European Commission

PRODUCT USER MANUAL

In Situ TAC T&S REP Product

INSITU_GLO_PHY_TS_DISCRETE_MY_013_001

Issue: 1.15

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Approval Date : November 2023

Copernicus Europe's eyes on Earth

Copernicus Marine Service

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RECORD TABLE

Issue	Date	§	Description of Change	Author	Validated By
1.0	10/06/2013		Creation of the document	GROUAZEL Antoine	S Pouliquen
1.2	16/01/2014		Update for CORA-GLOBAL 4.0	GROUAZEL Antoine	S Pouliquen
1.3	15/12/2014		Update for CORA 4.1	Tanguy Szekely	L. Crosnier
1.4	May 1 2015	all	Change format to fit CMEMS graphical rules		L. Crosnier
1.5	Dec 10 2015	All	Change MyOcean in CMEMS Update for CMEMS V2	S. Pouliquen Tanguy Szekely	S. Pouliquen
1.6		All	Update for CORA4,2	Tanguy Szekely	
1.7	19/12/2016		Update for CORA 5.0	Tanguy Szekely	
1.8	01/03/2018		Update for CORA 5.1	Tanguy Szekely	
1.9	04/04/2019		Update for CORA 5.2 and Easy CORA	Tanguy Szekely	
1.10	10/09/2019		Cora version no longer in dataset name	Stéphane Tarot Tanguy Szekely	
1.11	11/09/2020		Switch to the Netcdf file format	Tanguy Szekely	
1.12	25.06.2021		Update of the data validation	Tanguy Szekely	
1.13	10/02/2022		Spring 2022 release update	Tanguy Szekely	S. Tarot
1.14	12/05/2022		Change template and product/dataset names Change file bigram format	Tanguy Szekely	S. Tarot
1.15	15/06/2023		Dataset update – File format update	Tanguy Szekely	Copernicus Marine Product management

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GLOSSARY AND ABBREVIATIONS

CF	Climate Forecast (convention for NetCDF)
CORA	COriolis Re-Analysis
CORIOLIS	In situ data system for operational oceanography
DT	Delayed Time
EU	European Union
FTP	File Transfer Protocol
GDAC	Global Data Archiving Centre
GTS	Meteorological data exchange network
INS	In situ
ISAS	In Situ Analysis System
MFC	Monitoring and Forecasting Centre
CMEMS	Copernicus Marine Environment Monitoring Service
MOI	Mercator Ocean International
NetCDF	Network Common Data Form
NRT	Near Real Time
OA	Objective Analysis
PUM	Product User Manual
RAN	ReANalysis
R&D	Research and Development
RT	Real Time
S	Sea Salinity

T	Sea Temperature
TAC	Thematic Assembly Centre

I INTRODUCTION

I.1 Scope of this document

This Product User Manual describes the CORA-GLOBAL dataset and the additional dataset EasyCORA (subset of the previous one with best quality). These datasets are distributed as part of the product INSITU_GLO_PHY_TS_DISCRETE_MY_013_001 in the Copernicus Marine catalogue. This document explains how the datasets are build, what the content is, which data services are available to have access to the data.

I.2 The Copernicus Marine Service

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 for marine applications: maritime safety, marine resources, marine and coastal environment and climate, seasonal and weather forecasting. The Copernicus In Situ TAC prepares re-analysed datasets for reanalysis activities performed by the Copernicus MFCs and external users in collaboration with the SeaDataNet infrastructure and the EMODnet program for the global ocean and the European regional seas.

I.3 Short introduction to the product

Product INSITU_GLO_PHY_TS_DISCRETE_MY_013_001 is generated by the company OceanScope and the Coriolis team (the Data Centre and the R&D team) in Brest, France. It provides global Temperature and Salinity observations. The CORA dataset (also called CORA-GLOBAL, Cabanes *et al.*, 2013, doi:10.5194/osd-9-1273-2012) is a reanalysis of the Real / Near Real Time insitu dataset in delayed-mode. The Easy CORA dataset in an extraction of the CORA-GLOBAL dataset providing only the best quality measurements with a vertical and temporal sub setting.

II DESCRIPTION OF THE PRODUCT SPECIFICATION

CORA-GLOBAL is a In-situ global temperature and salinity dataset that aggregates data from Coriolis database which is the In Situ TAC Global component of the Copernicus Marine Service. This dataset is updated twice a year by R&D Coriolis team. The spring release corresponds to profiles dated up to June of the n-1 year. The November release corresponds to December of year n-1. The data are extracted in NetCDF Argo format at a given date. The dataset contains data from different types of instruments: mainly Argo floats, XBT, CTD and XCTD, and Moorings (see table 2). The data are stored in different files types: PF, XB, CT, OC, MO, BA, TE ... explained hereafter in the manual (§IVI). Measurements from CORA have been through both Coriolis validation (automatic checks, objective analysis) and a delayed-mode validation (format and range checks, climatological tests, spike checks, duplicates checks, XBT correction, ultimate objective analysis).

II.1 General information

The program Coriolis has been setup at Ifremer at the beginning of the 2000's in the wake of the development of operational oceanography in France. The project was launched in order to provide ocean insitu measurements to the French operational ocean analysis and forecasting system (Mercator-Océan) and to contribute to a continuous, automatic, and permanent observation networks. The Coriolis data centre has been set up to gather, qualify and distribute data from the global ocean both in real and delayed time. The Coriolis database is a real time database as it is updated every day as new data arrive. On the contrary, the CORA dataset corresponds to an extraction of all in situ temperature and salinity data from the Coriolis database at a given time. All the data is then re-qualified.

The first release of CORA dataset was in 2007. Since CORA 3.4 it is integrated to MyOcean project as the Temperature and salinity reprocessed product (T&S REP) from the global region of the In Situ TAC. Data in CORA correspond to data in global Distribution Unit but with extra assessments. From the user point of view this dataset is more reliable than *monthly latest* or *history* distribution but it is less up-to-date since there is only twice release of CORA per year.

Moreover, the file format is not the official Copernicus file format because CORA main users are modellers that need a specific classification per date to ease the assimilation in models.

The CORA products are now diffused by the Copernicus Marine Service.

II.2 History of the product

The CORA dataset production is stable since the version 5.2 (April 2019). Table 1 sums up the evolution of the CORA product before this release.

The whole validation and update process for this product is performed twice a year: around June for temporal extension of six months and at the end of the year (November-December) for temporal extension of six months and also several possible modifications or improvements of the product including full reprocessing.

In the December 2020 major release, the CORA dataset file format have been moved from the netcdf-3.4 file format to the netcdf-4 file format.

	diffusion date	**starting extraction date (netcdf)**	**Dataset time span**	**Severity**	**New Features**	**Authors**
CORA1.0	2007		1990-2005	Major	Beta version	Emmanuelle Autret
CORA2.2	2009		1990-2008	Major	+procedures de validation (climatological checks) +analyse objective (gridded fields)	Cécile Pertuisot Cécile Cabanes
CORA3.1	2010		1990-2009 extended to 2010 (v3.1.2)	Major	+2009 +Development of update process from N-1 version	Cécile Cabanes François Paris Antoine Grouazel
CORA3.2	Septembe r 2011	14/03/2011	1990-2010	Minor	+2010 +duplicate detection/suppression +XBT correction from *Hamon et al, 2011* +Sea mammals data +model assimilation feedbacks (glorys1v1)	Cécile Cabanes Antoine Grouazel

