



PRODUCT USER MANUAL

For Black Sea Physical Reanalysis Product BLKSEA_MULTIYEAR_PHY_007_004

Issue: 3.2

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1.1	02.10.16		Update version after PIT v1.2 acceptance: Correction in §IV.3	S. Ciliberti, S. Creti'	
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3.0	10.09.20	all	New template. New product nomenclature including new datasets	R. Lecci, S. Ciliberti, L. Lima	C. Derval
3.1	15.01.21	all	Addition of interim datasets and processing chain	R. Lecci, S. Ciliberti	C. Derval
3.2	29.11.22	all	Additional dataset	R. Lecci, L. Lima, L. Stefanizzi	Copernicus Marine Product management

GLOSSARY AND ABBREVIATIONS

BS	Black Sea
CF	Climate Forecast (convention for NetCDF)
CMEMS	Copernicus Marine Environment Monitoring Service
CTD	Conductivity Temperature Depth
ECMWF	European Centre for Medium-Range Weather Forecasts
EOF	Empirical Orthogonal Function
FAQ	Frequently Asked Question
FTP	File Transfer Protocol
MDT	Mean Dynamic Topography
Meridional Velocity	West to East component of the horizontal velocity vector
MFC	Monitoring and Forecasting Centre
NEMO	Nucleus for European Modelling of the Ocean
NetCDF	Network Common Data Form
NOAA	National Oceanic and Atmospheric Administration
OA	Objective Analyses
OCEANVAR	Oceanographic variational data assimilation scheme developed at CMCC.
OGCM	Ocean General Circulation Model
OpenDAP	Open-Source Project for a Network Data Access Protocol. Protocol to download subset of data from a n-dimensional gridded dataset (ie: 4 dimensions: lon-lat,depth,time)
PU	Production Unit

Subsetter	Copernicus Marine service tool to download a NetCDF file of a selected geographical box using values of longitude and latitude, and time range
TAC	Thematic Assembly Centre
Zonal Velocity	South to North component of the horizontal velocity vector

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I INTRODUCTION

I.1 Summary

This document is the user manual for the Copernicus Marine reanalysis product **BLKSEA_MULTIYEAR_PHY_007_004**. An archive of reanalysis since 01/01/1993 is available on the Copernicus Marine server.

It contains the reanalysis product of the physical state of the Black Sea, composed by 3D, daily and monthly mean fields of Potential Temperature, Salinity, Zonal and Meridional Velocity, and by 2D, daily and monthly mean fields of Sea Surface Height, Bottom Temperature and Mixed Layer Depth.

BLKSEA_MULTIYEAR_PHY_007_004 product is organized in 26 datasets:

- 5 contain 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 information.
 - **cmems_mod_blk_phy-tem_my_2.5km_P1D-m**
 - **cmems_mod_blk_phy-sal_my_2.5km_P1D-m**
 - **cmems_mod_blk_phy-cur_my_2.5km_P1D-m**
 - **cmems_mod_blk_phy-ssh_my_2.5km_P1D-m**
 - **cmems_mod_blk_phy-mld_my_2.5km_P1D-m**
- 5 contain 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 information.
 - **cmems_mod_blk_phy-tem_my_2.5km_P1M-m**
 - **cmems_mod_blk_phy-sal_my_2.5km_P1M-m**
 - **cmems_mod_blk_phy-cur_my_2.5km_P1M-m**
 - **cmems_mod_blk_phy-ssh_my_2.5km_P1M-m**
 - **cmems_mod_blk_phy-mld_my_2.5km_P1M-m**
- 5 contain the yearly mean fields: 3D potential temperature, salinity, and currents information from top to bottom and 2D sea surface level, bottom potential temperature, mixed layer thickness information.
 - **cmems_mod_blk_phy-tem_my_2.5km_P1Y-m**
 - **cmems_mod_blk_phy-sal_my_2.5km_P1Y-m**

