# PRODUCT USER MANUAL

# For Global Ocean Reprocessed in-situ Observations of biogeochemical Product

## INSITU_GLO_BGC_DISCRETE_MY_013_046

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**RECORD TABLE**

| Issue | Date | § | Description of Change | Author | Validated By |
|---|---|---|---|---|---|
| 1.0 | 13/04/2018 | | Creation of the document | P. Jaccard, D. Hjermann | |
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| 1.2 | 28/11/2019 | | Added O2 variables | V.S. Lien | |
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| 2.1 | 07/09/2020 | | New PUM format | V.S. Lien, Virginie Racapé | |
| 2.2 | 31/08/2021 | | EMODnet chemistry inclusion | V.S. Lien, V. Racapé | S. Tarot |
| 2.3 | 30/11/2021 | | Correction of external links | S. Tarot | S. Tarot |
| 2.4 | 21/02/2022 | | Added information on update frequency | V.S. Lien | S. Tarot |
| 2.5 | 01/05/2022 | | New product name | V.S. Lien | S. Tarot |
| 2.6 | 01/06/2023 | | Inclusion of parameters SLCW and PHOW | V. S. Lien | S. Tarot |
| 2.7 | 17/05/2024 | | New download description | V. S. Lien, J.E.Ø. Nilsen | S. Tarot |

## Table of Contents

# GLOSSARY AND ABBREVIATIONS

| | |
|---|---|
| BGC | Biogeochemical |
| CF | Climate Forecast (convention for NetCDF) |
| EU | European Union |
| INS | In situ |
| MDS | Marine Data Store |
| MFC | Monitoring Forecasting Centre |
| NetCDF | Network Common Data Form |
| NRT | Near Real Time |
| PUM | Product User Manual |
| REP | Reprocessed |
| RT | Real Time |
| TAC | Thematic Centre |

## DATA ACCESS

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.

# I INTRODUCTION

## I.1 Summary

This Product User Manual describes the reprocessed biogeochemical product INSITU_GLO_BGC_DISCRETE_MY_013_046 distributed by the Copernicus Marine Service In Situ Thematic Assembly Centre (In Situ TAC): how it is built, what is the content, what data services are available to access them, and how to use the files. The product is global and covers the period from 1st January 1990 up to real-time less eleven months, and it contains three datasets with parameters on chlorophyll-*a* concentration, oxygen, and nutrients (nitrate, silicate, phosphate).

The In Situ TAC is a distributed system built on the existing activities and services developed within EU-funded projects and support from EuroGOOS Regional alliances. It provides a research and operational framework to develop and deliver in situ observations and derived products to address progressively global and regional needs for monitoring, modeling and downstream service development.

The main objective of the Copernicus Marine Service is to deliver and operate a rigorous, robust and sustainable Ocean Monitoring and Forecasting system to users of all marine applications: maritime safety, marine resources, marine and coastal environment and climate, seasonal and weather forecasting. The In Situ TAC prepares reprocessed datasets for reanalysis activities performed by the Copernicus Marine Service forecasting centers (MFCs) and external users.

The in situ reprocessed biogeochemical product integrates quality flags from the NRT multiparameter product INSITU_GLO_PHYBGCWAV_DISCRETE_MYNRT_013_030. The quality flags have been reassessed in delayed mode using updated real-time and delayed mode quality assessment procedures for the most common biogeochemical parameters, found in CMEMS-INS-QUID-013-046 (Jaccard et al., 2024)

This product is designed for users that need aggregated datasets with a well-documented and transparent quality control (e.g., ocean forecasting centres, research communities, etc.).

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

The reprocessing system is described in the Quality Information Document (QUID): CMEMS-INS-QUID-013-046 (Jaccard et al., 2024)

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

## I.2 History of changes

| Date | Description of changes and impacted product |
|---|---|
| 31/01/2019 | Updated chl-*a* quality control procedures |
| 28/11/2019 | Updated oxygen quality control procedures |
| 29/03/2020 | Inclusion of nutrients variables (nitrate, silicate, phosphate) and nutrients quality control procedures |
| 31/08/2021 | Inclusion of a first batch of EMODnet chemistry 2018 data set (impact = increase <10% / especially the resolution of data in coastal areas) |
| 29/11/2022 | Product has been renamed and split into three datasets |
| 29/11/2024 | File format change |