CORA3.3	September 2012	January to September 2011: 04/10/2011 October to December 2011: 22/03/2012	1990-2011	Minor	+2011 +Article submitted to Ocean Science +integration of alerts from objective analysis standardisation	Antoine Grouazel
CORA3.4	April 2013	22/01/2013	1990-2011	Minor	+ ICES data from coriolis database for V3 of MyOcean.	Antoine Grouazel
CORA4.0	January 2014 (V4 Myocean)	28/05/2013 up to 15/06/2013	1990-2012	Major	+2012 +Time series data (TSG, FerryBox, Drifters, Moorings) +Integration of alerts from objective analysis residuals	Antoine Grouazel Emilie Brion
CORA 4.1	January 2015	02/01/2015	1950-1989 (Extraction from EN4) + 1990-2013	Minor	+ 2013 + TSG data, delayed mode sea mammals and surface drifters + Integration of XBT and CTD from EN4	Tanguy Szekely Emilie Brion Jerôme Gourrion
CORA 4.2	January 2015	15/01/2015	1950-1989 (Extraction from EN4) + 1990-2014	Major	+ 2014 + 2,4 million profiles from the SHOM (Service Hydrographique de la Marine), mostly of XBTs CTDs and MBTs from 1950 to 2009	Tanguy Szekely Emilie Brion Jerôme Gourrion
CORA5.0	April 2017	15/05/2016	1950-2015	Major	+ 2015 + profiles extracted from the EN,4 dataset and validated	Tanguy Szekely Emilie Brion

						Anne Piron Jerôme Gourrion
CORA 5.1	April 2018	15/05/2017	1950-2016	Minor	Validation in delayed time mode of year 2016 and of the profiles updated from the Coriolis database since the last CORA version.	Tanguy Szekely Anne Piron Jerôme Gourrion
CORA 5.2	April 2019	15/05/2018	1950- ongoing	Major	+ Validation in delayed time mode of year 2017 and jan-june 2018 and of the profiles updated from the Coriolis database since the last CORA version. + Production of the first version of the Easy CORA dataset	Tanguy Szekely Anne Piron Jerôme Gourrion Nathalie Verbrugge Rachel Killick
CORA 5.2	Novembe r 2023	20/02/2013	1950-ongoing	Major	Change in the parameters variable format (change from int to a float and removal of the scale_factor/add_offset) Distribution of the CORA files in unzipped format.	Tanguy Szekely

Table 1 : CORA releases

II.3 Content of the product and datasets

The Coriolis centre (global region from the In Situ TAC) receives data from Argo GDAC, French research ships, GTS flow, GTSPP, GOSUD GDAC, MEDS, voluntary observing and merchants ships, moorings (TAO-TRITON-PIRATA-RAMA plus coastal moorings), and the World Ocean Database (not in real time for the last one and for CTD only). CORA thus contains data from different types of instruments: mainly Argo floats, XBT, CTD, XCTD, and moorings. Figure 1 gives an overview of the yearly number of CORA profiles and the evolution of instruments types. Table 2 gives an overview of the data providers for delayed time mode and near real time mode data for various instruments types.

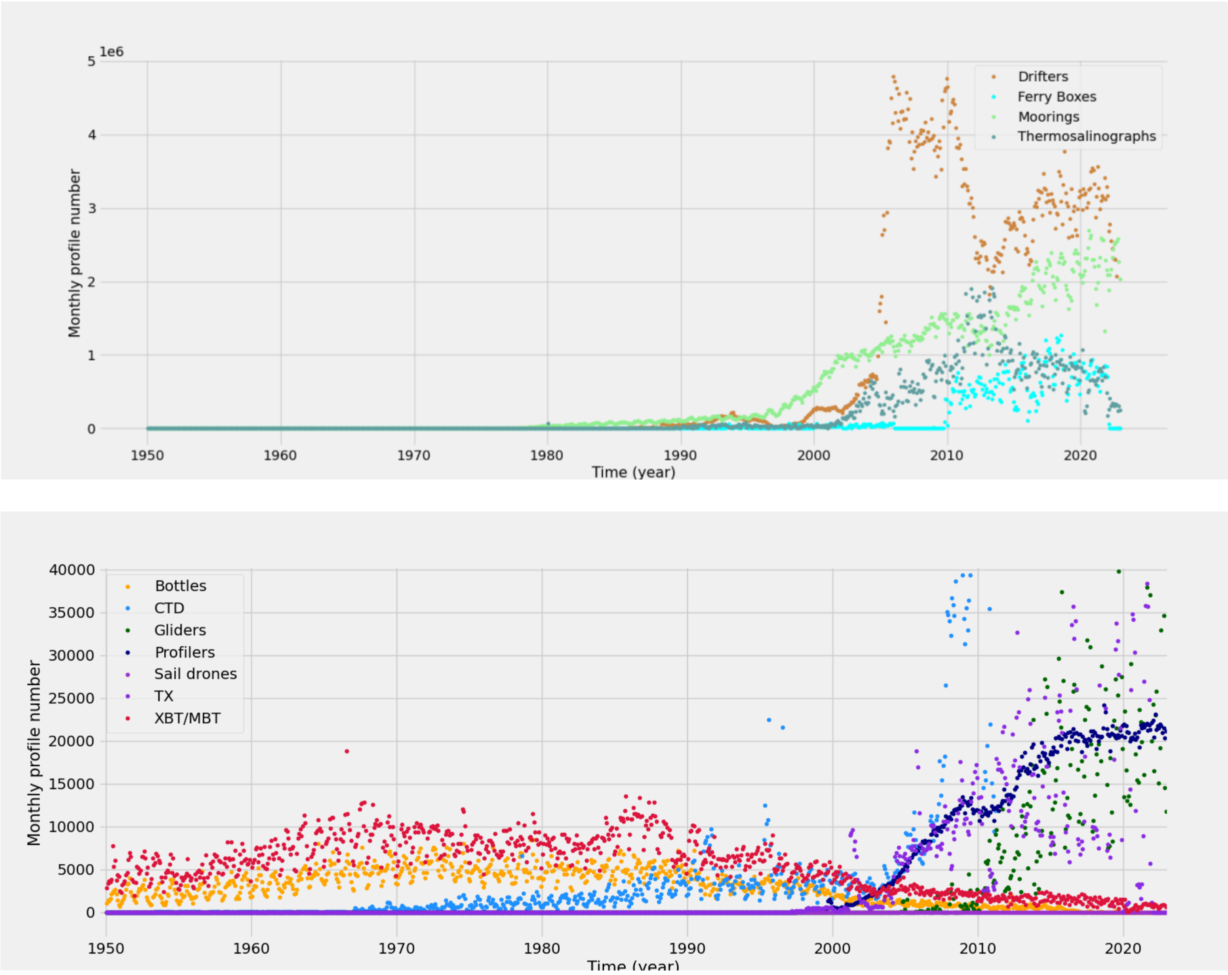

Figure 1(a,b): Yearly number of profiles in CORA dataset for each data type. Top: high frequency instruments, bot: low frequency instruments

data type.

Type of measurements	**Real time Sources**	**Delayed Mode Sources**
Gliders	Most EGO gliders data	
Drifters	GTSPP	MétéoFrance current reanalysis on SVP buoys, UDASH database

Moorings	TAO-TRITON-PIRATA-RAMA + others moorings from OceanSites network	PMEL reprocessed files, UDASH database
Profilers	Argo GDAC	Argo GDAC with PI adjustments, UDASH database
Thermo-salinographs	SSS merchant and research ships	GOSUD GDAC, UDASH database
Sea mammals	Data from CEBC animals trough GTSPP	MEMO high resolution measurements, UDASH database
XBTs, CTDs, MBTs, X-CTD, bottles, scan-fish	GTSPP (bathy or tessac)+ French research ships, Copernicus regional In Situ TAC	ICES, SeaDatanet, WOD, UDASH database, ...

Table 2 : Coriolis data sources

To simple the dataset use, the product files are distributed for the global ocean and for six sub regions covering the European and Arctic seas. Please refer to doi: 10.17882/44395 for the location of the sub-region boundaries.

II.4 Details of the datasets

The product described in Copernicus Marine catalogue is

Short Description	Product code *Dataset code*	Area	Delivery Time
Global DT	INSITU_GLO_PHY_TS_DISCRETE_MY_013_001 *cmems_obs-ins_glo_phy-temp-sal_my_cora_irr* *cmems_obs-ins_glo_phy-temp-sal_my_easycora_irr*	Global	Half-yearly

Table 3 : List of In SItu TAC products for which this manual apply

Detailed information on the INSITU_GLO_PHY_TS_DISCRETE_MY_013_001 product is available in the Quality Information Document (QUID):

https://catalogue.marine.copernicus.eu/documents/QUID/CMEMS-INS-QUID-013_001.pdf
This document is the Quality Information Document of this product. ***If you use the CORA data, please cite this article that describe CORA dataset:***

Szekely T, ***Gourrion J***, ***Pouliquen S***, ***Reverdin G. 2019***. The CORA 5.2 dataset: global in-situ temperature and salinity measurements dataset. Data description and validation. Ocean Science Discussion., 15, 1601–1614, https://doi.org/10.5194/os-15-1601-2019

To have a detailed description of the tests performed on CORA dataset please refer to the CORA product QUID document distributed in the Copernicus catalogue.