- **cmems_mod_blk_phy-cur_my_2.5km_P1Y-m**
- **cmems_mod_blk_phy-ssh_my_2.5km_P1Y-m**
- **cmems_mod_blk_phy-mld_my_2.5km_P1Y-m**
- 5 contain the monthly climatology fields: 3D potential temperature, salinity, and currents information from top to bottom and 2D sea surface level, bottom potential temperature, mixed layer thickness information.
 - **cmems_mod_blk_phy-tem_my_2.5km-climatology_P1M-m**
 - **cmems_mod_blk_phy-sal_my_2.5km-climatology_P1M-m**
 - **cmems_mod_blk_phy-cur_my_2.5km-climatology_P1M-m**
 - **cmems_mod_blk_phy-ssh_my_2.5km-climatology_P1M-m**
 - **cmems_mod_blk_phy-mld_my_2.5km-climatology_P1M-m**
- 5 contain the interim 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 information.
 - **cmems_mod_blk_phy-tem_myint_2.5km_P1M-m**
 - **cmems_mod_blk_phy-sal_myint_2.5km_P1M-m**
 - **cmems_mod_blk_phy-cur_myint_2.5km_P1M-m**
 - **cmems_mod_blk_phy-ssh_myint_2.5km_P1M-m**
 - **cmems_mod_blk_phy-mld_myint_2.5km_P1M-m**
- **1** contains the static fields for the system: coordinates, mean sea surface level, mask, and bathymetry: **cmems_mod_blk_phy_my_2.5km_static**

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

The reanalysis system is described in the Quality Information Document (QUID – see link in [REFERENCES](#)).

Disclaimer: The quality of the product may vary during the proposed time series depending on the possible update of the system.

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

1.2 History of changes

Date	Description
Jul 2016	First version of document
Oct 2018	Addition of static files
Sep 2020	New product name including new dataset
Jan 2021	Addition of interim datasets
Nov 2022	Addition of yearly and monthly climatology datasets

II DESCRIPTION OF THE PRODUCT SPECIFICATION

II.1 General Information

Product name	BLKSEA_MULTIYEAR_PHY_007_004	
Geographical coverage	27.73°E → 41.96°E ; 40.86°N → 46.80°N	
Variables	Temperature Salinity Sea Surface Height Horizontal velocity (eastward and northward components) Ocean mixed layer thickness Sea floor potential temperature	
	Reanalysis	Interim
Update frequency	Twice a year	Every month
Available time series	Since 1993 up to the previous year	Since the last day of Reanalysis up to the previous month
Target delivery time	NA	20th of each month at 12UTC
Temporal resolution	cmems_mod_blk_phy-tem_my_2.5km_P1Y-m, cmems_mod_blk_phy-sal_my_2.5km_P1Y-m, cmems_mod_blk_phy-cur_my_2.5km_P1Y-m, cmems_mod_blk_phy-ssh_my_2.5km_P1Y-m, cmems_mod_blk_phy-mld_my_2.5km_P1Y-m: yearly mean cmems_mod_blk_phy-tem_my_2.5km_P1M-m, cmems_mod_blk_phy-sal_my_2.5km_P1M-m, cmems_mod_blk_phy-cur_my_2.5km_P1M-m, cmems_mod_blk_phy-ssh_my_2.5km_P1M-m, cmems_mod_blk_phy-mld_my_2.5km_P1M-m: monthly mean cmems_mod_blk_phy-tem_my_2.5km_P1D-m, cmems_mod_blk_phy-sal_my_2.5km_P1D-m, cmems_mod_blk_phy-cur_my_2.5km_P1D-m,	

	<p>cmems_mod_blk_phy-ssh_my_2.5km_P1D-m, cmems_mod_blk_phy-mld_my_2.5km_P1D-m: daily mean</p> <p>cmems_mod_blk_phy-tem_myint_2.5km_P1M-m, cmems_mod_blk_phy-sal_myint_2.5km_P1M-m, cmems_mod_blk_phy-cur_myint_2.5km_P1M-m, cmems_mod_blk_phy-ssh_myint_2.5km_P1M-m, cmems_mod_blk_phy-mld_myint_2.5km_P1M-m: interim monthly mean</p> <p>cmems_mod_blk_phy-tem_my_2.5km-climatology_P1M-m, cmems_mod_blk_phy-sal_my_2.5km-climatology_P1M-m, cmems_mod_blk_phy-cur_my_2.5km-climatology_P1M-m, cmems_mod_blk_phy-ssh_my_2.5km-climatology_P1M-m, cmems_mod_blk_phy-mld_my_2.5km-climatology_P1M-m : monthly climatology</p>
Horizontal resolution	About 3 km (1/27° zonal resolution, 1/36° meridional resolution)
Number of vertical levels	31
Format	NetCDF CF1.6
Delivery mechanisms	Subsetter FTP

