s ;

mlotst:cell_methods = "area: mean" ;

short siconc(time, latitude, longitude) ;

siconc:long_name = "Ice concentration" ;

siconc:standard_name = "sea_ice_area_fraction" ;

siconc:units = "1" ;

siconc:unit_long = "Fraction" ;

siconc:add_offset = -3.81481368094683e-05 ;

siconc:scale_factor = 3.81481368094683e-05 ;

siconc:_FillValue = -32767s ;

siconc:cell_methods = "area: mean where sea_ice" ;

float latitude(latitude) ;

latitude:valid_min = -80.f ;

latitude:valid_max = 90.f ;

latitude:step = 0.08333588f ;

latitude:units = "degrees_north" ;

latitude:unit_long = "Degrees North" ;

latitude:long_name = "Latitude" ;

latitude:standard_name = "latitude" ;

latitude:axis = "Y" ;

latitude:_CoordinateAxisType = "Lat" ;

short thetao(time, depth, latitude, longitude) ;

thetao:long_name = "Temperature" ;

thetao:standard_name = "sea_water_potential_temperature" ;

thetao:units = "degrees_C" ;

thetao:unit_long = "Degrees Celsius" ;

thetao:_FillValue = -32767s ;

thetao:add_offset = 21. ;

thetao:scale_factor = 0.000732444226741791 ;

thetao:cell_methods = "area: mean" ;

short usi(time, latitude, longitude) ;

usi:long_name = "Sea ice eastward velocity" ;

usi:standard_name = "eastward_sea_ice_velocity" ;

usi:units = "m s-1" ;

usi:unit_long = "Meters per second" ;

usi:add_offset = 0. ;

usi:scale_factor = 3.05185094475746e-05 ;

usi:_FillValue = -32767s ;

usi:cell_methods = "area: mean where sea_ice" ;

short sithick(time, latitude, longitude) ;

sithick:long_name = "Sea ice thickness" ;

sithick:standard_name = "sea_ice_thickness" ;

sithick:units = "m" ;

sithick:unit_long = "Meters" ;

sithick:add_offset = -0.000762962736189365 ;

sithick:scale_factor = 0.000762962736189365 ;

sithick:_FillValue = -32767s ;

sithick:cell_methods = "area: mean where sea_ice" ;

short bottomT(time, latitude, longitude) ;

bottomT:long_name = "Sea floor potential temperature" ;

bottomT:standard_name = "sea_water_potential_temperature_at_sea_floor" ;

bottomT:units = "degrees_C" ;

bottomT:unit_long = "Degrees Celsius" ;

bottomT:_FillValue = -32767s ;

bottomT:add_offset = 21. ;

bottomT:scale_factor = 0.000732444226741791 ;

bottomT:cell_methods = "area: mean" ;

short vsi(time, latitude, longitude) ;

vsi:long_name = "Sea ice northward velocity" ;

vsi:standard_name = "northward_sea_ice_velocity" ;

vsi:units = "m s-1" ;

vsi:unit_long = "Meters per second" ;

vsi:add_offset = 0. ;

vsi:scale_factor = 3.05185094475746e-05 ;

vsi:_FillValue = -32767s ;

vsi:cell_methods = "area: mean where sea_ice" ;

float depth(depth) ;

depth:valid_min = 0.494025f ;

depth:valid_max = 0.494025f ;

depth:units = "m" ;

depth:positive = "down" ;

depth:unit_long = "Meters" ;

depth:long_name = "Depth" ;

depth:standard_name = "depth" ;

depth:axis = "Z" ;

depth:_CoordinateAxisType = "Height" ;

depth:_CoordinateZisPositive = "down" ;

short vo(time, depth, latitude, longitude) ;

vo:long_name = "Northward velocity" ;

vo:standard_name = "northward_sea_water_velocity" ;

vo:units = "m s-1" ;

vo:unit_long = "Meters per second" ;

vo:_FillValue = -32767s ;

vo:add_offset = 0. ;

vo:scale_factor = 0.000610370188951492 ;

vo:cell_methods = "area: mean" ;