Following paragraph gives a short summary of those assessments.

Data extracted from Coriolis database has undergoes automatic checks and objectives analysis within the database. After the extraction it goes through a series of extra validation in delayed-mode: this is the added value of CORA dataset.

Name of the validation	**Description**
Measure on Earth	Compare position to bathymetry, to reject bad positions
Date check	Checks that the date corresponds to the name of the file
Parameter Range check	Check that TEMP PSAL PRES and DEPH have acceptable values

Name of the validation	Description
Constant check	Check that TEMP PSAL PRES and DEPH have different values along the vertical
Ascending immersion check	Check that PRES and/or DEPH are increasing
Duplicate levels check	Check that immersion level are not duplicated
Minmax test	Check the profiles by comparing the measurements with the minimum and maximum temperature/salinity ever measured with the ARGO floats from 2002 to 2014.
Spike check	Semi-automatic (need a visual control) check that spots spikes on profiles
Quality Flag relevance	Control that a given QC is relevant with the associated measure
Depth wrote in pressure field	Check that depth measurements are not written in PRES field (especially for XBT and X-CTD)
Duplicate profile	Detect duplicate profile and delete the one having a worse quality or less meta-data
XBT correction	Empirical correction of depth bias and temperature offset on XBTs based on the Cheng et al. 2014 correction method.
Timeseries spike test	Semi-automatic check that spots spikes in timeseries such as moorings, TSGs and surface drifters.
Satellite colocalization test	Co-localize the surface timeseries data with satellite measured SSS to detect measurement bias
Climatology colocalization test	Co-localize timeseries data (at all levels) with a monthly climatology measured SSS to detect measurement bias
Stranding test	Check if a timeseries is stranded (surface drifters) or have been recuperated by a ship

Name of the validation	**Description**
Assimilation feedback	Alerts on profiles raised by a too strong innovation value when assimilated in a model.
Ultimate objective analysis	Last step of the process that guarantee a global (spatial and temporal) consistency of the dataset by computing a residual value between each measure and the "background" given by the climatology and the other measurements.

Table 4 : CORA Validation process

III PRODUCT DISTRIBUTION

III.1 Which Download mechanism is available for this 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.

III.2 Portal ftp structure

The original product, containing temperature and salinity measure at observed levels, is called INSITU_GLO_PHY_TS_DISCRETE_MY_013_001**.**

To give more visibility to the gridded fields and standardized data that are a derived product of INSITU_GLO_PHY_TS_DISCRETE_MY_013_001**,** a new product has been added to the catalogue called INSITU_GLO_PHY_TS_OA_MY_013_052.

Those by-products are systemically built at the end of the validation process of the original data set thanks to the software ISAS dedicated to run objective analysis.

The ftp portal described here correspond to the current version of the dataset (CORA 5.2). To have a detailed description of the previous version of the dataset, please see the corresponding version of this document.

To recap Copernicus In Situ TAC service distributes on its FTP server:

1. "RAW" data that have been through the validation process in delayed-mode: **INSITU_GLO_PHY_TS_DISCRETE_MY_013_001.**
2. global gridded fields (77°S,89.89°N,180°W,180°E,z=0-2000m, 720x545x152 : longitude latitude level) built at the end of the validation process: (OA/field/) : **INSITU_GLO_PHY_TS_OA_MY_013_052**
3. geographically and daily sub-sampled data interpolated on 152 vertical levels : (OA/data/) : **INSITU_GLO_PHY_TS_OA_MY_013_052**
4. yearly Index files to browse quickly meta-data from the dataset: (Index/)

The global datasets and the corresponding extractions are distributed in the ftp portal

The following directories of the ftp portal relate to various and different data:

cmems_obs-ins_glo_phy-temp-sal_my_cora_irr: Directory containing the CORA dataset.

cmems_obs-ins_glo_phy-temp-sal_my_easycora_irr: Directory containing the EasyCORA dataset.

Inside these directories, the datasets are distributed in directory corresponding to the Copernicus sub regions: Arctic, Baltic, Black Sea, Med Sea, Northwestshelf, Southwestshelf (IBI) and Global.

For detailed information on CORA directories, please visit:

https://www.coriolis.eu.org/Science2/Global-Ocean/CORA

IV CORA FILES NOMENCLATURE AND FORMAT

IV.1 Nomenclature of files when downloaded through the Copernicus FTP Service

INSITU_GLO_PHY_TS_DISCRETE_MY_013_001/cmems_obs-ins_glo_phy-temp-sal_my_cora_irr files nomenclature when downloaded through the Copernicus FTP service is based as follows:

The INSITU files: **CO_code_YYYYMMDD_PR_TT.nc** where:

code is the name of the analysis performed: DMQCGL01

YYYYMMDD is the date of the data,

PR stands for vertical profile, **TS** stands for time serie

TT is the type of file (see Table 5)

CORA file types content:

The CORA file system is based on 17 daily file types corresponding to the instrument type of the data provider.

CODE	Meaning
BO	Bottles
CT	CTD
DB	Drifter buoys
FB	Ferry boxes
GL	Gliders
ML	Mini loggers for fishery observations
MO	Moorings
PF	Profilers
SD	Sail drones
SF	Scanfish (towed CTDs)

SM	Sea mammals
TS	Ship underway data, thermosalinograph
TX	Thermistor chain data
XB	XBT, XCTD or MBT profiles
XX	Not yet identified

Table 5 : Data file bigrams

IV.2 File Format

The products are stored using the NetCDF format.

Since December 2020 release, the products are stored using the NetCDF format (NetCDF-4). To know more about the NetCDF format, please follow this link:

What is the format of Copernicus Marine products ? NetCDF

For In Situ files, the used NetCDF format is Argo 3.3 (see https://doi.org/10.13155/29825) and for other files it is CF-1.4.