# II DESCRIPTION OF THE PRODUCT SPECIFICATION

## II.1 General Information

| | |
|---|---|
| **Product Lines** | INSITU_GLO_BGC_DISCRETE_MY_013_046 |
| **Geographical coverage** | Global |
| **Variables** | • Chl-*a* fluoresence<br>• Chl-*a* concentration<br>• Dissolved oxygen<br>• Nitrate<br>• Silicate<br>• Phosphate |
| **Product Type** | Multi Year |
| **Available time series** | 1st January 1990 and regularly updated see product improvements pages |
| **Temporal resolution** | Instantaneous |
| **Target delivery time** | N/A |
| **Delivery mechanism** | MDS |
| **Horizontal resolution** | N/A |
| **Number of vertical levels** | 1 m vertical resolution |
| **Format** | NetCDF CF1.11 |

*Table 1: In Situ TAC Multi-year biogeochemistry product*

The runtime schedule:

The dataset is updated two times per year: in June when the dataset is extended to include all data up until the end of June the previous year, and in November when the full dataset up until the end of December the previous year is reprocessed.

## II.2 Details of datasets

| INSITU_GLO_BGC_DISCRETE_MY_013_046 |
|---|
| **Chlorophyll dataset: cmems_obs-ins_glo_bgc-chl_my_na_irr**<br>**Variables name in the NetCDF file and Unit: Long_name & Standard_name** |
| **CHLT [mg m-3]**<br>**Total chlorophyll**<br>**mass_concentration_of_chlorophyll_in_sea_water** |
| **CPHL [mg m-3]**<br>**Chlorophyll-a**<br>**mass_concentration_of_chlorophyll_a_in_sea_water** |
| **FLU2 [mg m-3]**<br>**Chlorophyll-a fluorescence**<br>**mass_concentration_of_chlorophyll_a_fluorescence_in_sea_water** |
| **Oxygen dataset: cmems_obs-ins_glo_bgc-ox_my_na_irr**<br>**Variables name in the NetCDF file and Unit: Long_name & Standard_name** |
| **DOXY [mmol m-3]**<br>**Dissolved oxygen**<br>**mole_concentration_of_dissolved_molecular_oxygen_in_sea_water** |
| **DOX1 [ml l-1]**<br>**Dissolved oxygen**<br>**volume_fraction_of_oxygen_in_sea_water** |
| **DOX2 [mmol kg-1]**<br>**Dissolved oxygen**<br>**moles_of_oxygen_per_unit_mass_in_sea_water** |
| **Nutrients dataset: cmems_obs-ins_glo_bgc-nut_my_na_irr**<br>**Variables name in the NetCDF file and Unit: Long_name & Standard_name** |
| **NTRA [mmol m-3]**<br>**Nitrate (NO3-N)**<br>**mole_concentration_of_nitrate_in_sea_water** |
| **NTAW [µmol kg-1]**<br>**Nitrate (NO3-N)**<br>**moles_of_nitrate_per_unit_mass_in_sea_water** |
| **SLCA [mmol m-3]**<br>**Silicate (SIO4-SI)**<br>**mole_concentration_of_silicate_in_sea_water** |
| **SLCW [µmol kg-1]**<br>**Silicate (SIO4-SI)**<br>**moles_of_silicate_per_unit_mass_in_sea_water** |
| **PHOS [mmol m-3]**<br>**Phosphate (PO4-P)**<br>**mole_concentration_of_phosphate_in_sea_water** |
| **PHOW [µmol kg-1]**<br>**Phosphate (PO4-P)**<br>**moles_of_phosphate_per_unit_mass_in_sea_water** |

*Table 2: list of the datasets and variable names and unit for the INSITU_GLO_BGC_DISCRETE_MY_013_046 product*

## II.3 Production System Description

The reprocessed biogeochemical product is based on the NRT product (INSITU_GLO_PHYBGCWAV_DISCRETE_MYNRT_013_030) history directory files from the Global Production Unit operated by IFREMER. Quality flags for the most relevant parameters have been reprocessed using updated quality assessment procedures. This work has been performed for all platforms for which a sufficient measurement volume was provided.

Quality control procedures were developed and tested by the partners of the Copernicus Marine Service In Situ TAC phase 1 *Task 3.2 Methods to assess multi-year historical biogeochemical products* during period 2015-2018. More information on these procedures and quality assessments of the product can be found in CMEMS-INS-QUID-013-046 (Jaccard et al., 2024).