short uo(time, depth, latitude, longitude) ;

uo:long_name = "Eastward velocity" ;

uo:standard_name = "eastward_sea_water_velocity" ;

uo:units = "m s-1" ;

uo:unit_long = "Meters per second" ;

uo:_FillValue = -32767s ;

uo:add_offset = 0. ;

uo:scale_factor = 0.000610370188951492 ;

uo:cell_methods = "area: mean" ;

float time(time) ;

time:long_name = "Time (hours since 1950-01-01)" ;

time:standard_name = "time" ;

time:calendar = "gregorian" ;

time:units = "hours since 1950-01-01 00:00:00" ;

time:axis = "T" ;

time:_CoordinateAxisType = "Time" ;

time:valid_min = 606972.f ;

time:valid_max = 606972.f ;

short so(time, depth, latitude, longitude) ;

so:long_name = "Salinity" ;

so:standard_name = "sea_water_salinity" ;

so:units = "1e-3" ;

so:unit_long = "Practical Salinity Unit" ;

so:_FillValue = -32767s ;

so:add_offset = -0.00152592547237873 ;

so:scale_factor = 0.00152592547237873 ;

so:cell_methods = "area: mean" ;

float longitude(longitude) ;

longitude:valid_min = -180.f ;

longitude:valid_max = 179.9167f ;

longitude:step = 0.08332825f ;

longitude:units = "degrees_east" ;

longitude:unit_long = "Degrees East" ;

longitude:long_name = "Longitude" ;

longitude:standard_name = "longitude" ;

longitude:axis = "X" ;

longitude:_CoordinateAxisType = "Lon" ;

short zos(time, latitude, longitude) ;

zos:long_name = "Sea surface height" ;

zos:standard_name = "sea_surface_height_above_geoid" ;

zos:units = "m" ;

zos:unit_long = "Meters" ;

zos:add_offset = 0. ;

zos:scale_factor = 0.000305185094475746 ;

zos:_FillValue = -32767s ;

zos:cell_methods = "area: mean" ;

// global attributes:

:title = "daily mean fields from Global Ocean Physics Analysis and Forecast updated Daily"
;

:easting = "longitude" ;

:northing = "latitude" ;

:history = "2019/03/21 01:34:33 MERCATOR OCEAN Netcdf creation" ;

:source = "MERCATOR PSY4QV3R1" ;

:institution = "MERCATOR OCEAN" ;

:references = "http://www.mercator-ocean.fr" ;

:comment = "CMEMS product" ;

:Conventions = "CF-1.4" ;

:domain_name = "GL12" ;

:FROM_ORIGINAL_FILE__field_type = "mean" ;

:field_date = "2019-03-30 00:00:00" ;

:field_julian_date = 25290.f ;

:julian_day_unit = "days since 1950-01-01 00:00:00" ;

:forecast_range = "9-day_forecast" ;

:forecast_type = "forecast" ;

:bulletin_date = "2019-03-21 00:00:00" ;

:bulletin_type = "operational" ;

:FROM_ORIGINAL_FILE__longitude_min = -180.f ;

:FROM_ORIGINAL_FILE__longitude_max = 179.9167f ;

:FROM_ORIGINAL_FILE__latitude_min = -80.f ;

:FROM_ORIGINAL_FILE__latitude_max = 90.f ;

:z_min = 0.494025f ;

:z_max = 5727.917f ;

:_CoordSysBuilder = "ucar.nc2.dataset.conv.CF1Convention" ;

For dataset cmems_mod_glo_phy_anfc_merged-uv_PT1H-i_YYYYMMT0000Z_PYYYYMMDDThhmmZ.nc

dimensions:

longitude = 4320 ;

latitude = 2041 ;

depth = 1 ;

time = UNLIMITED ; // (24 currently)

variables:

float longitude(longitude) ;

longitude:valid_min = -180.f ;

longitude:valid_max = 179.9167f ;

longitude:long_name = "longitude coordinate" ;

longitude:standard_name = "longitude" ;

longitude:units = "degrees_east" ;

longitude:step = 0.08332825 ;

float latitude(latitude) ;