IV.3 Structure and semantic of NetCDF maps files

For CO_code_YYYYMMDD_PR_TT.nc:

```
netcdf CO_DMQCGL01_20220101_PR_PF {
dimensions:
        DATE_TIME = 14 ;
        STRING256 = 256 ;
        STRING64 = 64 ;
        STRING32 = 32 ;
        STRING16 = 16 ;
        STRING8 = 8 ;
        STRING4 = 4 ;
        STRING2 = 2 ;
        N_PROF = 682 ;
        N_PARAM = 5 ;
```

```
        N_LEVELS = 2851 ;
        N_CALIB = 1 ;
        N_HISTORY = 1 ;
variables:
        char DATA_TYPE(STRING16) ;
                DATA_TYPE:_FillValue = " " ;
                DATA_TYPE:long_name = "Data type" ;
        char FORMAT_VERSION(STRING4) ;
                FORMAT_VERSION:_FillValue = " " ;
                FORMAT_VERSION:long_name = "File format version" ;
        char HANDBOOK_VERSION(STRING4) ;
                HANDBOOK_VERSION:_FillValue = " " ;
                HANDBOOK_VERSION:long_name = "Data handbook version" ;
        char REFERENCE_DATE_TIME(DATE_TIME) ;
                REFERENCE_DATE_TIME:_FillValue = " " ;
                REFERENCE_DATE_TIME:long_name = "Date of reference for Julian days" ;
                REFERENCE_DATE_TIME:conventions = "YYYYMMDDHHMISS" ;
        char DATE_CREATION(DATE_TIME) ;
                DATE_CREATION:_FillValue = " " ;
                DATE_CREATION:long_name = "Date of file creation" ;
                DATE_CREATION:conventions = "YYYYMMDDHHMISS" ;
        char DATE_UPDATE(DATE_TIME) ;
                DATE_UPDATE:_FillValue = " " ;
                DATE_UPDATE:long_name = "Date of update of this file" ;
                DATE_UPDATE:conventions = "YYYYMMDDHHMISS" ;
        char PLATFORM_NUMBER(N_PROF, STRING32) ;
                PLATFORM_NUMBER:_FillValue = " " ;
                PLATFORM_NUMBER:long_name = "Float unique identifier" ;
                PLATFORM_NUMBER:conventions = "WMO float identifier : A9IIIII" ;
        char PROJECT_NAME(N_PROF, STRING64) ;
                PROJECT_NAME:_FillValue = " " ;
                PROJECT_NAME:long_name = "Name of the project" ;
```

```
char PI_NAME(N_PROF, STRING64) ;
        PI_NAME:_FillValue = " " ;
        PI_NAME:long_name = "Name of the principal investigator" ;
char STATION_PARAMETERS(N_PROF, N_PARAM, STRING16) ;
        STATION_PARAMETERS:_FillValue = " " ;
        STATION_PARAMETERS:long_name = "List of available parameters for the station" ;
        STATION_PARAMETERS:conventions = "Argo reference table 3" ;
int CYCLE_NUMBER(N_PROF) ;
        CYCLE_NUMBER:_FillValue = 99999 ;
        CYCLE_NUMBER:long_name = "Float cycle number" ;
        CYCLE_NUMBER:conventions = "0..N, 0 : launch cycle (if exists), 1 : first complete cycle" ;
char DIRECTION(N_PROF) ;
        DIRECTION:_FillValue = " " ;
        DIRECTION:long_name = "Direction of the station profiles" ;
        DIRECTION:conventions = "A: ascending profiles, D: descending profiles" ;
char DATA_CENTRE(N_PROF, STRING2) ;
        DATA_CENTRE:_FillValue = " " ;
        DATA_CENTRE:long_name = "Data centre in charge of float data processing" ;
        DATA_CENTRE:conventions = "Argo reference table 4" ;
char DC_REFERENCE(N_PROF, STRING32) ;
        DC_REFERENCE:_FillValue = " " ;
        DC_REFERENCE:long_name = "Station unique identifier in data centre" ;
        DC_REFERENCE:conventions = "Data centre convention" ;
char DATA_STATE_INDICATOR(N_PROF, STRING4) ;
        DATA_STATE_INDICATOR:_FillValue = " " ;
        DATA_STATE_INDICATOR:long_name = "Degree of processing the data have passed through" ;
        DATA_STATE_INDICATOR:conventions = "Argo reference table 6" ;
char DATA_MODE(N_PROF) ;
        DATA_MODE:_FillValue = " " ;
        DATA_MODE:long_name = "Delayed mode or real time data" ;
```

```
        DATA_MODE:conventions = "R : real time; D : delayed mode; A : real time with adjustment" ;
    char PLATFORM_TYPE(N_PROF, STRING32) ;
        PLATFORM_TYPE:_FillValue = " " ;
        PLATFORM_TYPE:long_name = "Type of float" ;
    char FLOAT_SERIAL_NO(N_PROF, STRING16) ;
        FLOAT_SERIAL_NO:_FillValue = " " ;
        FLOAT_SERIAL_NO:long_name = "Serial number of the float" ;
    char FIRMWARE_VERSION(N_PROF, STRING16) ;
        FIRMWARE_VERSION:_FillValue = " " ;
        FIRMWARE_VERSION:long_name = "Instrument version" ;
    char WMO_INST_TYPE(N_PROF, STRING4) ;
        WMO_INST_TYPE:_FillValue = " " ;
        WMO_INST_TYPE:long_name = "Coded instrument type" ;
        WMO_INST_TYPE:conventions = "Argo reference table 8" ;
    double JULD(N_PROF) ;
        JULD:_FillValue = 999999. ;
        JULD:long_name = "Julian day (UTC) of the station relative to REFERENCE_DATE_TIME" ;
        JULD:standard_name = "time" ;
        JULD:units = "days since 1950-01-01 00:00:00 UTC" ;
        JULD:conventions = "Relative julian days with decimal part (as parts of day)" ;
        JULD:axis = "T" ;
    char JULD_QC(N_PROF) ;
        JULD_QC:_FillValue = " " ;
        JULD_QC:long_name = "Quality on Date and Time" ;
        JULD_QC:conventions = "Argo reference table 2" ;
    double JULD_LOCATION(N_PROF) ;
        JULD_LOCATION:_FillValue = 999999. ;
        JULD_LOCATION:long_name = "Julian day (UTC) of the location relative to REFERENCE_DATE_TIME" ;
        JULD_LOCATION:units = "days since 1950-01-01 00:00:00 UTC" ;
```

```
        JULD_LOCATION:conventions = "Relative julian days with decimal part (as parts of day)" ;
    double LATITUDE(N_PROF) ;
        LATITUDE:_FillValue = 99999. ;
        LATITUDE:long_name = "Latitude of the station, best estimate" ;
        LATITUDE:standard_name = "latitude" ;
        LATITUDE:units = "degree_north" ;
        LATITUDE:valid_min = -90. ;
        LATITUDE:valid_max = 90. ;
        LATITUDE:axis = "Y" ;
    double LONGITUDE(N_PROF) ;
        LONGITUDE:_FillValue = 99999. ;
        LONGITUDE:long_name = "Longitude of the station, best estimate" ;
        LONGITUDE:standard_name = "longitude" ;
        LONGITUDE:units = "degree_east" ;
        LONGITUDE:valid_min = -180. ;
        LONGITUDE:valid_max = 180. ;
        LONGITUDE:axis = "X" ;
    char POSITION_QC(N_PROF) ;
        POSITION_QC:_FillValue = " " ;
        POSITION_QC:long_name = "Quality on position (latitude and longitude)" ;
        POSITION_QC:conventions = "Argo reference table 2" ;
    char POSITIONING_SYSTEM(N_PROF, STRING8) ;
        POSITIONING_SYSTEM:_FillValue = " " ;
        POSITIONING_SYSTEM:long_name = "Positioning system" ;
    char PROFILE_PRES_QC(N_PROF) ;
        PROFILE_PRES_QC:_FillValue = " " ;
        PROFILE_PRES_QC:long_name = "Global quality flag of PRES profile" ;
        PROFILE_PRES_QC:conventions = "Argo reference table 2a" ;
    char PROFILE_PSAL_QC(N_PROF) ;
        PROFILE_PSAL_QC:_FillValue = " " ;
        PROFILE_PSAL_QC:long_name = "Global quality flag of PSAL profile" ;
```

PROFILE_PSAL_QC:conventions = "Argo reference table 2a" ;

char PROFILE_TEMP_QC(N_PROF) ;

PROFILE_TEMP_QC:_FillValue = " " ;

PROFILE_TEMP_QC:long_name = "Global quality flag of TEMP profile" ;

PROFILE_TEMP_QC:conventions = "Argo reference table 2a" ;

char VERTICAL_SAMPLING_SCHEME(N_PROF, STRING256) ;

VERTICAL_SAMPLING_SCHEME:_FillValue = " " ;

VERTICAL_SAMPLING_SCHEME:long_name = "Vertical sampling scheme" ;

VERTICAL_SAMPLING_SCHEME:conventions = "Argo reference table 16" ;

int CONFIG_MISSION_NUMBER(N_PROF) ;

CONFIG_MISSION_NUMBER:_FillValue = 99999 ;

CONFIG_MISSION_NUMBER:long_name = "Float\'s mission number for each profile" ;

CONFIG_MISSION_NUMBER:conventions = "0..N, 0 : launch mission (if exists), 1 : first complete mission" ;

float PRES(N_PROF, N_LEVELS) ;

PRES:_FillValue = 99999 ;

PRES:long_name = "SEA PRESSURE" ;

PRES:standard_name = "sea_water_pressure" ;

PRES:units = "decibar" ;

PRES:valid_min = 0 ;

PRES:valid_max = 12000 ;

PRES:axis = "Z" ;

char PRES_QC(N_PROF, N_LEVELS) ;

PRES_QC:_FillValue = " " ;

PRES_QC:long_name = "quality flag" ;