### II.3.1 Chl-a Fluorescence

Measurements of chl-*a* fluorescence are saved in variable FLU2. For historical reasons, variable CPHL is in use for BioArgo platforms. This is the only exception. A variable attribute named *sensing_method* has been added and set to **fluorescence** for these files**.** We hope hereby to avoid the confusion of proxy measurements based on fluorescence to be regarded as concentration based on laboratory analysis from water samples.

### II.3.2 Dissolved Oxygen

Dissolved oxygen in sea water comes in different units, depending on the sensor used. This is the reason why product files may have variables DOXY, DOX1 or DOX2 in the “OriginalUnit” subdirectory. To be user-friendly, product files are also available with an easy format where oxygen unit has been standardized either in mmol $m^{-3}$ equivalent to µmol $l^{-1}$ (DOXY) in “Data_In_micromolL” subdirectory or in µmol $kg^{-1}$ (DOX2) in “Data_In_micromolKG” subdirectory.

### II.3.3 Nutrients

Nutrients include nitrate (NTRA and NTAW), silicate (SLCA and SLCW) and phosphate (PHOS and PHOW).

### II.3.4 QC Procedures

Quality control procedures applied to data in this product have been developed and tested by the partners of Copernicus Marine Service In Situ TAC phase 1, *Task 3.2 Methods to assess multi-year historical biogeochemical products* during period 2015-2018, and further developed by the Task 6.2 task team. This includes both real-time applicable tests, delayed mode tests as well as

some visual controls. Finally, an evaluation against ocean colour products has been applied on the quality flags of in-situ chl-*a* fluorescence measurements.

More information on these procedures is available in CMEMS-INS-QUID-013-046 (Jaccard et al., 2024).

## II.4 Processing information

### II.4.1 Update Time

The product is updated two times per year.

### II.4.2 Temporal extent of analysis and forecast stored on delivery mechanism

The product covers the period from 1st January 1990 up to launch date less eleven months.

### II.4.3 Time averaging

The fields are instantaneous.

# III FILES NOMENCLATURE

Information about nomenclature of files when downloaded can be found in this article: " How is defined the nomenclature of Copernicus Marine data? | Copernicus Marine Help Center "

## III.1 Nomenclature of files when downloaded through the Copernicus Marine Service Web Portal Subset Service

Files nomenclature when downloaded through the Copernicus Marine Service Web Portal Subset is based on product dataset name and a numerical reference related to the request date on the MIS.

NetCDF file names are as follow: GL_XX_YY_CODE_<_ZZZ>.nc

- GL: region bigram corresponding to global area
- XX: TS (timeseries) or PR (profile)
- YY: data type (see
- CODE: platform code
- ZZZ: optional subsetting code, may be a year, a group of CTDs, a cruise code…

Examples: BO_TS_MO_Norrbyn.nc, GL_TS_MO_61284_2013.nc.

Table 1 Codes for data types

| Name | Meaning |
|---|---|
| BO | bottle data |
| CT | oceanographic CTD profiles |
| FB | ferrybox |
| GL | gliders |
| ML | mini logger for fishery observing system |
| MO | fixed buoys, mooring time series, fixed observations |
| PF | profiling floats |

| | |
|---|---|
| SM | Sea mammals |

## III.2 Other information: mean centre of Products, land mask value, missing value

The missing value for this product is: -2147483647

Land and sea-ice masks are equal to "_FillValue" (see variable attribute on NetCDF file).

## III.3 File size

The size of each file depends on the type of instrument and the length of the serie of data. It varies from about 60 Kb to about 230 Mb.

## III.4 Index files

It is important to help users find the platforms and the files that provide such observations in the dataset. A data discovery mechanism is provided by means of index files, which are located at the top level of the dataset directory and provide information on each platform and file located on the server.

These index files allow users to know what is in the files without having to download them. They contain a list of all available data files by providing the relative path to the file (such path can be directly used by Copernicus Marine Toolbox), together with a selection of relevant metadata (temporal and spatial ranges, parameters…) that describes the data file contents.

Three index files describe the content of latest, monthly and history directories: index_latest.txt, index_monthly.txt and index_history.txt.

In addition, another index file (index_platform.txt) is provided. It registers the list of all the individual platforms that are available in the product directory and is updated daily.

These index files are also useful for automatic data download by operational users.

### III.4.1 Index files update and consistency

There is consistency between the index files and the file system. When a file must be deleted, its reference is removed from the index before the file deletion. When a file is added or updated, it is indexed after its addition or update.