Table 1: BS-MFC MultiYear products

II.2 Details of datasets

BLKSEA_MULTIYEAR_PHY_007_004	
Datasets:	
<ul style="list-style-type: none"> • cmems_mod_blk_phy-tem_my_2.5km_P1M-m, • cmems_mod_blk_phy-sal_my_2.5km_P1M-m, • cmems_mod_blk_phy-cur_my_2.5km_P1M-m, • cmems_mod_blk_phy-ssh_my_2.5km_P1M-m, • cmems_mod_blk_phy-mld_my_2.5km_P1M-m 	
<p>contain 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</p>	

- **cmems_mod_blk_phy-tem_my_2.5km_P1D-m,**
- **cmems_mod_blk_phy-sal_my_2.5km_P1D-m,**
- **cmems_mod_blk_phy-cur_my_2.5km_P1D-m,**
- **cmems_mod_blk_phy-ssh_my_2.5km_P1D-m,**
- **cmems_mod_blk_phy-mld_my_2.5km_P1D-m**

contain 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

- **cmems_mod_blk_phy-tem_my_2.5km_P1Y-m,**
- **cmems_mod_blk_phy-sal_my_2.5km_P1Y-m,**
- **cmems_mod_blk_phy-cur_my_2.5km_P1Y-m,**
- **cmems_mod_blk_phy-ssh_my_2.5km_P1Y-m,**
- **cmems_mod_blk_phy-mld_my_2.5km_P1Y-m**

contain yearly mean fields: 3D potential temperature, salinity, and currents information from top to bottom and 2D sea surface level, bottom potential temperature, mixed layer thickness

- **cmems_mod_blk_phy-tem_my_2.5km-climatology_P1M-m,**
- **cmems_mod_blk_phy-sal_my_2.5km-climatology_P1M-m,**
- **cmems_mod_blk_phy-cur_my_2.5km-climatology_P1M-m,**
- **cmems_mod_blk_phy-ssh_my_2.5km-climatology_P1M-m,**
- **cmems_mod_blk_phy-mld_my_2.5km-climatology_P1M-m**

contain the monthly climatology and standard deviation fields: 3D potential temperature, salinity, and currents information from top to bottom and 2D sea surface level, bottom potential temperature, mixed layer thickness

- **cmems_mod_blk_phy-tem_myint_2.5km_P1M-m,**
- **cmems_mod_blk_phy-sal_myint_2.5km_P1M-m,**
- **cmems_mod_blk_phy-cur_myint_2.5km_P1M-m,**
- **cmems_mod_blk_phy-ssh_myint_2.5km_P1M-m,**
- **cmems_mod_blk_phy-mld_myint_2.5km_P1M-m**

contain the interim 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

- **cmems_mod_blk_phy_my_2.5km_static**

contains the static fields for the system: coordinates, mean sea surface level, mask, and bathymetry

Variables name in the NetCDF file and Unit: Long_name & Standard_name
zos [m] Sea surface height sea_surface_height_above_geoid
zos_mean [m] Sea surface height monthly climatology sea_surface_height_above_geoid
zos_std [m] Standard Deviation of sea surface height monthly climatology sea_surface_height_above_geoid
uo [m/s] Eastward Eulerian velocity (Navier-Stokes current) eastward_sea_water_velocity
uo_mean [m/s] Eastward Eulerian velocity (Navier-Stokes current) monthly climatology eastward_sea_water_velocity
uo_std [m/s] Standard Deviation of Eastward Eulerian velocity (Navier-Stokes current) monthly climatology eastward_sea_water_velocity
vo [m/s] Northward Eulerian velocity (Navier-Stokes current) northward_sea_water_velocity
vo_mean [m/s] Northward Eulerian velocity (Navier-Stokes current) monthly climatology northward_sea_water_velocity
vo_std [m/s] Standard Deviation of Northward Eulerian velocity (Navier-Stokes current) monthly climatology northward_sea_water_velocity
so [psu] Salinity sea_water_salinity
so_mean [psu] Salinity monthly climatology sea_water_salinity
so_std [psu] Standard Deviation of salinity monthly climatology sea_water_salinity
thetao [°C] Sea temperature sea_water_potential_temperature
thetao_mean [°C] Sea temperature monthly climatology sea_water_potential_temperature
thetao_std [°C] Standard Deviation of sea temperature monthly climatology sea_water_potential_temperature
bottomT [°C]

