



PRODUCT USER MANUAL

In Situ TAC objective analysis Products

INSITU_GLO_PHY_TS_OA_MY_013_052

INSITU_GLO_PHY_TS_OA_NRT_013_002

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GLOSSARY AND ABBREVIATIONS

CF	Climate Forecast (convention for NetCDF)
CORA	COriolis Re-Analysis
COROLIS	In situ data system for operational oceanography
DT	Delayed Time
EU	European Union
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
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
MOI	Mercator Ocean International

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 Scope of this document

This Product User Manual describes the multiyear INSITU_GLO_PHY_TS_OA_MY_013_052 and the near real time INSITU_GLO_PHY_TS_OA_NRT_013_002 products from the Copernicus Marine In Situ Thematic Assembly Centre (In Situ TAC): how they are built, which content, which data services are available to access them.

I.2 The Copernicus Marine project

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 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 products

Products INSITU_GLO_PHY_TS_OA_MY_013_052 and INSITU_GLO_PHY_TS_OA_NRT_013_002 generated by the Coriolis team (the Data Centre and the Research & Development team) in Brest, France, provide global Temperature and Salinity observations datasets and objective analysis gridded fields at different time scales. The second one is a Near Real Time product (NRT) while the first one (also called CORA Analysed fields, see Cabanes *et al.*, 2013 and Szekely *et al.*, 2019) is a reanalysis of these Near Real Time datasets in delayed-mode.

II SYSTEM DESCRIPTION

The operational analysis system set up by the In Situ TAC Global component is operated by CORIOLIS data centre and R&D team. It produces quality-controlled temperature and salinity observations datasets and gridded fields. The system is based on a statistical analysis method (objective analysis, Bretherton *et al.*, 1976) developed and maintained at LOPS (Laboratoire d'Océanographie Physique et Spatial, Gaillard *et al.*, 2009): the In Situ Analysis System (ISAS). It is performed on the datasets extracted from the Coriolis database for data quality control and producing gridded scalar fields. This system allows presenting a synthesis and a validation of the dataset, providing a support for localized experience (cruises), providing a validation source for operational models, observing seasonal cycle and inter-annual variability. It is the In Situ Objective analysis operational nominal product for the Global Ocean. The dataset contains data from different types of instruments: mainly Argo floats (including ITP), CTD, XBT and XCTD, moorings, drifting buoys and sea mammals.

Both products INSITU_GLO_PHY_TS_OA_NRT_013_002 and INSITU_GLO_PHY_TS_OA_MY_013_052 use the version 8.0 of ISAS, and have been fully reprocessed with this version.

Product INSITU_GLO_PHY_TS_OA_MY_013_052 covers 1960 to 11 month ago (when updated).

Product INSITU_GLO_PHY_TS_OA_NRT_013_002 covers the last 2 years.

Further information on the ISAS tool is available at <http://dx.doi.org/10.13155/22583>.

III PRODUCT DESCRIPTION

III.1 General Information

The operational analysis system is operated by the In Situ TAC on different time scales through the two products.

- For the INSITU_GLO_PHY_TS_OA_NRT_013_002 product (A Near-Real-Time Objective Analysis - former NRTOAGL01). The objective analysis is run several times for each month, the first time it is run on the 8th of the following month, and the second time, it is run 3 weeks later, on the 1st of the month after, as new data still arrive more than 3 weeks after acquisition. Then annually, the monthly products that are more recent than the last available monthly REP (delayed mode) product are generated once more, This allows to take into account the quality improvement in the overall Coriolis dataset, and in particular, a better correction of salinity drifts (see a more detailed justification in the QUID <https://doi.org/10.13155/99215>).
- For the INSITU_GLO_PHY_TS_OA_MY_013_052 product, a complete re-analysis is performed in delayed mode on all the data extracted from the Coriolis database since 1960 and updated each year to add the latest complete year of data

THIS IS THE PRODUCT TO USE WHEN AVAILABLE AS THE TIME SERIE IS HOMOGENEOUS IN TERM OF VERSION OF THE ANALYSIS SYSTEM AND THE OBSERVATIONS USED HAVE BEEN SCIENTIFICALLY ASSESSED