PRES_QC:conventions = "Argo reference table 2" ;

float PRES_ADJUSTED(N_PROF, N_LEVELS) ;

PRES_ADJUSTED:_FillValue = 99999 ;

PRES_ADJUSTED:long_name = "SEA PRESSURE" ;

PRES_ADJUSTED:standard_name = "sea_water_pressure" ;

PRES_ADJUSTED:units = "decibar" ;

```
        PRES_ADJUSTED:valid_min = . ;
        PRES_ADJUSTED:valid_max = 12000. ;
        PRES_ADJUSTED:axis = "Z" ;
    char PRES_ADJUSTED_QC(N_PROF, N_LEVELS) ;
        PRES_ADJUSTED_QC:_FillValue = " " ;
        PRES_ADJUSTED_QC:long_name = "quality flag" ;
        PRES_ADJUSTED_QC:conventions = "Argo reference table 2" ;
    float PRES_ADJUSTED_ERROR(N_PROF, N_LEVELS) ;
        PRES_ADJUSTED_ERROR:_FillValue = 99999.f ;
        PRES_ADJUSTED_ERROR:long_name = "SEA PRESSURE" ;
        PRES_ADJUSTED_ERROR:units = "decibar" ;
        PRES_ADJUSTED_ERROR:C_format = "%7.1f" ;
        PRES_ADJUSTED_ERROR:FORTRAN_format = "F7.1" ;
        PRES_ADJUSTED_ERROR:resolution = 0.0001 ;
    float PSAL(N_PROF, N_LEVELS) ;
        PSAL:_FillValue = 99999 ;
        PSAL:long_name = "PRACTICAL SALINITY" ;
        PSAL:standard_name = "sea_water_salinity" ;
        PSAL:units = "psu" ;
        PSAL:valid_min = 0. ;
        PSAL:valid_max = 41. ;
    char PSAL_QC(N_PROF, N_LEVELS) ;
        PSAL_QC:_FillValue = " " ;
        PSAL_QC:long_name = "quality flag" ;
        PSAL_QC:conventions = "Argo reference table 2" ;
    float PSAL_ADJUSTED(N_PROF, N_LEVELS) ;
        PSAL_ADJUSTED:_FillValue = 99999 ;
        PSAL_ADJUSTED:long_name = "PRACTICAL SALINITY" ;
        PSAL_ADJUSTED:standard_name = "sea_water_salinity" ;
        PSAL_ADJUSTED:units = "psu" ;
        PSAL_ADJUSTED:valid_min = 0. ;
        PSAL_ADJUSTED:valid_max = 41. ;
```

```
char PSAL_ADJUSTED_QC(N_PROF, N_LEVELS) ;
        PSAL_ADJUSTED_QC:_FillValue = " " ;
        PSAL_ADJUSTED_QC:long_name = "quality flag" ;
        PSAL_ADJUSTED_QC:conventions = "Argo reference table 2" ;
float PSAL_ADJUSTED_ERROR(N_PROF, N_LEVELS) ;
        PSAL_ADJUSTED_ERROR:_FillValue = 99999.f ;
        PSAL_ADJUSTED_ERROR:long_name = "PRACTICAL SALINITY" ;
        PSAL_ADJUSTED_ERROR:units = "psu" ;
        PSAL_ADJUSTED_ERROR:C_format = "%9.3f" ;
        PSAL_ADJUSTED_ERROR:FORTRAN_format = "F9.3" ;
        PSAL_ADJUSTED_ERROR:resolution = 0.0001 ;
float TEMP(N_PROF, N_LEVELS) ;
        TEMP:_FillValue = 99999 ;
        TEMP:long_name = "SEA TEMPERATURE IN SITU ITS-90 SCALE" ;
        TEMP:standard_name = "sea_water_temperature" ;
        TEMP:units = "degree_Celsius" ;
        TEMP:valid_min = -2. ;
        TEMP:valid_max = 40. ;
char TEMP_QC(N_PROF, N_LEVELS) ;
        TEMP_QC:_FillValue = " " ;
        TEMP_QC:long_name = "quality flag" ;
        TEMP_QC:conventions = "Argo reference table 2" ;
float TEMP_ADJUSTED(N_PROF, N_LEVELS) ;
        TEMP_ADJUSTED:_FillValue = 99999 ;
        TEMP_ADJUSTED:long_name = "SEA TEMPERATURE IN SITU ITS-90 SCALE" ;
        TEMP_ADJUSTED:standard_name = "sea_water_temperature" ;
        TEMP_ADJUSTED:units = "degree_Celsius" ;
        TEMP_ADJUSTED:valid_min = -2. ;
        TEMP_ADJUSTED:valid_max = 40. ;
char TEMP_ADJUSTED_QC(N_PROF, N_LEVELS) ;
        TEMP_ADJUSTED_QC:_FillValue = " " ;
        TEMP_ADJUSTED_QC:long_name = "quality flag" ;
```

```
        TEMP_ADJUSTED_QC:conventions = "Argo reference table 2" ;
    float TEMP_ADJUSTED_ERROR(N_PROF, N_LEVELS) ;
        TEMP_ADJUSTED_ERROR:_FillValue = 99999.f ;
        TEMP_ADJUSTED_ERROR:long_name = "SEA TEMPERATURE IN SITU ITS-90 SCALE" ;
        TEMP_ADJUSTED_ERROR:units = "degree_Celsius" ;
        TEMP_ADJUSTED_ERROR:C_format = "%9.3f" ;
        TEMP_ADJUSTED_ERROR:FORTRAN_format = "F9.3" ;
        TEMP_ADJUSTED_ERROR:resolution = 0.0001 ;
    char PARAMETER(N_PROF, N_CALIB, N_PARAM, STRING16) ;
        PARAMETER:_FillValue = " " ;
        PARAMETER:long_name = "List of parameters with calibration information" ;
        PARAMETER:conventions = "Argo reference table 3" ;
    char SCIENTIFIC_CALIB_EQUATION(N_PROF, N_CALIB, N_PARAM, STRING256) ;
        SCIENTIFIC_CALIB_EQUATION:_FillValue = " " ;
        SCIENTIFIC_CALIB_EQUATION:long_name = "Calibration equation for this parameter" ;
    char SCIENTIFIC_CALIB_COEFFICIENT(N_PROF, N_CALIB, N_PARAM, STRING256) ;
        SCIENTIFIC_CALIB_COEFFICIENT:_FillValue = " " ;
        SCIENTIFIC_CALIB_COEFFICIENT:long_name = "Calibration coefficients for this equation" ;
    char SCIENTIFIC_CALIB_COMMENT(N_PROF, N_CALIB, N_PARAM, STRING256) ;
        SCIENTIFIC_CALIB_COMMENT:_FillValue = " " ;
        SCIENTIFIC_CALIB_COMMENT:long_name = "Comment applying to this parameter calibration" ;
    char SCIENTIFIC_CALIB_DATE(N_PROF, N_CALIB, N_PARAM, DATE_TIME) ;
        SCIENTIFIC_CALIB_DATE:_FillValue = " " ;
        SCIENTIFIC_CALIB_DATE:long_name = "Date of calibration" ;
    char HISTORY_INSTITUTION(N_HISTORY, N_PROF, STRING4) ;
        HISTORY_INSTITUTION:_FillValue = " " ;
        HISTORY_INSTITUTION:long_name = "Institution which performed action" ;
        HISTORY_INSTITUTION:conventions = "Argo reference table 4" ;
    char HISTORY_STEP(N_HISTORY, N_PROF, STRING4) ;
```

```
            HISTORY_STEP:_FillValue = " " ;
            HISTORY_STEP:long_name = "Step in data processing" ;
            HISTORY_STEP:conventions = "Argo reference table 12" ;
    char HISTORY_SOFTWARE(N_HISTORY, N_PROF, STRING4) ;
            HISTORY_SOFTWARE:_FillValue = " " ;
            HISTORY_SOFTWARE:long_name = "Name of software which performed action"
;
            HISTORY_SOFTWARE:conventions = "Institution dependent" ;
    char HISTORY_SOFTWARE_RELEASE(N_HISTORY, N_PROF, STRING4) ;
            HISTORY_SOFTWARE_RELEASE:_FillValue = " " ;
            HISTORY_SOFTWARE_RELEASE:long_name = "Version/release of software
which performed action" ;
            HISTORY_SOFTWARE_RELEASE:conventions = "Institution dependent" ;
    char HISTORY_REFERENCE(N_HISTORY, N_PROF, STRING4) ;
            HISTORY_REFERENCE:_FillValue = " " ;
            HISTORY_REFERENCE:long_name = "Reference of database" ;
            HISTORY_REFERENCE:conventions = "Institution dependent" ;
    char HISTORY_DATE(N_HISTORY, N_PROF, DATE_TIME) ;
            HISTORY_DATE:_FillValue = " " ;
            HISTORY_DATE:long_name = "Date the history record was created" ;
            HISTORY_DATE:conventions = "YYYYMMDDHHMISS" ;
    char HISTORY_ACTION(N_HISTORY, N_PROF, STRING4) ;
            HISTORY_ACTION:_FillValue = " " ;
            HISTORY_ACTION:long_name = "Action performed on data" ;
            HISTORY_ACTION:conventions = "Argo reference table 7" ;
    char HISTORY_PARAMETER(N_HISTORY, N_PROF, STRING16) ;
            HISTORY_PARAMETER:_FillValue = " " ;
            HISTORY_PARAMETER:long_name = "Station parameter action is performed
on" ;
            HISTORY_PARAMETER:conventions = "Argo reference table 3" ;
    float HISTORY_START_PRES(N_HISTORY, N_PROF) ;
            HISTORY_START_PRES:_FillValue = 99999.f ;
            HISTORY_START_PRES:long_name = "Start pressure action applied on" ;
```

```
HISTORY_START_PRES:units = "decibar" ;
float HISTORY_STOP_PRES(N_HISTORY, N_PROF) ;
HISTORY_STOP_PRES:_FillValue = 99999.f ;
HISTORY_STOP_PRES:long_name = "Stop pressure action applied on" ;
HISTORY_STOP_PRES:units = "decibar" ;
float HISTORY_PREVIOUS_VALUE(N_HISTORY, N_PROF) ;
HISTORY_PREVIOUS_VALUE:_FillValue = 99999.f ;
HISTORY_PREVIOUS_VALUE:long_name = "Parameter/Flag previous value before action" ;
char HISTORY_QCTEST(N_HISTORY, N_PROF, STRING16) ;
HISTORY_QCTEST:_FillValue = " " ;
HISTORY_QCTEST:long_name = "Documentation of tests performed, tests failed (in hex form)" ;
HISTORY_QCTEST:conventions = "Write tests performed when ACTION=QCP$; tests failed when ACTION=QCF$" ;

// global attributes:
:doi = " 10.17882/46219" ;
:pi_name = "Tanguy Szekely" ;
:qc_manual = "Recommendations for in-situ data Near Real Time Quality Control https://doi.org/10.13155/36230" ;
string :author = "Société Coopérative ARL OceanScope" ;
:contact = "cmems-service@ifremer.fr" ;
:netcdf_version = "netCDF-4 classic model" ;
:format_version = "3.3" ;
:Conventions = "CF-1.8 Copernicus-InSituTAC-FormatManual-1.42 Copernicus-InSituTAC-SRD-1.5 Copernicus-InSituTAC-ParametersList-3.2.0" ;
:date_update = "2023-06-12T10:20:11Z" ;
}
```