Sea floor potential temperature sea_water_potential_temperature_at_sea_floor
bottomT_mean [°C] Sea floor potential temperature monthly climatology sea_water_potential_temperature_at_sea_floor
bottomT_std [°C] Standard Deviation of sea floor potential temperature monthly climatology sea_water_potential_temperature_at_sea_floor
m1otst [m] Mixed layer depth ocean_mixed_layer_thickness_defined_by_sigma_theta
m1otst_mean [m] Mixed layer depth monthly climatology ocean_mixed_layer_thickness_defined_by_sigma_theta
m1otst_std [m] Standard Deviation of mixed layer depth monthly climatology ocean_mixed_layer_thickness_defined_by_sigma_theta
e1t [m] Cell dimension along X axis
e2t [m] Cell dimension along Y axis
e3t [m] 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

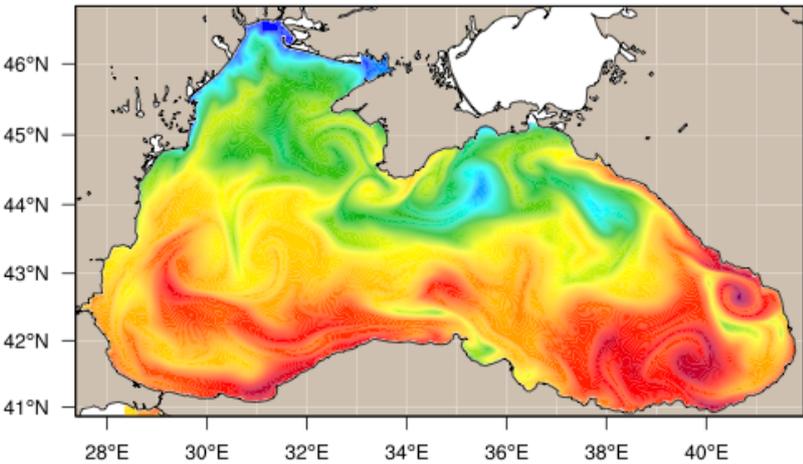
Table 2: list of the datasets and variable names and unit for the BLKSEA_MULTIYEAR_PHY_007_004 product

II.3 Additional Information on parameters

m1otst [m]	ocean_mixed_layer_thickness_defined_by_sigma_theta. It is the depth where the density increases of 0.01 kg.m ⁻³ compared to density at 10 m depth
-------------------	--

zos [m]	sea_surface_height_above_geoid. The geoid is a surface of constant geopotential (the mean ocean surface of the Earth if the ocean is 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 was at rest.
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II.4 Production System Description

Domain Resolution and grid Geographic coverage	<p>BLKSEA (27.73°E → 41.96°E ; 40.86°N → 46.80°N)</p> <p>~3km ; regular grid ; 395 x 215</p> <p>This product covers the Black Sea area (the Azov Sea is not included), the horizontal resolution is approximatively 3 km, the vertical grid is composed of 31 unevenly spaced vertical z-levels.</p> 
Model Version Production unit Period of validation	<ul style="list-style-type: none"> ▪ NEMO v3.6 ▪ CMCC, Italy ▪ 01/01/1993-31/12/2018
Vertical grid	<p>The product is delivered at the model native grid, with up to 31 vertical levels:</p> <p>levels [m]: 2.501079, 7.511193, 12.5362, 17.5834, 22.66374, 27.79346, 32.99686, 38.31007, 43.78698, 49.50773, 55.59151, 62.21519, 69.64064, 78.25402, 88.6217, 101.5674, 118.2747, 140.4134, 170.2776, 210.8995, 266.0667, 340.1394, 437.566, 562.0992, 715.9152, 899.0139, 1109.219, 1342.778, 1595.243, 1862.253, 2140.021</p>
Tides	N/A