### III.4.2 Index of latest/monthly/history directories

The index files are updated to describe all the files available in the latest, the monthly and the history directories.

Each index file contains one line per data file, with the following fields:

- product_id
  COP-XX-YY (e.g., COP-NO-01)
  - COP: Copernicus trigram
  - XX: production unit bigram (RD [1] Copernicus Marine In Situ NetCDF Format Manual - Reference table 2: production unit bigrams)
  - YY: product version
- file_name
- geospatial_lat_min
- geospatial_lat_max
- geospatial_lon_min
- geospatial_lon_max
- time_coverage_start
- time_coverage_end
- institution (separator: semicolon)
- date_update
- data_mode
- parameters (separator: blank)

The information in both index files and NetCDF files must be the same when the index element is a global attribute in the NetCDF file. These fields in the index file are directly extracted from the NetCDF files, not calculated upon index generation.

The **fields are sorted** in the order mentioned in this definition.

The **index files are named** according to the directory they describe.

- index_latest.txt
- index_monthly.txt
- index_history.txt

The **index lines are sorted** by file name and time coverage start.

The **field separator** character is "," (comma).
Some fields contain a list of values. They are separated by blank (example : the list of parameters) or separated by semicolon (if blank is a valid character in the values). Commas are not allowed in the values of these fields and therefore they are replaced with hyphens (-).

The **parameters** field contains the physical parameters as listed in the RD [2] Copernicus Marine in situ TAC - Physical Parameters List and candidate parameters (not yet approved in the official list). Coordinates, pseudo-coordinates, metadata and ancillary variables are ignored. The

following variables are thus ignored: TIME, LATITUDE, LONGITUDE, <PARAM>_QC, POSITION_QC, <PARAM>_ADJUSTED_QC, <PARAM>_ADJUSTED_ERROR, <PARAM>_DM, <PARAM>_UNCERTAINTY, DC_REFERENCE, DIRECTION, POSITIONING_SYSTEM, VERTICAL_SAMPLING_SCHEME.

**ISO8601 format** is used in date-time fields: YYYY-MM-DDThh:mm:ssZ

The **header** is composed of several lines starting with '#' character. It contains metadata about the content of the index file.

# Title : in-situ files catalog

# Description : catalog of available in-situ files compliant with Marine Data Store

# Project : Copernicus Marine In Situ TAC

# Format version : 3.0

# Date of update : 2020-04-20T12:34:20Z

#product_id,file_name,geospatial_lat_min,geospatial_lat_max,geospatial_lon_min, geospatial_lon_max,time_coverage_start,time_coverage_end,institution,date_update,data_ mode, parameters

| Copernicus In Situ data file index example |
|---|
| # Title : in-situ files catalog<br># Description : catalog of available in-situ files compliant with Marine Data Store<br># Project : Copernicus Marine In Situ TAC<br># Format version : 3.0<br># Date of update : 2020-04-20T12:34:20Z<br># product_id,file_name,geospatial_lat_min,geospatial_lat_max,geospatial_lon_min, geospatial_lon_max,time_coverage_start,time_coverage_end,institution,date_update,data_mode, parameters<br>INSITU_IBI_PHYBGCWAV_DISCRETE_MYNRT_013_033/cmems_obs-ins_ibi_phybgcwav_mynrt_na_irr_202311/latest/20200408/IR_TS_MO_1300131_20200408.nc,27.9951,27.9995,-16.6089,-16.6052,2020-04-08T00:00:00Z,2020-04-08T23:00:00Z,Puertos del Estado (Spain),2020-04-10T23:24:37Z,R,DEPH VHM0 VZMX VTPK VTM02 VMDR VPED ATMS DRYT WSPD WDIR HCSP HCDT TEMP PSAL CNDC<br>COP-IR-01,INSITU_IBI_PHYBGCWAV_DISCRETE_MYNRT_013_033/cmems_obs-ins_ibi_phybgcwav_mynrt_na_irr_202311/latest/20200409/IR_TS_MO_1300131_20200409.nc,27.9937,28.001,-16.6107,-16.6052,2020-04-09T00:00:00Z,2020-04-09T23:00:00Z,Puertos del Estado (Spain),2020-04-11T23:25:53Z,R,DEPH VHM0 VZMX VTPK VTM02 VMDR VPED ATMS DRYT WSPD WDIR HCSP HCDT TEMP PSAL CNDC<br>COP-IR-01,INSITU_IBI_PHYBGCWAV_DISCRETE_MYNRT_013_033/cmems_obs-ins_ibi_phybgcwav_mynrt_na_irr_202311/latest/20200410/IR_TS_MO_1300131_20200410.nc,27.9937,27.9981,-16.6107,-16.6034,2020-04-10T00:00:00Z,2020-04-10T23:00:00Z,Puertos del Estado |