III.2 Details of datasets

The list of products described in the Copernicus Marine Catalogue is

Short Description	Product code <i>Dataset code</i>	Area	Delivery Time	Included Data
Global NRT	INSITU_GLO_PHY_TS_OA_NRT_013_002 <i>cmems_obs-ins_glo_phy-temp-sal_nrt_oa_P1M</i>	Global	Monthly	Stations for which both temperature and salinity fields are available and no eXpendable (XBT, XCTD) data

Global MY	INSITU_GLO_PHY_TS_OA_MY_013_052 <i>cmems_obs-ins_glo_phy-temp-sal_my_cora-aa_P1M</i>	Global	Yearly	All types of data (described thoroughly in PUM of INSITU_GLO_PHY_TS_DISCRETE_MY_013_001 product)
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Table 1: 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 at: <http://www.coriolis.eu.org/Science2/Global-Ocean/CORA>

III.3 Temporal extent of analysis and update date

- For INSITU_GLO_PHY_TS_OA_NRT_013_002 product

A monthly analysis is run using data covering a six-week window, 21 days before and after the date of the analysis centred on the 15th of the month. These monthly analyses are delivered as mentioned previously: the 8th of the following month, the 1st of the Month after and annually in January or February if the monthly analysis date is more recent than the last delayed-mode (REP) product. This time series shouldn't contain gaps unless no data was available for this month.

- For the INSITU_GLO_PHY_TS_OA_MY_013_052 product

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.

III.4 Spatial coverage and resolution

For both products, this is a global analysis, covering -180 to 179.5 degrees in longitude and -77.0 to 89.9 in latitude. Longitude resolution is equal to 0.5 degrees. Latitude resolution is not homogenous: it is equal to 0.5 degrees at the equator, reaches 0.1 degrees at 77 S and 0.2 degrees at 89.9 N (see Figure 1)

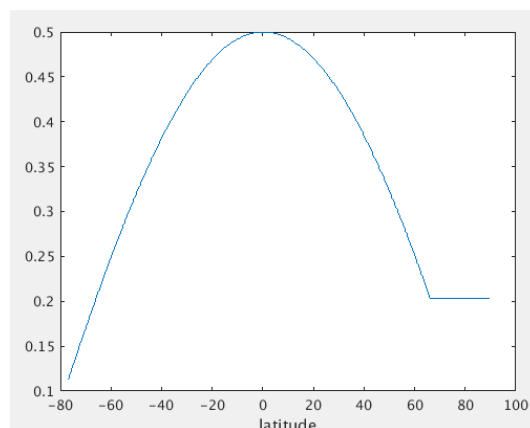


Figure 1: latitude resolution of the gridded field

The vertical resolution is 187 vertical levels from surface to 5500 meters. Depth levels are: 1m, 3 m, one level every 5 meters from 5 m to 95 m, one level every 10 meters from 100 m to 790 m, one level every 20 meters from 800 m to 1980 m and one level every 100 m from 2000 m to 5500 meter depth.

III.5 ISAS Configuration and first-guesses

The following ISAS configuration was used to generate the gridded fields:

Product	Configuration file	Content
NRT	PSAL.cnf	PSAL ISAS17_DMFD_CLIM_ann_STD_PSA.nc% a priori climatology variance ISAS15_DMFD_ann_0_COVS.nc % a priori climatology covariance bathy_isas17.nc % bathy definition 300 300 30 % covar_ls x, y t (in km, km, days) 20 % covar_ms_t (in days) 1 2 8 % var_weigh (LS, MS, UR) 1 1 0 1 % x, y, z, t covariance dependency (1 = yes, 0 = no) 1.5 % fact. Variance 5 12 % QC Max Mx_std 0.99 % Cov_max (if > 1, no oversampling test) (v4 : 1.1)
NRT	TEMP.cnf	TEMP ISAS17_DMFD_CLIM_ann_STD_TEMP.nc% a priori climatology variance ISAS15_DMFD_ann_0_COVS.nc % a priori climatology covariance bathy_isas17.nc % bathy definition 300 300 30 % covar_ls x, y t (in km, km, days) 20 % covar_ms_t (in days) 1 2 8 % var_weigh (LS, MS, UR) 1 1 0 1 % x, y, z, t covariance dependency (1 = yes, 0 = no)