Atmospheric forcing	Reanalysis: 1-h, 0.25° horizontal-resolution ERA5 reanalysis fields from the European Centre for Medium-Range Weather Forecasts (ECMWF) Interim: 1-h, 0.25° horizontal-resolution ERA5T reanalysis fields from the European Centre for Medium-Range Weather Forecasts (ECMWF)
Boundary forcing	The current system applies closed boundaries
Assimilation scheme	OceanVar (3DVAR)
Assimilated observations	In situ vertical profiles of Temperature and Salinity from different platforms (e.g. Argo, CTD); Sea Level Anomaly (SLA) from available satellites Jason 2 & 3, Saral-Altika, Cryosat; Sentinel-3A, and Sentinel-3B.
Initial conditions (spin-up process)	Reanalysis: January climatology for temperature and salinity, estimated from results of the previous Copernicus Marine Black Sea reanalysis (version BSe2r2), by considering the period 1992-2018. Interim: Last day Reanalysis restart file
Bathymetry	GEBCO 30sec interpolated on the model grid
River run-off	monthly climatological mean estimate for the period 1960–1984 and provided by the SESAME project

The Black Physical Reanalysis component, is a hydrodynamic model, supplied by the Nucleus. The physical component of the Black Sea Reanalysis System (BS-REA) is a hydrodynamic model implemented over the whole Black Sea basin. The model horizontal grid resolution is 1/27° in zonal resolution, 1/36° in meridional resolution (ca. 3 km) and has 31 unevenly spaced vertical levels.

The hydrodynamics are supplied by the Nucleus for European Modeling of the Ocean (NEMO, v3.6). The model solutions are corrected by the variational assimilation OceanVar (based on a 3DVAR scheme), originally developed for the Mediterranean Sea and later extended for the global ocean. The observations assimilated in the BS-REA includes in-situ T/S profiles from SeaDataNet and Copernicus Marine INS TAC, and along-track sea level anomalies (SLA) from Copernicus Marine SL TAC.

II.5 Processing information

II.5.1 Update Time

The Black Sea physical reanalysis has been initialized using temperature and salinity fields, computed as a mean of the first week of January in the period 1992-2018 using the previous assimilation Black Sea reanalysis (version BSe2r2). The timeseries is updated twice per year.

II.5.2 Temporal extent of analysis and forecast stored on delivery mechanism

The Reanalysis timeseries is available from 01/01/1993.

The Interim timeseries is available from the last day of Reanalysis.

II.5.3 Time averaging

For the yearly dataset, the fields are yearly averages over the calendar year (first to last day of the year). For the monthly dataset, the fields are monthly averages over the calendar month (first to last day of the month). For the daily dataset, the fields are daily averages over a day (00:00 to 24:00 UTC, centered at midday).

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

IV.1 Nomenclature of files when downloaded through the Copernicus Marine Web Portal Subsetter Service

BLKSEA_MULTIYEAR_PHY_007_004 files nomenclature when downloaded through the Copernicus Marine 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: cmems_mod_blk_phy-sal_my_2.5km_P1D-m_1303461772348.nc

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

BLKSEA_MULTIYEAR_PHY_007_004 files nomenclature when downloaded through the Copernicus Marine FTP service is based as follows:

{valid date}_{freq flag}-{producer}-{parameter}-{config}-{region}-{bul date}_{product type}-sv{file version}.nc

where

- **valid date** YYYYMMDD is the validity day of the data in the file
- **freq flag** is the frequency of data values in the file (h = hourly, hts = hourly time series, d = daily, m=monthly)
- **producer** is a short version of the Copernicus Marine production unit
- **config** identifies the producing system and configuration
- **region** is a six-letter code for the region
- **parameter** is a four-letter code for the parameter or parameter set from Standard BODC.
- **bul date** bYYYYMMDD is the bulletin date the product was produced
- **product type** is a two-letter code for the product type, for example fc for forecast, an for analysis and sm for hindcast.