(Spain),2020-04-12T23:25:18Z,R,DEPH VHM0 VZMX VTPK VTM02 VMDR VPED ATMS DRYT WSPD WDIR HCSP HCDT TEMP PSAL CNDC
COP-IR-01,INSITU_IBI_PHYBGCWAV_DISCRETE_MYNRT_013_033/cmems_obs-ins_ibi_phybgcwav_mynrt_na_irr_202311/latest/20200411/IR_TS_MO_1300131_20200411.nc,27.9922,27.9995,-16.6107,-16.6071,2020-04-11T00:00:00Z,2020-04-11T23:00:00Z,Puertos del Estado (Spain),2020-04-13T23:26:11Z,R,DEPH VHM0 VZMX VTPK VTM02 VMDR VPED ATMS DRYT WSPD WDIR HCSP HCDT TEMP PSAL CNDC
COP-IR-01,INSITU_IBI_PHYBGCWAV_DISCRETE_MYNRT_013_033/cmems_obs-ins_ibi_phybgcwav_mynrt_na_irr_202311/latest/20200412/IR_TS_MO_1300131_20200412.nc,27.9937,28.0024,-16.6107,-16.6052,2020-04-12T00:00:00Z,2020-04-12T23:00:00Z,Puertos del Estado (Spain),2020-04-14T23:26:45Z,R,DEPH VHM0 VZMX VTPK VTM02 VMDR VPED ATMS DRYT WSPD WDIR HCSP HCDT TEMP PSAL CNDC

### III.4.3 Index of platforms

The platforms index file is updated, at least, daily and registers the list of individual platforms that are available on the server.

Each platform index contains a line per platform with the following information:

- platform_code
- date_creation: date of the first file related to the platform appearing in the product
- date_update: the latest update date of any file associated with the platform
- wmo_platform_code: It can be empty.
- data_source: list of different data streams of the platform = all possible combinations of data types, file type and sources (latest, monthly, history) of this platform (see the example of a line content below)
- institution
- institution_edmo_code: list of the different edmo codes of the platform. It can be empty.
- parameters
- last_latitude_observation
- last_longitude_observation
- last_date_observation

The information in both index files and NetCDF files must be the same when the index element is a global attribute in the NetCDF file. It implies that the computation of these global attributes is performed in the generation process of the NetCDF files.

A platform will appear in the platforms index only if there is at least one file in the files' indexes.

It must be cross-checked that platform_code used in files indexes matches one of the platfom_code listed in the index_platform.txt.

The **fields** are provided **in the order** mentioned in this definition.

The **index lines are sorted** by platform_code.

The **field separator** character is "," (comma). Within each field, the commas found in the content are replaced by "-". Some fields contain a list of values separated by blank (example: the list of parameters) or separated by semicolon (if blank is a valid character in the values).

Data streams are identified thanks to the different filenames without date/period value. **Data source** lists the distinct PUs and data types for each individual platform:

- Latest files: RR_XX_YY_CODE_YYYYMMDD
- Monthly files: RR_XX_YY_CODE_YYYYMM
- History files: RR_XX_YY_CODE

See Erreur ! Source du renvoi introuvable. Erreur ! Source du renvoi introuvable.

The **parameters** field contains the physical parameters as listed in the RD [2] Copernicus Marine in situ TAC - Physical Parameters List and candidate parameters (not yet approved in the official list). Coordinates, pseudo-coordinates and metadata and ancillary variables are ignored. The following variables are thus ignored: TIME, LATITUDE, LONGITUDE, <PARAM>_QC, POSITION_QC, <PARAM>_ADJUSTED_QC, <PARAM>_ADJUSTED_ERROR, <PARAM>_DM, <PARAM>_UNCERTAINTY, DC_REFERENCE, DIRECTION, POSITIONING_SYSTEM, VERTICAL_SAMPLING_SCHEME.

**ISO8601 format** used in date-time fields: YYYY-MM-DDThh:mm:ssZ

The **header** is composed of several lines starting with '#' character. It contains metadata about the content of the index file.