		1.5 % fact. Variance 5 12 % QC Max Mx_std 0.99 % Cov_max (if > 1, no oversampling test)
NRT	Pre-treatment conf_isasana.xml	For a same platform, if relevant, a reduction is performed by averaging information on : <ul style="list-style-type: none"> • 5km/5days areas for data treated as vertical profiles • 55km/9days areas for data treated as time series (namely TAO/PIRATA/RAMA moorings)
REP	PSAL.cnf	PSAL ISAS17_DMFD_CLIM_ann_STD_PSA.nc% a priori climatology variance ISAS15_DMFD_ann_0_COVS.nc % a priori climatology covariance bathy_isas17.nc % bathy definition 300 300 30 % covar_ls x, y t (in km, km, days) 20 % covar_ms_t (in days) 1 2 8 % var_weigh (LS, MS, UR) 1 1 0 1 % x, y, z, t covariance dependency (1 = yes, 0 = no) 1.5 % fact. Variance 5 12 % QC Max Mx_std 0.9999 % Cov_max (if > 1, no oversampling test)
REP	TEMP.cnf	TEMP ISAS17_DMFD_CLIM_ann_STD_TEMP.nc% a priori climatology variance ISAS15_DMFD_ann_0_COVS.nc % a priori climatology covariance bathy_isas17.nc % bathy definition 300 300 30 % covar_ls x, y t (in km, km, days) 20 % covar_ms_t (in days) 1 2 8 % var_weigh (LS, MS, UR) 1 1 0 1 % x, y, z, t covariance dependency (1 = yes, 0 = no) 1.5 % fact. Variance 5 12 % QC Max Mx_std 0.9999 % Cov_max (if > 1, no oversampling test)

The climatology (first-guess) used for NRT product is ISAS17 (Gaillard et al., 2016).

The climatology (first-guess) used for REP product is varying with the year of analysis. The list and the corresponding year of the analysis is given below.

Year	Climatology
1960 - 1975	WOA : 1965-1974 climatology
1975-1984	WOA : 1975-1984 climatology
1985-1994	WOA : 1985-1994 climatology

1995-2004	WOA : 1995-2004 climatology
2005-2015	WOA : 2005-2017 climatology
2016 - 2022	ISAS 17

III.6 Data organization

The directory organization on the ftp portal is described below.