V EASYCORA FILE NAMING, CONVENTION AND FORMAT

V.1 Nomenclature of files when downloaded through the Copernicus FTP Service

INSITU_GLO_PHY_TS_DISCRETE_MY_013_001/cmems_obs-ins_glo_phy-temp-sal_my_easycora_irr files nomenclature when downloaded through the Copernicus FTP service is based as follows:

-The INSITU files: **ECO_code_YYYYMMDD_PR_TT.nc** where:

code is the name of the analysis performed: DMQCGL01

YYYYMMDD is the date of the data,

PR stands for vertical Profile, **TS** stands for time serie

TT is the type of file (see Table 5)

Easy CORA file types content:

- **PR_PF files**: data from Argo floats directly received from the Argo DACS (real Time and delayed mode if available[1]).
- **PR_BT files:** XBT and MBT measurements extracted from the CORA files
- **PR_CT files:** All the other profiles distributed from the CORA dataset
- **TS_TM files:** Timeseries from the tropical moorings (TAO/TRITON/RAMA/PIRATA moorings)
- **TS_MO files:** all the other moorings
- **TS_TS files:** TSG measurements
- **TS_DR files:** Drifters timeseries measurements

[1]Principal Investigators have to provide a delayed mode validation on their floats within 6months after the date of observation

V.2 Easy CORA data and metadata

V.2.1 Best estimation of the parameters

The measured ocean parameters distributed by the Easy CORA dataset are the longitude, LONGITUDE, the latitude, LATITUDE, the time of the observation, JULD, the ocean pressure PRES or the depth, DEPTH, the in-situ temperature TEMP and the in-situ salinity PSAL. The parameters POSITION_QC, JULD_QC, TEMP_QC, PSAL_QC, PRES_QC and DEPTH_QC corresponding to the QC applied to the measurements are also distributed. In the cases were the measured parameter is the sea water pressure the corresponding depth is calculated.

The sea water density is calculated with EOS80 function.

In any cases, the measured parameters only are registered in the **STATION_PARAMETERS** metadata. The estimated PRES or DEPTH is registered in the **ESTIMATED_STATION_PARAMETERS** metadata.

The best estimation of the CORA parameters meets the following conditions:

- For the TEMP, PSAL, PRES and DEPTH parameters, if an adjusted version of the parameter is available (not at fillvalue), the adjusted version must be considered for the whole profile. In the other case, the original version of the parameter is considered. This method is applied independently for each parameter.
- If the temperature and the salinity parameters are both at fillvalue or with a QC at 3 or 4, the measurement must not be extracted. In the case of the measurements performed by deep ARGO (ARGO profilers, measurements below 2000m depth), if the parameter QC is at 3, if should be reset to 2 and extracted in the Easy CORA database.
- If the pressure and the depth parameters are both at fillvalue or with a QC at 3 or 4, the measurement must not be extracted.
- If the POSITION_QC parameter of the JULD_QC parameter are at 3 or 4, the whole profile must not be extracted.

V.2.2 Profiles subsampling

Vertical subsampling

A vertical subsampling is applied to the profiles in the **PR** files on the Easy CORA distribution. The vertical subsampling scheme follows the following recommendation.

The vertical axis is divided into bins with varying thickness from surface to bottom ocean. The thickness of the vertical bins is defined in table 6:

Depth/pressure	**bin thickness**

0-200 m	1 m
200-1000m	10m
1000- seafloor	50m

Table 6 Thickness of the vertical bin

For each profile, a single measurement is taken in each vertical bin. The selected measurement is the first measurement contained in the bin with all parameters with a good QC.

The measurement decision criterion is defined by a weighting point-based algorithm (see table 7). Points are attributed to every measurement level contained in a bin, the measurement level with the maximum points is selected. In case of equality, the measurement level with the greater distance from the measurement of the bin located immediately below is selected.

parameter	**Weight**
Parameter PRES not at fillvalue	100
Parameter DEPTH not at fillvalue	100
Parameter PSAL not at fillvalue	100
Parameter TEMP not at fillvalue	100
QC = 1	10
QC = 2|5|7|8	5

Table 7 *: Scale of the points applied to estimate the relevance of a measurement level.*

The points are defined in the 'Weight' column in table 7. All the points accumulated by a measurement level are summed to give the relevance of a layer.

In the case of vertical subsampling performed on a profile, the metadata **VERTICAL_SUBSAMPLING_STATUS** relative to the profile should be set to **1** (it will be set to 0 otherwise). The metadata **TEMP_SUBSAMPLING_REPRESENTATIVITY**, and **PSAL_SUBSAMPLING_REPRESENTATIVITY** must also be filled.

The **TEMP_SUBSAMPLING_REPRESENTATIVITY** is given by the distance in the mean square sense between the original profile and the subsampled profile, interpolated to the original profiles levels. This ratio varies from 0 if no subsampling has been performed to increasing positive numbers if the subsampling fails to describe the measured ocean variability.