latitude:valid_min = -80.f ;

latitude:valid_max = 90.f ;

latitude:long_name = "latitude coordinate" ;

latitude:standard_name = "latitude" ;

latitude:units = "degrees_north" ;

latitude:step = 0.08332825 ;

float depth(depth) ;
depth:valid_min = 0.494025f ;
depth:valid_max = 0.494025f ;
depth:long_name = "Depth" ;
depth:standard_name = "depth" ;
depth:units = "m" ;
depth:positive = "down" ;
float time(time) ;
time:units = "hours since 1950-01-01 0:0:0" ;
time:calendar = "standard" ;
time:long_name = "time" ;
time:standard_name = "time" ;
time:step = 1L ;
float uo(time, depth, latitude, longitude) ;
uo:_FillValue = 1.e+20f ;
uo:least_significant_digit = 3L ;
uo:long_name = "Eastward Eulerian velocity (Navier-Stokes current)" ;
uo:standard_name = "eastward_sea_water_velocity" ;
uo:units = "m s-1" ;
float vo(time, depth, latitude, longitude) ;
vo:_FillValue = 1.e+20f ;
vo:least_significant_digit = 3L ;
vo:long_name = "Northward Eulerian velocity (Navier-Stokes current)" ;
vo:standard_name = "northward_sea_water_velocity" ;
vo:units = "m s-1" ;
float vsdx(time, depth, latitude, longitude) ;
vsdx:_FillValue = 1.e+20f ;
vsdx:least_significant_digit = 3L ;
vsdx:long_name = "Eastward wave-induced velocity (Stokes drift)" ;
vsdx:standard_name = "sea_surface_wave_stokes_drift_x_velocity" ;
vsdx:units = "m s-1" ;
float vsdy(time, depth, latitude, longitude) ;
vsdy:_FillValue = 1.e+20f ;

vsdy:least_significant_digit = 3L ;

vsdy:long_name = "Northward wave-induced velocity (Stokes drift)" ;

vsdy:standard_name = "sea_surface_wave_stokes_drift_y_velocity" ;

vsdy:units = "m s-1" ;

float utide(time, depth, latitude, longitude) ;

utide:_FillValue = 1.e+20f ;

utide:least_significant_digit = 3L ;

utide:long_name = "Eastward tide-induced velocity (Tide current)" ;

utide:standard_name = " surface_sea_water_x_velocity_due_to_tide" ;

utide:units = "m s-1" ;

float vtide(time, depth, latitude, longitude) ;

vtide:_FillValue = 1.e+20f ;

vtide:least_significant_digit = 3L ;

vtide:long_name = "Northward tide-induced velocity (Tide current)" ;

vtide:standard_name = " surface_sea_water_y_velocity_due_to_tide" ;

vtide:units = "m s-1" ;

float utotal(time, depth, latitude, longitude) ;

utotal:_FillValue = 1.e+20f ;

utotal:least_significant_digit = 3L ;

utotal:long_name = "Eastward total velocity (Eulerian + Waves + Tide)" ;

utotal:standard_name = " surface_sea_water_x_velocity" ;

utotal:units = "m s-1" ;

float vtotal(time, depth, latitude, longitude) ;

vtotal:_FillValue = 1.e+20f ;

vtotal:least_significant_digit = 3L ;

vtotal:long_name = "Northward total velocity (Eulerian + Waves + Tide) " ;

vtotal:standard_name = " surface_sea_water_y_velocity" ;

vtotal:units = "m s-1" ;

// global attributes:

:_NCProperties = "version=1|netcdflibversion=4.5.0|hdf5libversion=1.8.18" ;

:product = "GLOBAL_ANALYSIS_FORECAST_PHY_001_024" ;

:producer = "CMEMS - Global Monitoring and Forecasting Centre" ;

:title = "hourly mean merged surface currents from oceanic circulation, tides and waves" ;

:area = "GLOBAL" ;

:quality_information_document = "http://marine.copernicus.eu/documents/QUID/CMEMS-GLO-QUID-001-024.pdf" ;

:Conventions = "CF-1.6" ;