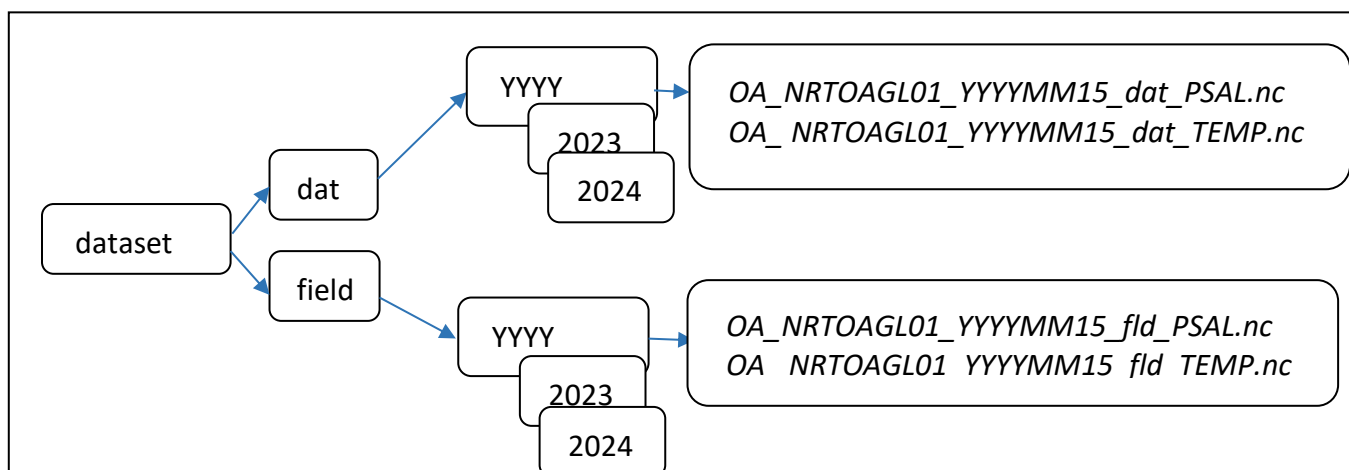


Figure 2: directory structure of the INSITU_GLO_PHY_TS_OA_NRT_013_002 product

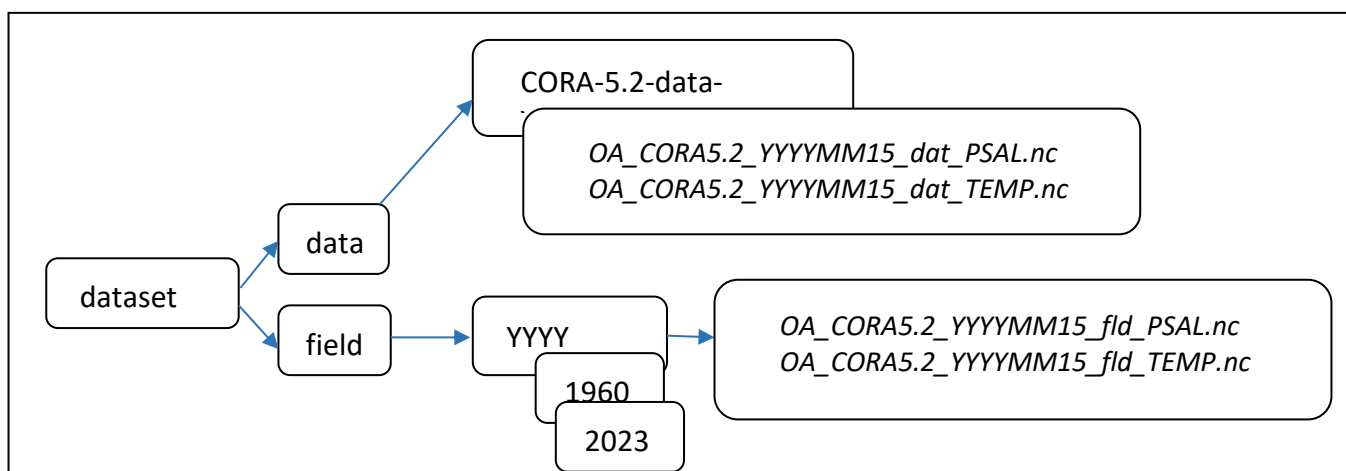


Figure 3: directory structure of the INSITU_GLO_PHY_TS_OA_MY_013_052 product

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

- DATA: information on the auxiliary data used to build the analysed gridded field.
- FIELD: the gridded field produced by the objective analysis and estimation error.

For detailed information on CORA, please visit: <http://www.coriolis.eu.org/Science2/Global-Ocean/CORA>

IV FILES NOMENCLATURE AND FORMAT

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](#) ”

Only files of the INSITU_GLO_PHY_TS_OA_013_002 product are described hereafter since a full description of the CORA files is available at: <http://www.coriolis.eu.org/Science2/Global-Ocean/CORA>

IV.1 Nomenclature of original files

The OA files are named following this convention : **OA_code_YYYYMMDD_type_param.nc**

- **code** is the name of the analysis performed: NRTOAGL01,
- **YYYYMMDD** is the central date of the analysed period,
- **type** is the type of analysis product: “dat” for data or “fld” for gridded field
- **param** is the analyzed parameter : TEMP (sea temperature) or PSAL (sea salinity).
 - o File Format

The products are stored using the NetCDF format.