A similar calculation is performed on the salinity measurements to fill the **PSAL_SUBSAMPLING_REPRESENTATIVITY** field.

Time subsampling

A time subsampling may be applied to the profiles in the **PR** files on the Easy CORA distribution. The aim of this time subsampling is to reduce the number of close profiles in time (and space) distributed by Easy CORA. The windowing of the time sampling as a function of the probe type is given on table 8.

Probe type	**Time window**
Sea Glider	1 hour
Scanfish/Seasoar	1 hour
XBT	6 hours | 10 km
CTD	6 hours
MBT	6 hours
Sea Mammals	6 hours
Profilers	6 hours
Other instruments	6 hours

Table 8 : Time window of the profile's time subsampling as a function of the probe type.

For **each measuring instrument** distributed in the CORA database, a single profile shall be distributed in the Easy CORA dataset, per time window defined in table 8.

The profile selection method is similar to the vertical thinning method defined in previous section. However, for the time profile selection method, the weighting points are summed over all levels in the profile and the profile with the most weight is selected. In case of equality, the profile which is most distant in time from the other profiles distributed in Easy CORA for this instrument is selected.

In the cases were a time subsampling is performed, the metadata **TIME_SUBSAMPLING_STATUS** must be set to 1 in the Easy CORA file, it will be 0 otherwise.

The **REMOVED_PROFILES_DC_REFERENCE** metadata must provide the dc_reference number associated to all the profiles removed in the time subsampling process.

V.2.3 Metadata distribution

The list of the metadata directly extracted from the CORA files is given below:

Variable: **REFERENCE_DATE_TIME**

Dimensions: DATE_TIME

Attributes:

long_name: "Date of reference for Julian days"

conventions: "YYYYMMDDHHMISS"

Variable: **DATE_CREATION**

Dimensions: DATE_TIME

Attributes:

long_name: "Date of file creation"

conventions: "YYYYMMDDHHMISS"

Variable: **DATE_UPDATE**

Dimensions: DATE_TIME

Attributes:

long_name: "Date of update of this file"

conventions: "YYYYMMDDHHMISS"

Variable: **CYCLE_NUMBER**

Dimensions: N_PROF

Attributes:

long_name: "Float cycle number"

conventions: "0..N, 0: launch cycle (if exists), 1, first complete cycle, etc…"

FillValue: 99999

Variable: **DATA_MODE**

Dimensions: N_PROF

Attributes:

long_name: "Delayed mode or real time data"

conventions: "R: real mode; D: delayed mode; A: real time with adjustment"

FillValue: " "

Variable: **DATA_TYPE**

Dimensions: N_PROF, STRING256

Attributes:

long_name: "Data type"

FillValue: " "

Variable: **DC_REFERENCE**

Dimensions:N_PROF, STRING32

Attributes:

long_name: "Station unique identifier in data centre"

FillValue: " "

Variable: **DEPTH**

Dimensions: N_PROF, N_LEVELS

Attributes:

long_name: "Depth under sea surface"

standard name: "depth"

units: "meter"

valid_min: 0

valid_max: 12000

FillValue: 99999

Variable: **DEPTH_QC**

Dimensions: N_PROF, N_LEVELS

Attributes:

long_name: "quality flag"

conventions: "Argo reference table 2"

FillValue: " "

Variable: **TIME**

Dimensions: N_PROF

Attributes:

long_name: "Julian day (UTC) of the station relative to REFERENCE_DATE_TIME"

standard_name: "time"

units: "days s"

conventions: "relative julian days with decimal part (as parts of day)"

FillValue: 99999

Axis: "T"

Variable: **TIME_QC**

Dimensions: N_PROF

Attributes:

long_name: Quality on date and time

conventions: "Argo reference table 2"

FillValue: " "

Variable: **LATITUDE**

Dimensions: N_PROF

Attributes:

long_name: "latitude of the station, best estimate"

standard_name: "latitude"

units: "degree north"

valid_min: -90

valid_max: 90

axis: "Y"

FillValue: 99999

Variable: **LONGITUDE**

Dimensions: N_PROF

Attributes:

long_name: "Longitude of the station, best estimate"

standard name: "longitude"

valid_min: -180

valid_max: 180

axis: “X”

FillValue: 99999

Variable: **PLATFORM_NUMBER**

Dimensions: N_PROF, STRING32

Attributes:

long_name: “Unique platform identifier”

conventions: “WMO float identifier : A9IIIII”

FillValue: “ “

Variable: **PLATFORM_TYPE**

Dimensions: N_PROF, STRING32

Attributes:

long_name: “Type of float”

FillValue: “ “

Variable: **POSITION_QC**

Dimensions: N_PROF

Attributes:

long_name: “Quality on position (latitude and longitude)”

conventions: “Argo reference table 2”

FillValue: “ “

Variable: **PRES**

Dimensions: N_PROF, N_LEVELS

Attributes:

long_name: “SEA PRESSURE”

standard name: “sea_water_pressure”

units: “decibar”

valid_min: 0

valid_max: 12000

FillValue: 99999

Variable: **PRES_QC**

Dimensions: N_PROF, N_LEVELS

Attributes:

long_name: “quality flag”

conventions: “Argo reference table 2”

FillValue: “ “

Variable: **PROJECT_NAME**

Dimensions: N_PROF, STRING64

Attributes:

long_name: “Name of the project”

FillValue = “ “

Variable: **PSAL**

Dimensions: N_PROF, N_LEVELS

Attributes:

long_name: “PRACTICAL SALINITY”

units: “psu”

standard_name: “sea_water_salinity”

valid_min: 0

valid_max: 43

FillValue: 99999

Variable: **PSAL_QC**

Dimensions: N_PROF, N_LEVELS

Attributes:

long_name: “quality flag”

conventions: “Argo reference table 2”

FillValue: “ “

Variable: **DENS**

Dimensions: N_PROF, N_LEVELS

Attributes:

long_name: "Potential density at 1000 db"

units: "kg.m-3"

standard_name: "sea_water_potential_density"

valid_min: 0

valid_max: 150000

FillValue: 99999

Variable: **DENS_QC**

Dimensions: N_PROF, N_LEVELS

Attributes:

long_name: "quality flag"

conventions: "Argo reference table 2"

FillValue: " "

Variable: **STATION_PARAMETERS**

Dimensions: N_PROF, N_PARAM, STRING16

Attributes:

long_name: "List of measured parameters for the station"

conventions: "Argo reference table 3"

FillValue: " "

Variable: **ESTIMATED_STATION_PARAMETERS**

Dimensions: N_PROF, N_PARAM, STRING16

Attributes:

long_name: "List of estimated parameters for the station"

conventions: "Argo reference table 3"

FillValue: " "

Variable: **TEMP**

Dimensions: N_PROF, N_LEVELS

Attributes:

long_name: "SEA TEMPERATURE IN SITU ITS-90 SCALE"

units: "degree_Celsius"

standard_name: "sea_water_temperature"

valid_min: -2

valid_max: 40

FillValue: 99999

Variable: **TEMP_QC**

Dimensions: N_PROF, N_LEVELS

Attributes:

long_name: "quality flag"

conventions: "Argo reference table 2"

FillValue: " "

Variable: **WMO_INST_TYPE**

Dimensions: N_PROF, STRING4

Attributes:

long_name: "Coded instrument type"

conventions: "Data center convention"

FillValue: " "

Variable: **PROBE_TYPE**

Dimensions: N_PROF

Attributes:

long_name: "Simplified designation of the station probe type"

conventions: "PROBE_TYPE table in the dataset QUID"

FillValue: 99999

a. Easy CORA specific metadata

Variable: **VERTICAL_SUBSAMPLING_STATUS**

Dimensions: N_PROF

Attributes:

long_name: “Vertical subsampling status of the station”

conventions: “ 0: the profile has not been vertically subsampled; 1: the profile has been vertically subsampled”

FillValue: “ “

Variable: **TIME_SUBSAMPLING_STATUS**

Dimensions: N_PROF

Attributes:

long_name: “Time subsampling status of the station”

conventions: “ 0: the profile has not been subsampled in time; 1: the profile has been subsampled in time”

FillValue: “ “

Variable: **REMOVED_PROFILES_DC_REFERENCE**

Dimensions: N_PROF, STRING16, N_EV_PROF

Attributes:

long_name: “Removed profile DC_REFERENCE list”

conventions: “List the DC_REFERENCE of the profiles removed during the subsampling process. All of those profiles are in the original CORA dataset.”