- **file version** is xx.yy where xx is the Copernicus Marine version (03, 04 or 05) and yy is an incremental version number

Table 1 shows the nomenclature for the BLKSEA_MULTIYEAR_PHY_007_004 product.

Table 1 Description of the nomenclature for BLKSEA_MULTIYEAR_PHY_007_004

valid date	YYYYMMDD
freq flag	m (monthly) d (daily) y (yearly) cli (climatology)
producer	CMCC
config	BSe3r1
region	BS
parameter	TEMP PSAL ASLV RFVL AMXL
field	mask_bathy mdt coordinates
bul date	bYYYYYMMDD
product type	re (reanalysis) in (interim)
file version	10.00

Example for a file of Salinity:

1. Daily mean:

20180309_d-CMCC--PSAL-BSe3r1-BS-b20200901_re-sv10.00.nc

This is the mean field of salinity centered at 00:00 UTC of the 9th March 2018, and the time coverage is from midnight (00:00 UTC) of the 9th March 2018 to midnight (23:59 UTC) of the 9th March 2018 .

2. Monthly mean:

20180315_m-CMCC--PSAL-BSe3r1-BS-b20200901_re-sv10.00.nc

This is the monthly mean field of salinity for the month of March 2018. The mean is computed from midnight (00:00 UTC) of the 1st March 2018 to midnight (00:00 UTC) of the 1st April 2018 .

IV.3 Other information: mean centre of Products, land mask value, missing value

The missing value for this product is: 1.e+20

Land mask is equal to “_FillValue” (see variable attribute on NetCDF file).

Real_Value = (Display_Value X scale_factor) + add_offset

The PHY reanalysis is using the NetCDF4 format without offset nor scale factors.

IV.4 File size

DATASET NAME	FILE NAME	DIMENSION [MB]
cmems_mod_blk_phy-ssh_my_2.5km_P1D-m	{date1}_d-CMCC--ASLV-BSe3r1-BS-b{date2}_re-sv10.00.nc	0.152
cmems_mod_blk_phy-sal_my_2.5km_P1D-m	{date1}_d-CMCC--PSAL-BSe3r1-BS-b{date2}_re-sv10.00.nc	3
cmems_mod_blk_phy-tem_my_2.5km_P1D-m	{date1}_d-CMCC--TEMP-BSe3r1-BS-b{date2}_re-sv10.00.nc	3.3

cmems_mod_blk_phy-cur_my_2.5km_P1D-m	{date1}_d-CMCC--RFVL-BSe3r1-BS-b{date2}_re-sv10.00.nc	7.4
cmems_mod_blk_phy-mld_my_2.5km_P1D-m	{date1}_d-CMCC--AMXL-BSe3r1-BS-b{date2}_re-sv10.00.nc	0.088
cmems_mod_blk_phy-ssh_my_2.5km_P1M-m	{date1}_m-CMCC--ASLV-BSe3r1-BS-b{date2}_re-sv10.00.nc	0.152
cmems_mod_blk_phy-sal_my_2.5km_P1M-m	{date1}_m-CMCC--PSAL-BSe3r1-BS-b{date2}_re-sv10.00.nc	3.1
cmems_mod_blk_phy-tem_my_2.5km_P1M-m	{date1}_m-CMCC--TEMP-BSe3r1-BS-b{date2}_re-sv10.00.nc	3.2
cmems_mod_blk_phy-cur_my_2.5km_P1M-m	{date1}_m-CMCC--RFVL-BSe3r1-BS-b{date2}_re-sv10.00.nc	7.2
cmems_mod_blk_phy-mld_my_2.5km_P1M-m	{date1}_m-CMCC--AMXL-BSe3r1-BS-b{date2}_re-sv10.00.nc	0.132
cmems_mod_blk_phy-ssh_my_2.5km_P1Y-m	{date1}_y-CMCC--ASLV-BSe3r1-BS-b{date2}_re-sv10.00.nc	0.154
cmems_mod_blk_phy-sal_my_2.5km_P1Y-m	{date1}_y-CMCC--PSAL-BSe3r1-BS-b{date2}_re-sv10.00.nc	2.1
cmems_mod_blk_phy-tem_my_2.5km_P1Y-m	{date1}_y-CMCC--TEMP-BSe3r1-BS-b{date2}_re-sv10.00.nc	2.4