# Title : in-situ platforms catalog

# Description : catalog of available in-situ platforms

# Project : Copernicus Marine In Situ TAC

# Format version : 2.0

# Date of update : 2020-04-20T12:36:44Z

# platform_code,date_creation,date_update,wmo_platform_code,data_source,institution, institution_edmo_code,parameters,last_latitude_observation,last_longitude_observation, last_date_observation

| Copernicus In Situ data platform index example |
|---|
| # Title : in-situ platforms catalog<br># Description : catalog of available in-situ platforms<br># Project : Copernicus Marine In Situ TAC<br># Format version : 2.0<br># Date of update : 2020-04-20T12:36:44Z |

# platform_code,date_creation,date_update,wmo_platform_code,data_source,institution,
institution_edmo_code,parameters,last_latitude_observation,last_longitude_observation,
last_date_observation
6100196,2020-05-08T13:24:29Z,2020-05-08T13:20:58Z,6100196,IR_TS_MO_6100196_YYYYMMDD
IR_TS_MO_6100196_YYYYMM IR_TS_MO_6100196 IR_WS_MO_6100196_YYYYMMDD
IR_WS_MO_6100196_YYYYMM IR_WS_MO_6100196,Puertos del Estado (Spain),2751,ATMS DEPH
DRYT FREQUENCY FREQUENCY_BOUNDS STHETA1 THETA1 VHM0 VMDR VPED VSPEC1D VTM02
VTPK VZMX WDIR WSPD,41.9111,3.6371,2020-05-08T13:00:00Z
6100198,2020-05-08T13:24:29Z,2020-05-08T13:20:58Z,6100198,IR_TS_MO_6100198_YYYYMMDD
IR_TS_MO_6100198_YYYYMM IR_TS_MO_6100198 IR_WS_MO_6100198_YYYYMMDD
IR_WS_MO_6100198_YYYYMM IR_WS_MO_6100198,Puertos del Estado (Spain),2751,ATMS CNDC
DEPH DRYT FREQUENCY FREQUENCY_BOUNDS HCDT HCSP PSAL STHETA1 TEMP THETA1 VHM0
VMDR VPED VSPEC1D VTM02 VTPK WDIR WSPD,36.57,-2.32,2020-05-08T13:00:00Z
6100280,2020-05-08T13:24:29Z,2020-05-08T13:20:58Z,6100280,IR_TS_MO_6100280_YYYYMMDD
IR_TS_MO_6100280_YYYYMM IR_TS_MO_6100280 IR_WS_MO_6100280_YYYYMMDD
IR_WS_MO_6100280_YYYYMM IR_WS_MO_6100280,Puertos del Estado (Spain),2751,ATMS CNDC
DEPH DRYT FREQUENCY FREQUENCY_BOUNDS HCDT HCSP PSAL STHETA1 TEMP THETA1 VHM0
VMDR VPED VSPEC1D VTM02 VTPK VZMX WDIR,40.68,1.47,2020-05-08T13:00:00Z
6100281,2020-05-08T13:24:29Z,2020-05-08T13:20:58Z,6100281,IR_TS_MO_6100281_YYYYMMDD
IR_TS_MO_6100281_YYYYMM IR_TS_MO_6100281 IR_WS_MO_6100281_YYYYMMDD
IR_WS_MO_6100281_YYYYMM IR_WS_MO_6100281,Puertos del Estado (Spain),2751,ATMS CNDC
DEPH DRYT FREQUENCY FREQUENCY_BOUNDS HCDT HCSP PSAL STHETA1 TEMP THETA1 VHM0
VMDR VPED VSPEC1D VTM02 VTPK WDIR,39.52,0.2,2020-05-08T13:00:00Z
6100284,2020-05-08T13:24:29Z,2020-05-
08T10:02:23Z,6100284,GL_TS_MO_6100284_YYYYMMDD GL_TS_MO_6100284_YYYYMM
GL_TS_MO_6100284,IFREMER Institut Francais de Recherche pour l'Exploitation de la
Mer,1054,ATMS DC_REFERENCE DEPH DRYT GSPD LGH4 POSITIONING_SYSTEM PRRD RELH WDIR
WSPD,43.3189,4.8662,2020-05-08T07:33:20Z

# IV FILE FORMAT

## IV.1 NetCDF

The products are stored using the NetCDF format.

To know more about the NetCDF format, please follow this link:

What is the format of Copernicus Marine products ? NetCDF

To understand the differences between netCDF and Zarr, please consult this article:

how-to-choose-between-netcdf-and-zarr-format-using-the-toolbox

The products are compliant with the NetCDF Climate and Forecast Convention CF-1.6 (see http://cf-pcmdi.llnl.gov/).