FillValue: “ “

Variable: **PSAL_SUBSAMPLING_REPRESENTATIVITY**

Dimensions: N_PROF

Attributes:

long_name: “Estimator of the subsampled profile salinity representativity relative to the original profile

conventions: “CORA QUID document”

FillValue: 99999

Variable: **TEMP_SUBSAMPLING_REPRESENTATIVITY**

Dimensions: N_PROF

Attributes:

long_name: “Estimator of the subsampled profile salinity representativity relative to the original profile

conventions: “CORA QUID document”

FillValue: 99999

VI GUIDANCE FOR USERS

VI.1 How to use DC_REFERENCE?

Each profile has a unique identifier in the Coriolis database and the CORA dataset which is the DC_REFERENCE number. Please, refer to this DC_REFERENCE number if you want to make a feedback on a specific profile to the Coriolis data centre. The variable PLATFORM_NUMBER is the platform identifier that is assigned for the life of the platform (e.g. Profiling floats, moored buoys...). For measurements collected from research vessels or merchant ships-of-opportunity the PLATFORM_NUMBER is the vessel/ship identifier.

VI.2 How to find a particular data type in CORA?

This classification of the data in netcdf files depends mainly on the data sources and resolution. However, it can be difficult for the user to find all the data from one type of instrument (e.g. CTD) as it is found in different types of files (e.g. CT, OC, TE files for CTD instruments). The variable WMO_INST_TYPE in the netcdf raw files can help to distinguish the different instrument types (see table A.1).

However the same WMO_INST_TYPE can be attributed to different types of instrument platform (e.g. the WMO_INST_TYPE 830 standing for CTD is attributed to CTD launched from vessels or ships, CTD attached to sea mammals, some mooring buoys etc...).

To facilitate the identification of a particular type of data a PROBE_TYPE code was attributed to each profile (see table A.1 for definition of codes). The PROBE_TYPE variable can be found in the Index files (see section 1.3.2) and be used to select a particular type of data.

VI.3 How to find older versions of the CORA dataset?

The CORA datasets are also available on the seanoe platform, with an appropriate doi number for citation (https://doi.org/10.17882/46219). The former version of CORA will, with time, be deleted from the Copernicus catalogue. They will thus be available on the seanoe platform.

VI.4 How to select the raw or the adjusted value of a parameters?

In the CORA dataset, the parameters may be available in a regular field (TEMP for instance) and a corresponding _ADJUSTED field (TEMP_ADJUSTED in this case).

VI.5 How to use Quality Flags of a parameter?

Quality Code	meaning
0	No QC was performed
1	Good data
2	Probably good data
3	Bad data that is potentially correctable
4	Bad data
5	Value changed (almost never used)
6	Not used
7	Nominal value
8	Interpolated value
9	Missing value (99999)

Table 9: Quality flags and their definition

Quality flags exist both for the PARAM (TEMP_QC, PSAL_QC,...) and the PARAM_ADJUSTED (TEMP_ADJUSTED_QC, PSAL_ADJUSTED_QC,...). Thus if one uses the adjusted values of salinity (PSAL_ADJUSTED) it should check the flag PSAL_ADJUSTED_QC to determine if the salinity value is good or not. PARAM_ADJUSTED are filled for Argo data and XBT data but for other type of platform/instrument most of the time it is an empty field.

VI.6 How to use XBT with thermal offset and depth corrected?

For XBT profiles (PROBE_TYPE=10 in the index files) the corrected values are reported in the ADJUSTED fields: TEMP_ADJUSTED field for the temperature corrected from the thermal offset and DEPH_ADJUSTED for the depth corrected. The depth correction which stretches the values of depth can lead to negative depth value on the first level of some profiles (depending on the year, on the category of XBT and on the value of the first level).

Those negative depth values have been kept in the DEPH_ADJUSTED field but the quality flag has been set to 4. Those negative values concern between 50 and 70% of the profiles each year. Users are free to reject or not this first level (notice that the correction applied in the first layer is not that relevant). It appeared to us that some XBT profiles of the CORIOLIS database and CORA dataset have values of depth incorrectly stored in the field PRES. As we were not able to find the origin of this error, we computed the depth correction assuming that we had a depth and not pressure information. However to allow future corrections, for those XBT, we let the corrected depth in the PRES_ADJUSTED parameter.

VI.7 How to know what is the kind of data (instrument/platform) of a given measure?

If you want a detailed (but not always filled) meta-data, you want read the variable WMO_INST_TYPE in the netcdf files that gives the instrument for each profiles.

WMO_INST_TYPE	Description	WMO_INST_TYPE	Description
001	Sippican T-4	700	Sippican XCTD standard
002	Sippican T-4 new eq.	710	Sippican XCTD deep
009	T-04 460m T-04 1500F	720	Sippican AXCTD
011	Sippican T-5	730	Sippican SXCTD
019	T-05 1830m	741	TSK XCTD
021	Sippican Fast Deep	742	TSK XCTD-2
022	inconnu022	743	TSK XCTD-2F
031	Sippican T-6	751	TSK AXCTD
032	Sippican T-6 new eq.	800	MBT Mechanical Bathy Thermograph
039	T-06 460m	810	Hydrocast
041	Sippican T-7	820	Thermistor Chain
042	Sippican T-7 new eq.	830	CTD
049	T-07 760m	831	Profiling Float (PF) - Generic
051	Sippican Deep Blue	840	PF, PROVOR, no conductivity sensor
052	Sippican Deep Blue new eq.	841	PF, PROVOR, SBE conductivity sensor
059	T-DB 760m	842	PF, PROVOR, FSI conductivity sensor
060	inconnu060	843	PF, Polar Ocean Profiling System (POPS), PROVOR SBE
061	Sippican T-10	844	PF, ARVOR, Seabird conductivity sensor
069	T-10 200m	845	PF, APEX, no conductivity sensor
071	Sippican T-11	846	PF, APEX, SBE conductivity sensor
079	T-11 460m	847	PF, APEX, FSI conductivity sensor
081	Sippican AXBT (300m probes)	850	PF, SOLO, no conductivity sensor
201	TSK T-4	851	PF, SOLO, SBE conductivity sensor
202	TSK T-4 new eq.	852	PF, SOLO, FSI conductivity sensor
211	TSK T-6	853	PF, SOLO2 (SCRIPPS), Seabird conductivity sensor
212	TSK T-6 new eq.	856	PF, NINJA, SBE conductivity sensor
221	TSK T-7	858	PF, NINJA, TSK conductivity sensor
222	TSK T-7 new eq.	860	PF, NEMO, SBE conductivity sensor
229	TSK T-7	861	PF, NEMO, FSI conductivity sensor
231	TSK T-5	995	Instrument attached to marine mammals
241	TSK T-10	999	Unknown
251	TSK Deep Blue		
252	TSK Deep Blue		
401	Sparton XBT-1		
411	Sparton XBT-3		
421	Sparton XBT-4		
431	Sparton XBT-5		
451	Sparton XBT-6		
460	Sparton XBT-7 (old)		
461	Sparton XBT-7		
462	Sparton XBT-7		
481	Sparton XBT-10		
491	Sparton XBT-20		
501	Sparton XBT-20DB		

Otherwise you can have more general information using the PROBE_TYPE variable from Index files:

PROBE_TYPE	Description
10	XBT
20	CTD
30	XCTD
40	PROFILING FLOAT
51	TAO-TRITON PIRATA RAMA MOORINGS
52	COASTAL MOORINGS (< 20km from the coast)
50	OTHER MOORINGS
60	GLIDERS
70	INSTRUMENT ATTACHED TO SEA MAMMALS
80	DRIFTING BUOYS
0	UNKNOWN