:credit = "E.U. Copernicus Marine Service Information (CMEMS)" ;

:contact = "servicedesk.cmems@mercator-ocean.eu" ;

:references = "http://marine.copernicus.eu" ;

:source = "MERCATOR PSY4QV3R1, mfwamglo, FES2014" ;

:licence = "http://marine.copernicus.eu/services-portfolio/service-commitments-and-licence/" ;

:dataset = " **cmems_mod_glo_phy_anfc_merged-uv_PT1H-i** " ;

:product_user_manual = "http://marine.copernicus.eu/documents/PUM/CMEMS-GLO-PUM-001-024.pdf" ;

:institution = "MERCATOR OCEAN" ;

:julian_day_unit = "hours since 1950-01-01 00:00:00" ;

:latitude_min = -80L ;

:latitude_max = 90. ;

:longitude_min = -180. ;

:longitude_max = 179.91667175293 ;

For dataset global-analysis-forecast-phy-001-024-3dinst-so

dimensions:

longitude = 4320 ;

latitude = 2041 ;

depth = 50 ;

time = UNLIMITED ; // (1 currently)

variables:

float longitude(longitude) ;

longitude:valid_min = -180.f ;

longitude:valid_max = 179.9167f ;

longitude:step = 0.08332825f ;

longitude:units = "degrees_east" ;

longitude:unit_long = "Degrees East" ;

longitude:long_name = "Longitude" ;

longitude:standard_name = "longitude" ;

longitude:axis = "X" ;

float latitude(latitude) ;

latitude:valid_min = -80.f ;

latitude:valid_max = 90.f ;

latitude:step = 0.08333588f ;

latitude:units = "degrees_north" ;

latitude:unit_long = "Degrees North" ;

latitude:long_name = "Latitude" ;

latitude:standard_name = "latitude" ;

latitude:axis = "Y" ;

float depth(depth) ;

depth:valid_min = 0.494025f ;

depth:valid_max = 5727.917f ;

depth:units = "m" ;

depth:positive = "down" ;

depth:unit_long = "Meters" ;

depth:long_name = "Depth" ;

depth:standard_name = "depth" ;

depth:axis = "Z" ;

float time(time) ;

time:long_name = "Time (hours since 1950-01-01)" ;

time:standard_name = "time" ;

time:calendar = "gregorian" ;

time:units = "hours since 1950-01-01 00:00:00" ;

time:axis = "T" ;

short thetao(time, depth, latitude, longitude) ;

thetao:long_name = "Temperature" ;

thetao:standard_name = "sea_water_potential_temperature" ;

thetao:units = "degrees_C" ;

thetao:unit_long = "Degrees Celsius" ;

thetao:_FillValue = -32767s ;

thetao:add_offset = 21. ;

thetao:scale_factor = 0.000732444226741791 ;

thetao:cell_methods = "area: mean" ;

thetao:valid_min = -32766s ;

thetao:valid_max = 25940s ;

// global attributes:

:title = "Instantaneous fields for product GLOBAL_ANALYSIS_FORECAST_PHY_001_024" ;

:references = "http://marine.copernicus.eu" ;

:credit = "E.U. Copernicus Marine Service Information (CMEMS)" ;

:licence = "http://marine.copernicus.eu/services-portfolio/service-commitments-and-licence/" ;

:contact = "servicedesk.cmems@mercator-ocean.eu" ;

:producer = "CMEMS - Global Monitoring and Forecasting Centre" ;

:institution = "Mercator Ocean" ;

:Conventions = "CF-1.6" ;

:area = "GLOBAL" ;

:product = "GLOBAL_ANALYSIS_FORECAST_PHY_001_024" ;

:dataset = "global-analysis-forecast-phy-001-024-3dinst-thetao" ;

:source = "MERCATOR PSY4QV3R1" ;

:product_user_manual = "http://marine.copernicus.eu/documents/PUM/CMEMS-GLO-PUM-001-024.pdf" ;

:quality_information_document = "http://marine.copernicus.eu/documents/QUID/CMEMS-GLO-QUID-001-024.pdf" ;