The INSITU_GLO_BGC_DISCRETE_MY_013_046 product is distributed in netCDF4 format.

## IV.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…

## IV.3 Structure of files

Examples of the header of output NetCDF files are inserted in annex, for each dataset.

# V REFERENCES

Jaccard, P. et al. (2024) Quality Information Document In Situ TAC INSITU_GLO_BGC_DISCRETE_MY_013_046. And Synthetic Quality Overview document (SQO). http://doi.org/10.13155/54846

# VI ANNEX

Below is an example of an output file showing all information provided in the files.

**File "GL_PR_BO_18DD9201.nc"**

File type: Hierarchical Data Format, version 5

```
netcdf /Users/a21627/Downloads/Copernicus/BGC_REP_2024NOV/ARC/BO/GL_PR_BO_18DD9201.nc {
  dimensions:
    DEPTH = 7;
    TIME = 4;
    STRING32 = 32;
    STRLEN = 8;
  variables:
    double TIME(TIME=4);
      :long_name = "Time";
      :standard_name = "time";
      :units = "days since 1950-01-01T00:00:00Z";
      :valid_min = -90000.0; // double
      :valid_max = 90000.0; // double
      :uncertainty = " ";
      :axis = "T";
      :ancillary_variables = "TIME_QC";
      :calendar = "standard";
      :_ChunkSizes = 4U; // uint

    byte TIME_QC(TIME=4);
      :long_name = "Time quality flag";
      :valid_min = 0B; // byte
      :valid_max = 9B; // byte
      :flag_values = 0B, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B, 9B; // byte
      :flag_meanings = "no_qc_performed good_data probably_good_data
bad_data_that_are_potentially_correctable bad_data value_changed value_below_detection nominal_value
interpolated_value missing_value";
      :_FillValue = -127B; // byte
      :_ChunkSizes = 4U; // uint

    float LATITUDE(TIME=4);
      :long_name = "Latitude of each location";
      :standard_name = "latitude";
      :units = "degree_north";
      :valid_min = -90.0f; // float
      :valid_max = 90.0f; // float
      :uncertainty = " ";
      :axis = "Y";
      :ancillary_variables = "POSITION_QC";
      :_ChunkSizes = 4U; // uint

    float LONGITUDE(TIME=4);
      :long_name = "Longitude of each location";
      :standard_name = "longitude";
      :units = "degree_east";
      :valid_min = -180.0f; // float
      :valid_max = 180.0f; // float
      :uncertainty = " ";
      :axis = "X";
      :ancillary_variables = "POSITION_QC";
      :_ChunkSizes = 4U; // uint

    byte POSITION_QC(TIME=4);
      :long_name = "Position quality flag";
      :valid_min = 0B; // byte
      :valid_max = 9B; // byte
      :flag_values = 0B, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B, 9B; // byte
```

```
      :flag_meanings = "no_qc_performed good_data probably_good_data
bad_data_that_are_potentially_correctable bad_data value_changed value_below_detection nominal_value
interpolated_value missing_value";
      :_FillValue = -127B; // byte
      :_ChunkSizes = 4U; // uint

    char DC_REFERENCE(TIME=4, STRING32=32);
      :long_name = "Station/Location unique identifier in data centre";
      :_FillValue = " ";
      :_ChunkSizes = 4U, 32U; // uint

    char DIRECTION(TIME=4);
      :long_name = "Direction of the profiles";
      :flag_values = "A, D, U";
      :flag_meanings = "ascending_profile descending_profile unknown";
      :_FillValue = " ";
      :_ChunkSizes = 4U; // uint

    char TRAJECTORY(STRLEN=8);
      :long_name = "trajectory";
      :cf_role = "trajectory_id";
      :_ChunkSizes = 8U; // uint

    float DEPH(TIME=4, DEPTH=7);
      :_FillValue = 9.96921E36f; // float
      :long_name = "Depth";
      :standard_name = "depth";
      :units = "m";
      :valid_min = -12000.0f; // float
      :valid_max = 12000.0f; // float
      :uncertainty = " ";
      :axis = "Z";
      :positive = "down";
      :reference = "sea_level";
      :data_mode = "R";
      :ancillary_variables = "DEPH_QC";
      :_ChunkSizes = 4U, 7U; // uint