cmems_mod_blk_phy-cur_my_2.5km_P1Y-m	{date1}_y-CMCC--RFVL-BSe3r1-BS-b{date2}_re-sv10.00.nc	6.8
cmems_mod_blk_phy-mld_my_2.5km_P1Y-m	{date1}_y-CMCC--AMXL-BSe3r1-BS-b{date2}_re-sv10.00.nc	0.154
cmems_mod_blk_phy-ssh_myint_2.5km_P1M-m	{date1}_m-CMCC--ASLV-BSe3r1i-BS-b{date2}_in-sv10.00.nc	0.152
cmems_mod_blk_phy-sal_myint_2.5km_P1M-m	{date1}_m-CMCC--PSAL-BSe3r1i-BS-b{date2}_in-sv10.00.nc	3.2
cmems_mod_blk_phy-tem_myint_2.5km_P1M-m	{date1}_m-CMCC--TEMP-BSe3r1i-BS-b{date2}_in-sv10.00.nc	3.1
cmems_mod_blk_phy-cur_myint_2.5km_P1M-m	{date1}_m-CMCC--RFVL-BSe3r1i-BS-b{date2}_in-sv10.00.nc	7.2
cmems_mod_blk_phy-mld_myint_2.5km_P1M-m	{date1}_m-CMCC--AMXL-BSe3r1i-BS-b{date2}_in-sv10.00.nc	0.132
cmems_mod_blk_phy-mld_my_2.5km-climatology_P1M-m	1993-2016_{month}_cli-CMCC--AMXL-BSe3r1-BS-b{date2}_re-sv10.00.nc	0.296
cmems_mod_blk_phy-cur_my_2.5km-climatology_P1M-m	1993-2016_{month}_cli-CMCC--RFVL-BSe3r1-BS-b{date2}_re-sv10.00.nc	13
cmems_mod_blk_phy-tem_my_2.5km-climatology_P1M-m	1993-2016_{month}_cli-CMCC--TEMP-BSe3r1-BS-b{date2}_re-sv10.00.nc	5.3
cmems_mod_blk_phy-sal_my_2.5km-climatology_P1M-m	1993-2016_{month}_cli-CMCC--PSAL-BSe3r1-BS-b{date2}_re-sv10.00.nc	5.1
cmems_mod_blk_phy-ssh_my_2.5km-climatology_P1M-m	1993-2016_{month}_cli-CMCC--ASLV-BSe3r1-BS-b{date2}_re-sv10.00.nc	0.272
cmems_mod_blk_phy_my_2.5km_static	BS-MFC_007_004_\${field}.nc	0.713

V FILE FORMAT

V.1 NetCDF

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 (<http://www.unidata.ucar.edu/software/netcdf/>) for more information, and to retrieve netCDF software package.

NetCDF data format 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.

The products are compliant with the NetCDF Climate and Forecast Convention CF-1.4 (see <http://cf-pcmdi.llnl.gov/>).

The BLKSEA_MULTIYEAR_PHY_007_004 product is distributed in netCDF4 format.

V.2 Reader Software

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

- ✓ ncBrowse: <http://www.epic.noaa.gov/java/ncBrowse/>,
- ✓ NetCDF Operator (NCO): <http://nco.sourceforge.net/>
- ✓ IDL, Matlab, Panoply, GMT...

V.3 Structure and semantic of netCDF maps files

The model output files contain some additional fields in addition to the variables mentioned earlier. An example output NetCDF file header for `cmems_mod_blk_phy-tem_my_2.5km_P1D-m` is inserted below, with the additional fields in italic fonts.

```
netcdf \20170101_d-CMCC--TEMP-BSe3r1-BS-b20200901_re-sv10.00 {
```

dimensions:

```
lon = 215 ;
```

```
lat = 395 ;
```

```
depth = 31 ;
```

```
time = UNLIMITED ; // (1 currently) ;
```

variables:

VI REFERENCES

Quality Information Document (QUID) :

<https://catalogue.marine.copernicus.eu/documents/QUID/CMEMS-BS-QUID-007-004.pdf>