Since mid-2020, INSITU_GLO_PHY_TS_OA_NRT_013_002 and INSITU_GLO_PHY_TS_OA_MY_013_052 files uses netCDF-4 classic model format (especially for compression capability). To know more about the NetCDF format, please follow this link:

<https://help.marine.copernicus.eu/en/articles/4427604-what-is-the-format-of-copernicus-marine-products-netcdf>

IV.2 Structure of files

The files distributed in the INSITU_GLO_PHYS_TS_OA_NRT_013_002 dataset are named OA_NRTGL01_YYYYMMDD_fld_PARAM.nc for the fields files and OA_NRTGL01_YYYYMMDD_dat_PARAM.nc for the data files. The PARAM can be TEMP or PSAL since temperature and salinity are stored in separate files. In the INSITU_GLO_PHYS_TS_OA_MY_013_052 dataset, the files have the same nomenclature, with the OA_CORA5.2 prefix instead of OA_NRTGL01.

IV.2.1 Field file structure.

Since TEMP and PSAL are stored in separate files the user should replace PARAM by TEMP or PSAL according to the selected file in the following nomenclature.

Important dimensions :

Longitude : 720

Latitude : 545

Depth : 187

Time : 1

Variables :

longitude : Longitude position of the grid.

latitude : latitude position of the grid.

depth : depth of the grid

time : date of the analysis

PARAM : Analyzed value for the selected parameter (TEMP or PSAL).

PARAM_ERR : Error on the objective analysis for the selected parameter.

PARAM_PCTVAR : Percentage of the variance

IV.2.2 Data file structure

Since TEMP and PSAL are stored in separate files the user should replace PARAM by TEMP or PSAL according to the selected file in the following nomenclature. The data files contain the profiles used to calculate the objective analysis, which are distributed in the corresponding field files. With a time correlation radius of 30 days, the data files for a given month also include profiles from the preceding and following months. Consequently, a single station can be included in multiple files.

Important dimensions :

N_PROF : Number of profiles in the file

N_LEVELS : 187

Variables :

LONGITUDE : Longitude of the station.

LATITUDE : Latitude of the station

JULD : Date of the station

DEPH : Depth of the station. The profiles distributed on the data files are interpolated on the vertical grid. The DEPH levels are the same as the depth levels of the objective analysis grid distributed in the field files.

PLATFORM_NUMBER : Code of the station platform

DATA_TYPE : Profile data type.

WMO_INST_TYPE : Code of the probe type.

DC_REFERENCE : Unique code of the station.

PARAM_PROC : Profile processing status (Adjusted or not).

PARAM : Station parameter value (TEMP or PSAL)

PARAM_QC : Quality control flag of a station point. This QC field does not match the QCs distributed in the CORA dataset since the objective analysis process selects only good quality data points. The QC s are attributed after the interpolation performed on the profiles are gives insights on the accuracy of the interpomation process. 1–4 : good_to_acceptable; 5 : bad_quality_interpolation ; 6 : bad.

PARAM_CLMN : Climatology at the position and level of the interpolated data profiles

PARAM_CLSD : Standard deviation of the climatology at the interpolated level of the data profiles.

PARAM_ERUR : Esimated error of the analysis linked to the unresolved dynamic scales

PARAM_ERME : Measurement error of the profiles

PARAM_RESI : Objective analysis residuals at the profile interpolated levels.

V REFERENCES

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. [DOI:10.5194/os-2018-144](https://doi.org/10.5194/os-2018-144)

Cabanes C, Grouazel A, von Schuckmann K, Hamon M, Turpin V, Coatanoan C, Paris F, Guinehut S, Boone C, Ferry N, de Boyer Montégut C, Carval T, Reverdin G, Pouliquen S, Le Traon, P.-Y. 2013. **The CORA dataset: validation and diagnostics of in-situ ocean temperature and salinity measurements.** Ocean Science. [DOI:10.5194/os-9-1-2013](https://doi.org/10.5194/os-9-1-2013)

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