    byte DEPH_QC(TIME=4, DEPTH=7);
      :valid_max = 9B; // byte
      :flag_values = 0B, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B, 9B; // byte
      :_FillValue = -127B; // byte
      :long_name = "Depth quality flag";
      :valid_min = 0B; // byte
      :flag_meanings = "no_qc_performed good_data probably_good_data
bad_data_that_are_potentially_correctable bad_data value_changed value_below_detection nominal_value
interpolated_value missing_value";
      :_ChunkSizes = 4U, 7U; // uint

    float DOX2(TIME=4, DEPTH=7);
      :long_name = "Dissolved oxygen";
      :data_mode = "R";
      :ancillary_variables = "DOX2_QC";
      :standard_name = "moles_of_oxygen_per_unit_mass_in_sea_water";
      :units = "µmol kg-1";
      :coordinates = "TIME LATITUDE LONGITUDE DEPH TRAJECTORY";
      :_FillValue = 9.96921E36f; // float
      :_ChunkSizes = 4U, 7U; // uint

    byte DOX2_QC(TIME=4, DEPTH=7);
      :valid_max = 9B; // byte
      :flag_values = 0B, 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B, 9B; // byte
      :flag_meanings = "no_qc_performed good_data probably_good_data
bad_data_that_are_potentially_correctable bad_data value_changed value_below_detection nominal_value
interpolated_value missing_value";
      :coordinates = "TIME LATITUDE LONGITUDE DEPH TRAJECTORY";
      :long_name = "Dissolved oxygen quality flag";
      :valid_min = 0B; // byte
      :_FillValue = -127B; // byte
      :_ChunkSizes = 4U, 7U; // uint

  // global attributes:
  :platform_code = "18DD9201";
  :platform_name = "UNKNOWN";
  :wmo_platform_code = "18DD9201";
```

```
  :ices_platform_code = " ";
  :coriolis_platform_code = "18DD9201";
  :site_code = " ";
  :comment = " ";
  :source = "unknown";
  :source_platform_category_code = "0";
  :institution = "Unknown institution";
  :institution_edmo_code = "1051";
  :institution_country = "Unknown";
  :institution_references = " ";
  :naming_authority = "Copernicus Marine In Situ";
  :title = "Global Ocean - In Situ Observation Copernicus";
  :summary = " ";
  :data_mode = "R";
  :wmo_instrument_type = 810; // int
  :area = "Global Ocean";
  :geospatial_lat_min = "48.53580";
  :geospatial_lat_max = "48.84430";
  :geospatial_lon_min = "-125.45420";
  :geospatial_lon_max = "-125.03430";
  :geospatial_vertical_min = "1.00";
  :geospatial_vertical_max = "90.00";
  :time_coverage_start = "1992-10-29T09:15:00Z";
  :time_coverage_end = "1992-10-31T02:09:00Z";
  :cdm_data_type = "profile";
  :featureType = "trajectoryProfile";
  :bottom_depth = " ";
  :last_date_observation = "1992-10-31T02:09:00Z";
  :last_latitude_observation = "48.64980";
  :last_longitude_observation = "-125.03430";
  :references = "http://marine.copernicus.eu http://www.marineinsitu.eu";
  :license = "https://marine.copernicus.eu/user-corner/service-commitments-and-licence";
  :update_interval = "PT1H";
  :citation = "These data were collated within the Copernicus Marine Service (In Situ) and EMODnet
collaboration framework. Data is made freely available by the Copernicus Marine Service and the
programs that contribute to it.";
  :doi = "https://doi.org/10.13155/59938 https://doi.org/10.13155/40846 https://doi.org/10.13155/53381
https://doi.org/10.13155/36230 https://doi.org/10.13155/43494";
  :creator_name = " ";
  :id = "GL_PR_BO_18DD9201";
  :netcdf_version = "netCDF-4 classic model";
  :format_version = "2.0";
  :Conventions = "CF-1.11 Copernicus-InSituTAC-FormatManual-2.0.0 Copernicus-InSituTAC-ParametersList-
3.3.0 Copernicus-InSituTAC-AttributesList-1.0.0";
  :date_modified = "2023-11-21T19:56:16Z";
  :history = "2023-11-21T19:56:16Z : Creation";
  :publisher_email = "cmems-service@ifremer.fr";
  :publisher_name = "Copernicus Marine Service";
  :publisher_url = "https://marine.copernicus.eu/ http://www.marineinsitu.eu/";
  :publisher_institution = "Ifremer";
}
```